

# The Location of Literature on Atomic Energy

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## Introduction

HISTORICALLY, the study of atomic energy started with the discovery of radioactivity in 1896 by Henri Becquerel.<sup>1</sup> Since then there have been several great milestones, among which have been the formulation of the equation relating mass and energy by Albert Einstein in 1905,<sup>2</sup> the description of isotopes by Frederick Soddy in 1913,<sup>3</sup> the observation of uranium fission by Otto Hahn and F. Strassmann in 1939<sup>4</sup> and the initiation of the first man-made, self-sustaining nuclear reaction in the University of Chicago squash court by Enrico Fermi and others on Dec. 2, 1942.<sup>5</sup>

From its beginning, atomic energy has had a rapid and varied development. The first few years of this century saw intense study of radioactivity and the radioactive elements and isotopes being discovered by Mme. Curie and others. In the 1930's the pace of progress became phenomenal with rapid developments in isotope separation, mass spectrometry, particle acceleration,

tracer technique, elemental transmutation, the preparation of synthetic elements and, later, the construction of the nuclear reactor.

The discussion in this paper will be primarily limited to the location of unclassified, technical literature representing research carried out after 1940. However, a few comments on the other information may be in order.

The results, prior to 1940, of atomic energy research—here intended to include nuclear physics, radiochemistry, radiobiology, and chemical, physical and biological studies with transuranium and other radioactive elements—are found in technical journals, monographs, treatises and reviews, the keys to which are those familiar to all who search the technical literature, e.g., *Chemical Abstracts*, *Science Abstracts*, *Biological Abstracts*, etc. During this period, very little nontechnical information on the subject appeared.

The nontechnical information on atomic energy has, since 1940 (actually since 1945), appeared almost everywhere. The daily newspaper, the household magazine, the trade periodical and the radio all carry or have carried numerous items of interest. There has also been a flood of monographs on the probable effects of atomic energy on civilization and international politics. A paper has already been prepared on nontechnical books on atomic energy,<sup>6</sup> and its

<sup>1</sup> Becquerel, H. "On the Radiation Emitted in Phosphorescence." *Compte rendus hebdomadaires des seances de l'Academie des sciences*, 122:420-21, 1896.

<sup>2</sup> Einstein, A. "Electrodynamics of Moving Bodies." *Annalen der Physik*, 17:891-921, 1905; "Does the Inertia of a Body Depend on Its Energy?" *Ibid.*, 18:639-41, 1905.

<sup>3</sup> Soddy, F. "Radio-active Elements and the Periodic Law." *Chemical News*, 107:97-99, 1913.

<sup>4</sup> Hahn, O., and Strassmann, F. "Neutron Induced Radioactivity of Uranium." *Naturwissenschaften*, 27:11-15, 1939.

<sup>5</sup> Allardice, C., and Trapnell, E. R. *The First Pile*. Oak Ridge, U.S.A.E.C., Nov. 17, 1949. (TID-292)

<sup>6</sup> Woodward, A. M. "Books on Atomic Energy for the Layman, 1948-1950." [New York, Columbia University, 1950]. *Ms.* (Term paper for course in Science Literature).

content will not be repeated here. However, the bibliography contains a few references to outstanding nontechnical bibliographies and indexes which may be of value in the science library.

The classified information, that which is not released to the public for reasons of national security, is of little concern to non-project personnel for they will have no contact with it. The very close bibliographic control under which this information is held has been described in the semiannual reports of the U.S.A.E.C. to Congress<sup>7</sup> and in the articles by Goldsmith<sup>8</sup> and Fry, *et al.*<sup>9</sup> Those faced with the control of industrial reports or multitudinous separates may be interested in current methods.

#### *Publications and Publication Methods*

From 1940 until 1945, the publication of the results of research in atomic energy was limited by cooperative agreement as well as by security regulations. The reasons for the limitations are obvious, for prior to the bombings at Hiroshima and Nagasaki in 1945 any information released would have indicated the extent of progress in the country reporting the result and

aided its enemy. The small amount of information which did appear on such topics as the chemistry of the fission products is found in the standard sources which publish the results on other research.

The first major publication after the bombings was the Smyth report<sup>10</sup> which attempted to review, briefly and simply, the achievements and general methods used by the Manhattan Engineer District and its contractors to produce their end product, the atomic bomb. With the publication of the Smyth report and shortly thereafter the passage of the Atomic Energy Act of 1946,<sup>11</sup> a veritable deluge of information was released or ready for release. This was partially the normal result of the desire of the individual scientist to publish his findings, and partially of the legal responsibility placed upon the newly formed U.S.A.E.C. by the Atomic Energy Act which stated in part:

... the dissemination of scientific and technical information relating to atomic energy should be permitted and encouraged so as to provide that free exchange of ideas and criticism which is essential to scientific progress.

In discharging its responsibility, the U.S.A.E.C. has used most of the modern communication media, emphasizing the well-established channels for disseminating scientific and technical information, but creating new publications as the need arose.

Basically the publication of atomic energy research involves two steps: first, the approval of the research paper for release from a security standpoint; and second, the selection and use of a publication medium. It is common knowledge that to-

<sup>7</sup> U. S. Atomic Energy Commission. *First Semiannual Report to the Congress by the United States Atomic Energy Commission*. Washington, U.S.G.P.O., 1947; *Second Semiannual Report to the Congress by the United States Atomic Energy Commission*. Washington, U.S.G.P.O., 1947; *Third Semiannual Report to the Congress by the United States Atomic Energy Commission*. Washington, U.S.G.P.O., 1948; *Fourth Semiannual Report to the Congress by the United States Atomic Energy Commission*. Washington, U.S.G.P.O., 1948; *Fifth Semiannual Report to the Congress by the United States Atomic Energy Commission*. Washington, U.S.G.P.O., 1949. (Also titled, *Atomic Energy Development 1947-1948*); *Sixth Semiannual Report to the Congress by the United States Atomic Energy Commission*. Washington, U.S.G.P.O., 1949. (Also titled *Atomic Energy and the Life Sciences*); *Seventh Semiannual Report to the Congress by the United States Atomic Energy Commission*. Washington, U.S.G.P.O., 1950. (Also titled *Atomic Energy and the Physical Sciences*); *Eighth Semiannual Report to the Congress by the United States Atomic Energy Commission*. Washington, U.S.G.P.O., 1950. (Also titled *Control of Radiation Hazards in the Atomic Energy Program*).

<sup>8</sup> Goldsmith, H. H. "The Literature of Atomic Energy of the Past Decade." *Scientific Monthly*, 68:291-98, 1949.

<sup>9</sup> Fry, B. M., Warheit, I. A., and Randall, G. E. "The Atomic Energy Commission Library System: Its Origin and Development." *College and Research Libraries*, 11:5-9, 1950.

<sup>10</sup> Smyth, H. D. *Atomic Energy for Military Purposes. The Official Report on the Development of the Atomic Bomb under the Auspices of the United States Government, 1940-1945*. Princeton, Princeton University Press, 1945.

<sup>11</sup> U. S. Congress. *An Act for the Development and Control of Atomic Energy. (Atomic Energy Act of 1946)*. Seventy-ninth Congress, Second Session, S.1717, Public Law 585, Aug. 1, 1946. Section 10, (a) (2).

day the scientific press is all but swamped with acceptable contributions, particularly from workers on government contracts, so publication is often delayed for many months. Therefore, other media of dissemination must be available.

The National Nuclear Energy Series is one of the outstanding publications carrying the results of atomic energy research. It is a numbered book series published by the McGraw-Hill Book Company under contract to the U.S.A.E.C., which will consist of approximately 60 volumes of reviews, collected papers and bibliography on the advances in the many fields of pure and applied science resulting from the efforts of the U.S.A.E.C., its predecessor the Manhattan Engineer District and their contractors. Each of the volumes is authoritative and is edited or written by one or more of today's outstanding scientists. The individual papers in the volumes of collected papers are, in many cases, the contributions of young men who have not yet become well known outside the atomic energy project itself. However, the papers have been carefully selected and those contributing are fully competent in the subjects upon which they dwell. (A list of the titles available in the National Nuclear Energy Series is given in each issue of *Nuclear Science Abstracts*.)

Although most of the technical journals are necessarily slow in publishing papers submitted to them, many of the results of atomic energy research appear between their covers. The decision on the submission of a paper to a journal rather than the use of some other method of publication is, for U.S.A.E.C. authors, usually considered a writer's prerogative. Consequently, papers by authors desiring their work published in the established periodicals are found throughout the recent scientific literature.

The publication of scientific papers as

serially numbered separates is the unusual feature in the reporting of results of atomic energy research. These separates are either declassified documents (reports which at the time of writing were restricted in distribution but which have since been determined to be releasable) or unclassified documents (reports which were available for broad distribution upon completion because of official interpretation of the term "restricted data" in the Atomic Energy Act). These reports, both declassified and unclassified, are available in much the same fashion as other government publications except that they should be ordered either from the Office of Technical Services in Washington or from the Technical Information Service, U.S.A.E.C., in Oak Ridge, Tenn. This method of publication corresponds to that adopted by the Naval Research Laboratory, the National Advisory Committee for Aeronautics and other technical organizations sponsored by the U. S. Government. These atomic energy separates, like the others, ordinarily contain the results of original study not published elsewhere. Automatic distribution of most of them is made to 31 depository libraries, and many of them are dispensed to other libraries upon specific request. There is, however, a group which is not usually distributed. These are the documents which are to be included in the volumes of the National Nuclear Energy Series or which the author wishes to submit for journal publication. This withholding is done so that sales potential will not be compromised by prior publication, and so that duplicate publication—an annoying problem in the technical literature—will not result. Periodic press releases are issued listing those documents made available during a brief period and these are usually reproduced in *Chemical and Engineering News*, *Science* and other periodicals.

The major part of the research data obtained on atomic energy by private institutions is published directly in the technical periodicals. This is also true of the unclassified, non-Russian, foreign results.

The keys to atomic energy research information are similar to those used in any technical field. However, the speed of availability is of utmost importance. There are abstracts, indexes and bibliographies which cover all of the technical information released by the U.S.A.E.C. and as much material on the topic contributed by other domestic and foreign organizations as can be located.

The outstanding key is *Nuclear Science Abstracts*. This is a semi-monthly publication begun in July 1948 by the Technical Information Service, U.S.A.E.C., which attempts to abstract all technical articles on atomic energy or other fields of direct interest to the atomic energy research worker.<sup>12</sup> The articles abstracted in the publication, which is approximately the size of *Science Abstracts*. *A. Physics Abstracts*, cover a number of subject disciplines: chemistry, physics, metallurgy, ceramics, biology, medicine and engineering. A detailed subject index, along with a number of other useful indexes, has been included in each issue as well as being cumulated in the final number of each volume. One of the outstanding features of this publication, in addition to a far smaller time lag of abstracting than any other commonly available abstracting service, is the large number of items included which do not appear in other abstracting journals. These are primarily monographic publications of the U.S.A.E.C., other domestic and foreign governmental laboratories, and university research laboratories and foundations, together with a few items from unusual or

esoteric periodicals obtained in the Technical Information Service exchange program.

*Nuclear Science Abstracts* is available free to all project and depository libraries, and to other libraries and individuals on a subscription or exchange basis.

Prior to the publication of *Nuclear Science Abstracts*, two other periodicals abstracted and indexed some of the same literature. These were *Abstracts of Declassified Documents* and *Guide to Published Research on Atomic Energy*. The first of these existed for two volumes starting in July 1947, and the second for three volumes starting in November 1946. In July 1948, both were discontinued in favor of the then new *Nuclear Science Abstracts*. The combination of these publications affords excellent entrée to the atomic energy research since 1940, or more accurately, to the technical data released since 1946.

The Office of Technical Services' publication, *Bibliography of Scientific and Industrial Reports*, also carries brief abstracts of U.S.A.E.C. documents. However, because of the inadequate indexes presently available, it is of little permanent value for atomic energy research data. The major abstracting and indexing services, such as *Chemical Abstracts*, *Science Abstracts* and those operated by the H. W. Wilson Company, New York, also carry references to a few of the U.S.A.E.C. publications.

Another tool made available by the U.S.A.E.C. to a number of libraries throughout the country (those serving U.S.A.E.C. contract holders) is a card index to unclassified and declassified reports which it has sponsored or handled.<sup>13</sup> This card file is a partial duplication of the information in *Nuclear Science Abstracts*, but for items published before its inception, it is useful because the subject division in the card file is more detailed than that found

<sup>12</sup> McGee, J. H. "The Organization of an Abstracting Service." *Special Libraries*, 40:244-48, 1949.

<sup>13</sup> Fry, B. M., et al., *Loc. cit.*

in the index to *Abstracts of Declassified Documents*, which is duplicated.

The unclassified and declassified documents mentioned above are issued, ordered, and for reasons of convenience, often referred to by number. This, coupled with the variation in availability between documents, makes necessary some tool for the actual location and/or indication of availability of individual documents. *Nuclear Science Abstracts* carries an issue-by-issue index of those numbered documents abstracted, but since it abstracts most of the unclassified and declassified documents in manuscript form, most of them are not publicly available as soon as the abstract appears. Hence, the Technical Information Service has issued cumulative bibliographies of the documents released, with indications of their locations in the literature and/or their sale price as separates. The last such list<sup>14</sup> contains over 1900 titles. These cumulative lists, as separates, were discontinued in favor of a document availability index in *Nuclear Science Abstracts*, the first of which appeared in the cumulative index number of volume IV. This index shows not only the locations and prices of the documents made available, but also the *Nuclear Science Abstracts* abstract number for every U.S.A.E.C. document abstracted during the period covered. The document availability index covering the period to Jan. 1, 1950 (through volume IV), contains information on over 3400 documents, many of which are not readily available at this time.

Lists of new documents for sale are also issued at about two-month intervals, and are available free from the Technical Information Service, Oak Ridge, Tenn.

A number of general and subject bibliog-

<sup>14</sup> Technical Information Division. "Documents Released by the United States Atomic Energy Commission to January 1, 1950." Oak Ridge, U.S.A.E.C., April 1950. (TID-358)

raphies have also been published which accumulate references to U.S.A.E.C. documents and other published literature of interest in atomic energy research. The bibliography of this paper contains a brief list of the general bibliographies available to the public. The subject bibliographies, such as the recent publication on tritium,<sup>15</sup> can be located through *Nuclear Science Abstracts* or the card file mentioned above, both of which contain main subject headings for bibliography.

The British, French and Canadian atomic energy projects issue reports as separates, much as does the U.S.A.E.C. However, none of these projects publishes readily available and complete lists of its unclassified documents. The British declassified documents are distributed by His Majesty's Stationery Office, and lists of publications prepared by that organization include those containing atomic energy information. Two lists made in this country are shown in the bibliography. These lists, together with the periodic lists published in *Chemical Age* (London) and *Nature*, are usable keys to the British documents.

Canadian documents are usually available through the National Research Council of Canada. However, little effort apparently is expended to indicate their availability. Documents published by the French project are less readily available.

The Technical Information Service takes pains to acquire as many of these foreign documents as possible and to include them in *Nuclear Science Abstracts*. Those acquired are often available on interlibrary loan from the Oak Ridge office of the Technical Information Service.

The German effort on atomic energy has been summarized in the much discussed F.I.A.T. reviews. These summaries are

<sup>15</sup> Croxton, F. E., and Schwind, S. B. *Tritium (H<sup>3</sup>): A Bibliography of Unclassified Literature*. Oak Ridge, U.S.A.E.C., Aug. 25, 1950. (TID-371)

quite complete, but it must be remembered that considerable hindsight went into their preparation. Hence, some results reported as obtained were not from German effort.

It has already been mentioned that a large portion of the unclassified foreign literature on atomic energy is published directly in technical journals, so the standard keys to the literature are applicable.

### Summary

The results of atomic energy research which are available to the public are located

in the National Nuclear Energy Series, standard technical periodicals and serial separates published by the U.S.A.E.C. and other agencies supporting atomic energy research. The most complete index to this information is furnished in *Nuclear Science Abstracts* and its predecessors, *Abstracts of Declassified Documents* and *Guide to Published Research on Atomic Energy*. Additional useful keys are the bibliographies prepared by the U.S.A.E.C. and others, and the standard technical abstracting and indexing services.

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