

The World Before 1907: Searching for Chemical Literature before Chemical Abstracts

by
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“This is no study for the man who is in a hurry.”
G. Malcolm Dyson, 1947

What chemistry librarian hasn't winced at the prospect of verifying an obscure 19th-century reference? Or gotten sweaty palms when faced with a search for an otherwise unknown procedure dating from “sometime in the 1870s”? It's times like these that modern librarians, spoiled just like our patrons by desktop access to almost everything of importance, must dig deep to find their inner detectives and dust off their old print-based searching skills.

Yes, there was a world “B.C.A.” (Before Chemical Abstracts). Modern chemical science had its origins in the 18th century Enlightenment, and so did its literature. Papers on chemical topics were published in many scholarly journals, often those of various academies and philosophical societies throughout Europe and America. Journals dedicated to chemistry, such as Crell's *Chemisches Journal* (1778) and Lavoisier's *Annales de Chimie* (1789), began in the late 18th Century (Crosland, 1994). The idea of including abstracts dates from the same period, when editors realized that scientists no longer had time to read everything that was published. Both Crell's and the *Annales* included abstracts, and the first chemical abstracting journal, *Pharmaceutisches Central-Blatt*, began in 1830 (Williams, 2000). Yet for most English-speakers, 1907 – the year *Chemical Abstracts* began indexing the world's chemical literature – is the watershed date that now serves as a somewhat arbitrary demarcation between “modern” and “historical” chemistry.

Few researchers today bother to do any exhaustive documentation or attribution of the historical aspects of their work beyond the rote citation of a seminal paper, which they almost certainly have not seen or read. For most practical purposes, this is not a serious crime. Delving into the ancient minutiae of a chemical discovery or process is not something most chemists are interested in doing, since it can be very time-consuming. Some might claim quite legitimately that there is little to be learned from pre-20th century literature that has not already been thoroughly re-examined, improved upon, or discarded in the decades since (Dyson, 1947). (Patent searchers should take note that I am intentionally omitting discussion of the patent literature, where prior art is an important concept, albeit for different reasons.)

Thus most questions about pre-CA literature are likely to come from the most curious and thorough patrons. Furthermore, many historical questions are likely to be bibliographic in nature, involving the verification of a reference and locating the article, rather than a more general topical search. This can often be accomplished with CASSI, WorldCat, and a few other basic tools, without resorting to unearthing dusty old abstract sources. But when deep digging is necessary, librarians can benefit from some knowledge of resources beyond the typical. The most challenging example is the patron who wants to know the earliest discovery of a particular piece of knowledge, without knowing exactly who discovered it or when. In these cases it's important to use good reference sources in conjunction with bibliographic sleuthing, to save time and increase reliability.

Finding Journal Articles

The searcher should realize that the journal landscape of the 19th century and before was considerably different than the one we know today. Dyson lists three significant pitfalls encountered on our journey through the past: multiple

publication, anonymous authors, and short-lived or ever-changing journals. An author might have published a particular paper in several different journals, identical, slightly revised, or translated into various languages -- a practice that had largely died out by the 1870s. While this may help locate an otherwise obscure paper in a findable journal or a readable language, it can cause serious bibliographic confusion too. Anonymous communications common in journals of that era can be even more maddening. And finally, when journals were very much a personal endeavor on the part of an editor, they often died with him, or were taken over by other editors who promptly put their own stamp on it, usually by starting over with new volume numbering and prefixing their name to it: *Gilbert's Annalen* begat *Poggendorff's Annalen*, which begat *Wiedemann's Annalen*, and so on. That these possessive labels were often unofficial shorthand rather than formal titles just adds to the fun (Dyson, 1947).

Here are some resources that can be helpful in identifying pre-1907 journal articles. They are listed in rough order of usefulness and accessibility, but naturally you should choose your targets based on the time period in question and what kind of information you're starting with. This section might help librarians re-discover some forgotten gems in their collections, and maybe even rethink some weeding and storage decisions.

Beilstein/Gmelin Crossfire

The chemical Handbuch concept pioneered by Leopold Gmelin and F.K. Beilstein took a different approach to summarizing the literature for working chemists, organized around chemical substances rather than the chronological abstracting of publications and patents. The Beilstein database covers the literature of organic chemistry fairly comprehensively back to 1779. The Gmelin file covers inorganic chemistry in a similar fashion. Unlike the printed handbooks, Crossfire can be searched in a variety of ways, including author name and bibliographic data. If you're starting from a chemical structure or reaction, this is your tool of choice. Versions of these databases are also available on STN.

SciFinder/SciFinder Scholar (Chemical Abstracts)

The CAPLUS file in SciFinder contains the full content of Chemical Abstracts back to 1907. CAS has done selective retro-indexing of some pre-1907 journal literature, starting with JACS and J. Phys. Chem. (including their abstracts sections) back to their first volumes (STNews, 2005). Users should be reminded that the more powerful Registry-based search features in SciFinder and STN (e.g. CAS Roles, RN crossover, etc.) query only the 1967-forward CA file segment. Searching of pre-1967 records is text-based only. In addition, the CASREACT file includes about 590 references from the French INPI core reaction database back to 1840 (STNews, 2004).

Catalogue of Scientific Papers. (1800-1900)

This is the best source for identifying scholarly papers by author in all the sciences (except medicine and surgery) from the 19th century, and it's also the easiest to use. Compiled by the Royal Society of London, the *Catalogue* covered nearly 1,900 periodicals at its peak. It is an author index divided into date ranges: v. 1-6: 1800-1863; v. 7-8: 1864-1873; v. 9-11: 1874-1883; v.12: Supplementary volume, 1800-1883; v.13-19: 1884-1900. Entries are brief, providing only the article title in its original language, and an abbreviated citation. One excellent feature is that multiple published versions or translations of the same paper are grouped together in a given entry. Seventeen separate subject indexes were planned, but only three were published: mathematics, mechanics, and physics. The entire set was reprinted by Scarecrow in 1968, and copies are available on the used book market.

While full digitization of the now-public-domain *Catalogue* might seem like a no-brainer, it has been the victim of missed opportunities, and so far no satisfactory electronic version exists. The three subject indexes have been added to Paratext's subscription-based **19th Century Masterfile** (<http://poolesplus.odyssey.com/19centWelcome.htm>), but the chemistry coverage in these indexes is very limited. Paratext did not respond to inquiries about when the full work might be available. The volumes have also been scanned (rather poorly) by the Bibliothèque Nationale de France, which provides free single-page PDFs on their **Gallica** site (<http://gallica.bnf.fr/periodiques.htm>). Because no text-searching or index capabilities are available, this version is not useful unless you already know the exact volume and page number you want to view. For practical purposes, it is still easier to use the print edition. For more information on the CSP, see the Scholarly Societies Project (<http://www.scholarly-societies.org/history/RSLC.html>).

International Catalogue of Scientific Literature. (1901-21)

This title, also published by the Royal Society, continued the *Catalogue of Scientific Papers* after 1901. It was a multi-part serial divided into sections on the various scientific disciplines; part D covered chemistry. It ceased in 1921, after covering literature up to about 1916 in 14 annual volumes. World War I was the disrupting force in its demise, but it helped to bridge the gap until most disciplines started their formal abstracting services. (Some biology sections remain especially useful since *Biological Abstracts* did not start until 1926.) In 1969 the Mini-Print Corp. issued a reduced-size reprint of the entire series. It has not been digitized.

Journal of the Chemical Society: Abstracts. (1871-1925)

The Chemical Society's flagship journal's even-numbered volumes contained abstracts of the literature in pure and theoretical chemistry after 1871. This section merged in 1926 with the abstracts section of the *Journal of the Society of Chemical Industry* to form *British Abstracts*, which continued until 1953. The JCS abstracts were not comprehensive, but they are the most readily accessible option for the time period before 1907. Each volume has subject and author indexes. The abstract text can be searched and PDF scans retrieved from the online RSC Archives, but it is not a database per se. It takes a bit of persistence to yield results this way.

Journal of the American Chemical Society. (1879-90)

JACS published abstracts from major foreign journals starting in its first volume in 1879; this section disappeared after 1890. (A separate section abstracting patents of interest to chemists can also be found in these early years.) After 1897 the *Review of American Chemical Research* was included as a supplement (see below). The pre-1890 abstracts have been digitized in the ACS Archive and have also been added to the CAPLUS file in SciFinder.

Review of American Chemical Research. (1895-1906)

This abstracting journal was founded at MIT by Arthur A. Noyes. Its first two volumes were published with *Technology Quarterly and Proceedings of the Society of Arts*. From 1897 to 1906, it was published as a separate supplement to the *Journal of the American Chemical Society* (bound with the Society's Proceedings). As its title implies, it initially covered only U.S. journals. When William A. Noyes (a distant relative of Arthur) became editor of JACS in 1902, RACR's scope was enlarged to include U.S. patents and papers by Americans published in foreign journals. By its final volume in 1906 RACR had grown to about 700 pages. Chemical Abstracts took over and further expanded this operation, under the latter Noyes' editorship, in 1907 (Powell, 2000). Librarians should note that RACR has *not* been digitized and is not included in the ACS Archive or in CAPLUS.

Chemisches Zentralblatt. (1830-1969)

This pioneering German abstracting journal had various titles and spellings over the years (*Pharmaceutisches Central-Blatt*, *Chemisch-Pharmaceutisches Zentralblatt*, etc.). After 1897 it was published by the German Chemical Society. It is an important tool for identifying 19th-century chemical and pharmacy literature, although it is a challenge to use for the non-German reader. Its coverage of German chemistry is regarded as superior to CA's until World War II, and its abstracts were longer and more informative. The disruptions of wars hot and cold brought on a long decline, but it lingered on through the 1960s. Many libraries have probably relegated CZ to storage or, worse, the recycler – this is a shame. Its use nowadays is naturally very limited, but it is a unique historical source that was very important in its day. No electronic version exists. (Crane, 1957; Weiske, 1973; Flambard, 1992)

Chemische Berichte. (ca.1880-96)

The German Chemical Society published abstracts (Referate) in its *Berichte* from about 1880 (in a separate section after 1884) until it took over publication of *Chemisches Zentralblatt* in 1897. Wiley now offers a new backfile package that includes *Berichte* plus the German *Angewandte Chemie* and *Liebigs Annalen*, but the status of their abstracts is still unknown.

Reuss Repertorium.

This bibliography, compiled by J.D. Reuss and originally published from 1801-21 (and reprinted by Burt Franklin in 1961), covers journals published by scholarly societies in the 17th and 18th centuries, and is a good precursor of the Royal Society's *Catalogue*. Its full Latin title, *Repertorium commentationum a societatis litterariis editarum secundum disciplinarium ordinem digessit*, translates as "Index of Articles published by Scholarly Societies, arranged by discipline." It has been digitized by GDZ at the University of Göttingen (<http://www-gdz.sub.uni-goettingen.de/cgi-bin/digbib.cgi?PPN36645336X>). For more information see the Scholarly Societies Project web page (<http://www.scholarly-societies.org/history/reuss.html>).

Poggendorff, J. C. *Biographisch-literarisches Handwörterbuch der exakten Naturwissenschaften*. (Berlin: Akademie-Verlag, 1863-)

Its title is a mouthful, and it's a handful to use. This multi-volume German biographical resource gathers dust on many a library's shelves, but it can shed light on publications from the early period into the early 20th century. For more information see the Scholarly Societies Project (<http://library.uwaterloo.ca/society/history/Poggendorff.html>). Wiley-VCH released a CD-ROM version of the entire database in 2004: (<http://www.poggendorff.com/>).

Science Citation Index (Web of Science)

SCI indexes articles and books from all time periods that have been cited by later authors. It's a good place to verify or clarify mysterious or incomplete bibliographic citations to early papers, books, patents, and miscellany. However, the abbreviations used in citations can be cryptic and often require further investigation.

In addition to the journals listed above, some of the other journals that also published abstracts during this time include:

- *Bulletin de la Société Chimique de France: Répertoire de chimie pure and Répertoire de chimie appliqué* (1857-?)
- *Annalen der Chemie* (1832-60)*
- *Journal für praktische Chemie* (1834-73)*
- *Journal of Physical Chemistry* (1896-1906)*
- *Journal of the Society of Chemical Industry* (1882-1925)
- *Annales de Chimie et de Physique* (1789-1870)

* electronic backfile available

Many journals published their own author and subject indexes annually, and some, such as *Liebigs Annalen*, helpfully cumulated these indexes every few years to make searching within that title easier.

Abbreviations and Union Lists

CASSI remains the key to translating almost any obscure journal title abbreviation. If you're stumped by cryptic citations to *Pogg. Ann.* or *Arch. Ges. Naturl.*, CASSI will lead you into the light. It also includes many serials that predate its titular 1907 starting point. CASSI's union list function, though lacking for recent titles, remains useful in identifying possible holding libraries of older materials, although WorldCat is broader and more up to date. Other earlier union list compilations, such as Bolton's *Catalogue of Scientific and Technical Periodicals, 1665-1895*, the *World List of Scientific Periodicals*; and Gregory's *Union List of Serials* were important in their day but are now largely obsolete (Mellon, 1950; Labov, 1950). Union lists specific to U.S. chemical libraries, mostly corporate, were published by the Special Libraries Association in 1935, 1939, and 1947 and are likewise now only of historical interest, as is the CZ journal title and abbreviation list, *Periodica Chimica* (Pflücke, 1952).

Finding Books

The need for this kind of literature searching is less likely to arise in everyday chemical research, but it is important for historians of science and rare book collectors.

WorldCat (OCLC)

With nearly 60 million records from over 10,000 libraries worldwide, this is the obvious first stop when searching for historical books, pamphlets, and serial publications.

RLG Union Catalog

The database formerly known as RLIN serves as a major union catalog of records describing books, serials, archival collections, manuscripts, and ephemera. It reflects the collections of a select group of major academic, public, and national research libraries, as well as archives, museums, and historical societies. It complements WorldCat and is stronger in coverage of historical/archival and rare book materials. Be sure to consult it along with WorldCat when searching for library holdings of old and obscure journals.

Chemical Abstracts Service Source Index. (CASSI)

One should not overlook the beloved CASSI when verifying obscure monographs and conferences that might have been indexed in CA. It might be your only clue for those in Russian or Slavic languages.

Dissertation Abstracts

Indexes PhD dissertations written at U.S. universities back to 1865. Records for older dissertations are brief and usually lack abstracts.

Bolton, Henry C. *Select Bibliography of Chemistry*. (Washington DC: Smithsonian Institution, 1893-1904; NY: Kraus Reprint, 1967)

This bibliography and its two supplements list books in chemistry in many languages from 1492 up to about 1902. Entries are arranged by author within these seven sections: bibliography, dictionaries/tables, history, biography, pure and applied chemistry, alchemy, and periodicals. Section VIII appeared later as a supplement covering dissertations.

Ferguson, John. *Bibliotheca Chemica*. (London: Derek Verschoyle, 1954)

Subtitled "A bibliography of books on alchemy, chemistry and pharmaceuticals," this two-volume set was originally published in 1906. It is a richly descriptive bibliography of early chemistry books in the collection of James Young (1811-83), a Scottish chemist and inventor.

National Union Catalog, pre-1956 Imprints.

The famous "green wall" beloved by catalogers and reference librarians "of a certain age," this massive printed card catalog of the Library of Congress, known as Mansell, contains book holdings information for a number of major research libraries. It's an invaluable source for books and ephemera that are not found in the WorldCat or RLIN databases (Beall, 2005).

The Web

Lastly, one should not forget that web search engines like Google can have a remarkable power to solve bibliographic mysteries if one is persistent enough. The growth of new deep-web indexing tools such as Google Scholar and digitization projects like Google Print (and many others) holds great promise in our quests for the obscure. They can locate digital copies of books and articles in otherwise unknown repositories, and they can free us from the tyranny of restrictive author-title-date searches that the more traditional resources impose. Many librarians (including this one) might even make Google their first stop, even if they're not yet prepared to admit it in public.

Happy sleuthing!

Notes

Beall, Jeffrey and Kafadar, Karen. 2005. "The Proportion of NUC pre-56 titles represented in OCLC WorldCat." *College and Research Libraries*, 66(5) 431-35. A random sample search indicated that 28 percent of Mansell entries are not represented in WorldCat.

Crane, E.J. et al. 1957. *Guide to the Literature of Chemistry*. 2nd ed. (NY: Wiley). Quoted in Maizell, Robert E. 1998. *How to Find Chemical Information*. 3rd ed. (NY: Wiley), pp.140-141. Crane was long-time editor of CA. His claim that "it is very unusual to find an abstract of a paper in CZ that is not also in CA from 1907 on" may have been based more on personal pride than actual fact.

Crosland, Maurice. 1994. *In the Shadow of Lavoisier : the Annales de Chimie and the Establishment of a New Science*. (Chalfont St. Giles: British Society for the History of Science)

Dyson, G. Malcolm. 1947. "Searching the older chemical literature." in *Searching the Chemical Literature*. (Advances in Chemistry Series, no. 30) (Washington: ACS, 1961), pp.83-91. This book collects a number of papers presented at ACS national meetings for the Divisions of Chemical Literature and Chemical Education from 1947 to 1956.

Flambard, A.R. and Weiske, C.M. 1992. "Fachinformationszentrum Chemie GmbH, Berlin: a decade in the service of chemistry information." *Chemische Berichte* 125 XXV-XXXI. The authors claim that CZ expanded its scope "to include all branches of pure and applied chemistry" by 1886-87, and that "in 1888 no fewer than 273 journals were covered." However, according to Mellon and Power, in 1910 CZ covered 162 titles; CA 435; and J. Chem. Soc. and J. Soc. Chem. Ind. combined covered 222. Crane states that CZ focused on pure chemistry until 1919, when it absorbed the abstracts section of *Zeitschrift für angewandte Chemie*.

Labov, Teresa G. 1950 (revised 1961). "Identification of less common forms of abbreviations for chemical journal titles." in *Searching the Chemical Literature*, op. cit., pp. 92-101.

Mellon, M. G. and Power, Ruth T. 1950 (revised 1960). "Searching less familiar periodicals." in *Searching the Chemical Literature*, op. cit., pp. 92-101.

Pflücke, M. and Hawalek, A. 1952. *Periodica chimica: Verzeichnis der im Chemischen Zentralblatt referierten Zeitschriften mit den entsprechenden genormten Titelabkürzungen*. (Berlin: Akademie Verlag, 1952). A supplement appeared in 1962.

Powell, Evelyn C. 2000. "A History of Chemical Abstracts Service, 1907-1998." *Science & Technology Libraries* 18(4) 93-110.

STNews, Jan./Feb. 2004, p.9.

STNews, Sept./Oct. 2005, p.9. The pre-1900 records added in 2005 to CAPLUS represent 1,600 articles from JACS; 125 articles from J. Phys. Chem.; 7,200 patent abstracts from JACS vols. 1-4, 6-10, and 12-17; plus approximately 5,000 article abstracts and book reviews from JACS and J. Phys. Chem. 7,000 records from these journals spanning 1900-06, plus several hundred "landmark papers of enduring value from 1900-1912," were added in 2004 (Sept./Oct. 2004, p.7). These records have been assigned volume "0," OCI, and the year 1906 for CA reference purposes. They have been assigned to appropriate ICI sections, but do not have CA indexing.

Weiske, Christian. 1973. "Das Chemisches Zentralblatt: ein Nachruf." *Chemische Berichte* 106(4) I-XVI. History and statistical data on CZ, in German.

Williams, Robert V. and Bowden, Mary Ellen. 2000. "Chronology of chemical information science." <http://www.chemheritage.org/explore/timeline/CHCHRON.HTM> (Accessed 1/12/2006)

This article is based on a pathfinder available at <http://www.lib.utexas.edu/chem/info/old.html>.