CHE 380/498 Institute for Green and Sustainable Science
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Library research in chemistry

Literature searching is an important element of all scientific research. Not only is this the only way of finding out whether a piece of research is truly novel, but the peer-reviewed scientific literature is also a vital repository of laboratory techniques, preparatory methods, and information of all kinds – if you know *where* and *how* to look for it.

At Marian University we have three main sources of scientific literature: books, hardcopy journals (limited selection) prior to 2000 or so, and online journal subscriptions. Of these, the online journals are likely to be of the most use. These can be accessed through the following URL:

http://libguides.marian.edu/content.php?pid=20723&sid=146409

The main databases of use to us in chemistry are the following:

Academic Search Premier, which offers access to a wide variety of journals (the list of available journals can be browsed, or one can go straight to the desired journal by typing its name into the box) such as *Journal of Chemical Physics* or *Analytical Letters*. Typically, the years available are limited, with access to the most recent journals (last 12 months) "embargoed".

American Chemical Society journals – our best resource, which offers full online (PDF) access and searching in all journals published by the American Chemical Society, including *Journal of the American Chemical Society* (JACS), *Journal of Physical Chemistry A* and *B*, *Analytical Chemistry*, *Biochemistry*, and *Chemical Reviews*, among many others.

Note – the library resources page and the ACS journals page are also linked directly from the Chemistry homepage: http://chemphys.marian.edu, and from the IGSS web site: http://igss.wikidot.com.

<u>Journal References</u>

The typical style of citation found in chemistry articles (with the exception of some reviews) is the numbering system, with the references gathered

either at the bottom of the page on which they are first mentioned or at the end of the article in their own section. Usually, the journal title is abbreviated (see e.g. http://www.cas.org/sent.html for abbreviations), and a typical reference might look something like:

R. Kadono, R. M. Macrae, K. Nagamine, *Phys. Rev. B.*, **68**, (2003), 245204.

Minor details of format vary from journal to journal.

Chemical Abstracts

A major resource for chemical research is the *Chemical Abstracts* service, which has for many years published indexed abstracts of virtually all work in the chemistry field. In addition to the main collection of abstracts, separate series of volumes contain indices by chemical name, by chemical formula, and by author name. Marian University has some of the older series of Chemical Abstracts in the library. Nowadays most people will access the Chemical Abstracts databases electronically using the software tool *SciFinder Scholar* – we don't have this (somewhat expensive) tool at the moment, but you may have the chance to use it elsewhere and tutorials are available online at

http://www.cas.org/SCIFINDER/SCHOLAR/interact/index.html.

Types of journal article

Various types of journal article exist in chemistry. These have differing intents and uses, and it is important to learn to distinguish between them:

1. *Brief report* or *letter* – a short paper, typically no more than 4 pages in print, describing important new work. This type of paper will not usually contain complete experimental details (often these are deferred until the publication of a full paper), but will report the most significant findings in a concise manner.
2. *Research report (AKA article or full paper)* – a complete description of new work, including full citations of all earlier related work, a complete account of the experimental or theoretical method (if it is new – otherwise this may be abbreviated), and a full set of data. In principle it should be possible to reproduce the work from the description in such a paper and the references contained within it, given the appropriate equipment.

3. *Review* – this type of paper (found for example in *Chemical Reviews*) overviews all recent (and sometimes not so recent) work in a particular field. It is typically written by someone who has published quite a lot of work in the field, but should in principle be a balanced report of all the work in the field, rather than concentrating on his or her own work. A review can often be a useful starting point for beginning to dig into a new field.

Types of journal

All sources of scientific information are not created equal. A key concept in scientific publishing is *peer review* – the notion that, before an article is accepted for publication, it should be studied critically by experts in the field to determine whether the procedures referred to are scientifically legitimate and the results obtained thereby plausible. The existence of peer review adds considerable weight to the findings in a particular article. (As a sidenote, this is why Intelligent Design advocates, cold fusion enthusiasts, and climate change contrarians are so desperate to have any of their work published in peer-reviewed journals.) However, peer review is not infallible – the referees may be ill-chosen, or the paper may contain mistakes which cannot be detected easily. In such cases, the basic scientific notion of *reproducibility* becomes important – if the work is valid, it should be possible to duplicate it using the same methods. In this way, science is to some extent self-correcting. Note, though, that not every incorrect paper is refuted in print. For this reason, critical reading and careful attempts to reproduce past findings are important.

That said, the scientific literature falls into a few broad categories:

Discipline-specific journals – these would include publications such as *Journal of Organic Chemistry*, *Journal of Raman Spectroscopy*, *Magnetic Resonance in Chemistry*, and so forth. The criteria for publication in such a journal are *basic validity* and *relevance to the field*. These will form the basis of the decision of the referees. (The American Chemical Society solicits names and addresses of potential referees from the author of the article. In the case of some other journals, the editors of the journal decide on the referees. It is typical for an article to be sent out to two referees for review.)

General interest journals – these would include *Journal of the American Chemical Society* within chemistry, or *Nature* within science as a whole.

Publication in these journals is subject to one extra criterion – generality of interest. For this reason, papers submitted to such journals are scrutinized more closely, and the rejection rate is higher (80% at *Nature*). These journals typically have a higher *impact factor* than the discipine-specific journals, as they are read by more people.

(*Impact factors* – see reference 3 below – are a measure of the degree to which work appearing in a given journal is cited by other scientists.)

Conference proceedings and abstracts – these are typically afforded less weight than publications in journals. This is largely because the level of peer review is variable, and may be nonexistent. (For example, proceedings of the μSR2008 conference recently held in Tsukuba, Japan, are published in *Physica B*, a real journal, and are subject to peer review, but the refereeing was largely done at the conference and may not rise to the level of thoroughness typical for this journal.) Additionally, the results presented are typically considerably more preliminary than those appearing in journal articles.

Outside the main body of the scientific literature, there are a variety of other information sources which should be treated with considerably more caution. These include market publications (which mainly exist to serve their advertisers), popular science publications such as *Scientific American* or *Discover*, and press releases from universities to the mass media (which tend to oversell research).

References

1. http://www.library.yale.edu/science/help/chemlit.html
2. http://www.scirus.com/srsapp/ (search engine for scientific information)
3. http://www.qualitas1998.net/ismn/impact_factors.htm