# Orienteering in the library

PAPER

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**A short exercise in literature searching is described which is suitable for students in the second year of a BSc chemistry course. The exercise was devised in order to help students to become familiar with the primary literature, before they start on a final year project involving a literature survey. Each student is given the structure of an organic compound and is required to find specified information about it in the primary literature.**

## Introduction

It is the commonly held view in the world of education, that the important thing for students is not so much to know a great deal but to be able to find information when they need it. And yet, in most chemistry courses we expect students to concentrate on learning the principles and practice of chemistry and a certain amount of basic material to provide the necessary foundations for the subsequent acquisition of specialised knowledge as part of the individual's professional development. We also hope, incidentally, that in the process of chemical instruction students will pick up the skills of using the literature and the art of finding information as and when it is needed.

This matter need not be left to hope and chance and there are reports in the educational literature[1,2] describing approaches to the teaching of chemical information retrieval. We have also introduced such instruction, but the amount of time available for it was much less than the 15 timetabled sessions in one approach[1] and we have made a conscious decision to concentrate on paper sources rather than electronic ones (for a different view see ref. 2) since the latter tend to have relatively recent starting points: BIDS in 1981, CA-Online in 1967; we also wanted to combat the all too common attitude that if something is not on an electronic database, it does not exist. Moreover, we felt that it is always easier to persuade students to make the move from printed paper to screen than vice versa.

In the first year or two of their studies our students are directed mainly to textbooks, to some specialist monographs and to the occasional original paper with full bibliographic details given. Up to that point they have no need to search the primary literature. What follows is an account of an exercise which is intended to introduce them to that.

## The problem

For many years our students have done a final year project of the background pertaining to their research topic, carrying out the experimental work and writing a project report for which the literature survey served as an introduction. For too many students the literature search was hindered by their unfamiliarity with the highways and byways of the chemical literature and we felt it would be helpful for them to be given some experience before they have to do it in earnest as part of their projects.

## A solution

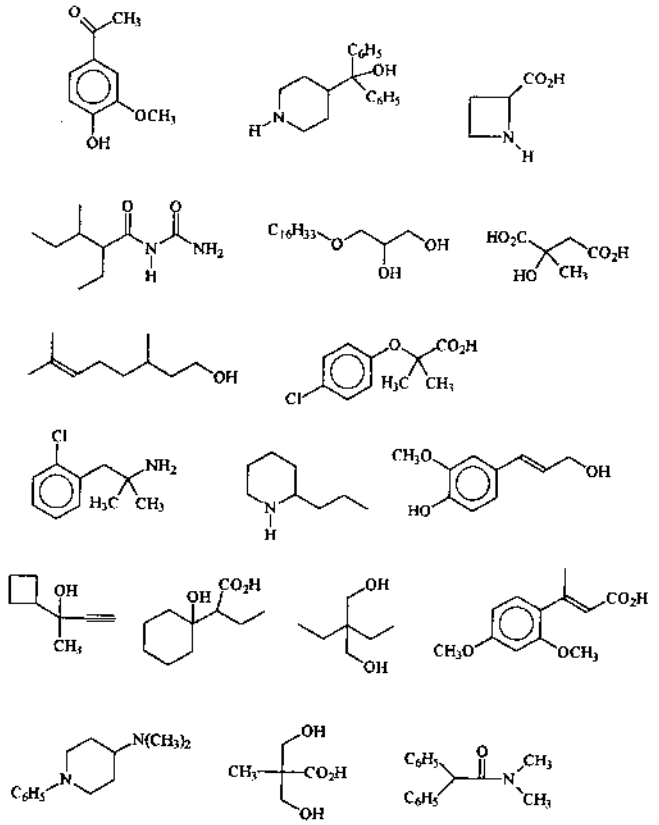
In 1995-96 we introduced a literature searching exercise as part of the second year organic chemistry practical course.[3] It was weighted the same as two lab experiments to justify the amount of time the students were expected to spend on it (12-16 hrs total). The exercise consisted of giving each student the structure of a (different) organic compound and asking them to find (and correctly reference) information about it in the literature. They were told to:

1. Find its melting point (and the solvent from which it was recrystallised) or the boiling point (and the pressure at which it was distilled), giving the reference to the source from which the information was obtained (only primary sources count!).
2. Describe a published synthesis for the compound, giving the reference to the source from which the information was obtained (only primary sources count!).
3. Give the earliest reference mentioning it (only primary sources count!).
4. Give a paper published between 1970 and 1980 referring to it. If they can't find one, to extend the search to the 60-s (only primary sources count!).

The compounds were relatively simple: a ring or two with two or three functional groups, just enough to get them out of the range of typical textbook examples. They were all selected from the Merck Index, which was a quick way of getting a range of structures of the right degree of complexity and for which the required information was guaranteed to be available. Figure 1 shows some of the compounds used.

The students were given these problems during an hour long introductory talk designed to help them on their way. The talk included information about the structure of the chemical literature, definitions of 'primary', 'secondary' and 'tertiary' sources with examples of each, descriptions of the structure and organisations of Chemical Abstracts, Beilstein and other such compendia and they were given some general advice on how to approach the problems[4]. They were then given a month to do the search with encouragement to com

**Figure 1:** A typical set of compounds used in the library exercises



also asked to fill in a questionnaire about their own particular experiences in working through this exercise.

## Results

The student responses to the four tasks ranged from good to excellent. Given the simple nature of the tasks, it was difficult to get the answers wrong, once the appropriate sources have been found. Mistakes were made in translation (*benzine* in a German paper was translated as *benzene* instead of the petroleum ether it is) or in understanding what is meant by *published synthesis* (taken by one student as being just the final step in a sequence leading to the specified product). Apart from these, the mistakes were in presentation: not giving the initials of authors, etc.

One problem revealed was the students' difficulty with naming their compounds. Apart from the introductory organic courses, nomenclature (being boring) plays little part in their later instruction with the result that when they start doing real chemistry they have problems.

## Conclusions

### The student view – from the questionnaires

1. Their previous experience in finding information ranged from none to some, using BIDS and finding references when given the precise details (journal, volume, year and for in this exercise was new to all of the students.
2. They set about finding the required information mostly by following the initial advice and starting with formula indices coupled with names for the compounds. Many of the students found the Merck Index a helpful source of information, not surprisingly, since the compounds were picked from that in the first place. (This is now changed). Once armed with reliable names and some initial information, they went to Beilstein and to Chemical Abstracts, especially for the answers to questions 3 and 4.
3. The source of the greatest difficulty was the use of Beilstein, partly owing to the unfamiliarity of its organisation, partly owing to the fact that it is not in English. This was also a complaint made against some authors who were inconsiderate enough to write in other languages! Other questionnaire responses identified *knowing where to start* and *naming the compound* as the main source of problems, the last combined with the fact that in Chemical Abstracts the names may change over time.
4. The introductory talk had a mixed reception, but the comments included many useful suggestions for its improvement. These were mainly for a more detailed introduction to Beilstein and for worked examples of finding information in it and in the Chem Abs indices.
5. All students reported that they now know their way around the chemistry section of the library (cf. the title!). Other 'discoveries' reported were: knowing how to find information about particular compounds, how to use literature sources, how stressful the search can be, the skill involved in eliminating unwanted information sifting out what is really needed, and last, but not least, some chemistry.
6. All students thought the exercise worth while. Most respondents recognised the relationship between what they did here and the skills needed for the task facing them when starting their projects. The one person with some reservation conceded that it was quite interesting but complained that some compounds were much easier to find information on than others and that this is a bit unfair!

The students were asked again at the end of their project work whether they felt the library exercise had helped. The answers were emphatically yes, so the original objective has been achieved.

### Lessons learned

1. We are revising the list of compounds on offer. Picking them from the Merck Index means that, once the students have found the book, they can cut short a lot of the exercise. The compounds will be replaced with others of a similar kind selected from the indices of Beilstein (4th supplement). This method of selection guarantees that each problem is tractable. Entries in successive supplements is evidence for continued interest in the compound. This makes it more than likely that it

so that the requirements of task 4 can be met. The Beilstein entry will contain a boiling/melting point with a reference (task 1) and this will provide (at least) a starting point for finding the information in tasks 2 and 3.

2. The introductory talk has been modified to include a more detailed and illustrated discussion of the use of Beilstein and Chemical Abstracts.

## References


1. Abrash H I 1992 A course in chemical information retrieval *J. Chem. Ed.* 69 143
2. Cooke RC 1994 Undergraduate online chemistry literature searching *J. Chem. Ed.* 71 867
3. Breuer S 1996 *Proceedings Variety in Chemistry Teaching*, (eds. T Overton and J Garratt) Royal Society of Chemistry
4. They were directed at published advice on finding chemical information. This included the excellent chapter in March J 1992 *Advanced Organic Chemistry* 4th ed, Appendix A, p 1239 (Wiley) and books, such as: Crane EJ, Patterson AM and Marr EB 1957 *A guide to the literature of chemistry*, 2nd ed (Wiley); Maizell RE 1979 *How to find chemical information* (Wiley); Mellon MG 1982 *Chemical publications – their nature and use* (McGraw-Hill); Bottle RT and Rowland J F B 1993 *Information sources in chemistry* (Bowker-Saur). The 1996-97 class also had their attention drawn to the excellent Web page by Dr Jeffrey Gosper at 'http://www.brunel.ac.uk/depts/chem/ch361a/lect.htm' from which one may also infer that such instruction is part of the undergraduate chemistry experience at Brunel University.