5. New Chemist article

Summary

Outline of the exercise

Students work in pairs to produce a short article for a fictitious journal – the *New Chemist*. This journal only publishes articles relating to chemistry, which are written for a general audience of chemists at many levels (*ie* from professional chemists to those at secondary school), and its aim is to highlight recent developments in chemistry by identifying novel and exciting research reported in chemical literature. The style of the articles which students produce is prescribed in this exercise and is based on the half-page news articles found in the *New Scientist* magazine. Recent papers from *Chemical Communications* can be used as a basis for the articles. Some examples of work produced by students during trialling of the exercise are included in this book.

Key aims

- To develop the skills of information retrieval (and comprehension), written delivery, and visual delivery.

Many students are poor at writing concise summaries, and at explaining chemistry to non-specialist audiences; these skills are required for this exercise.

Time requirements

- Less than 1 hour (tutor contact time)
- Approximately 18 hours private study

Timetable

Approximately 5 minutes are required to explain this exercise. Students need about 20 hours to to complete the exercise well – 9 hours for choosing and comprehending a suitable article, and 9 hours to write the article and format it correctly. A reasonably imminent deadline is helpful – if students have other course commitments, a timescale of 2 weeks is appropriate.

S5 New Chemist article

Publications such as *New Scientist*, and daily newspaper science pages keep us in touch with developments in chemistry and other subject areas; for example, with stories of 'Dolly' the cloned sheep, the Hale-Bopp comet, or the debate about the demise of the dinosaurs. These stories are usually picked up by a journalist with a training in science, who takes an interesting journal article (often a preliminary communication), and follows up the science to make a story. Some examples of chemistry articles in *New Scientist* are:

1. A. Coghlan, 'Water winds up the world's smallest spring' *New Scientist*, 1997, No. 2077, 16.
2. C. Seife, 'This way up – why the HIV drug AZT needs to stay in shape' *New Scientist*, 1998, No. 2129, 15.
3. D. Bradley, 'Ringing the changes: the hard slog of making steroids should soon be a distant memory' *New Scientist*, 1998, No. 2123, 14.
4. P. Hadfield & R. Walden, 'Catalysts for change: could some cunning chemistry make hydrogen the fuel of the 21st century?' *New Scientist*, 1998, No. 2123, 10.

In this exercise you and a colleague are required to produce a similar article for the *New Chemist* magazine. This publication reports recent advances in chemistry for a general audience of chemists from the professional to the secondary school pupil. Choose a paper that interests you from any recent issue of *Chemical Communications*. Your friends will be assessing the article you produce – so if they cannot understand it, non-specialists will have even greater difficulty! Instructions from the editor are given below and must be followed exactly. Some guidelines are also provided to help you.

Instructions and guidelines for authors

- The article must be exactly one half side of A4;
- It should follow the *New Scientist* format (font, font size, column width, etc). It is often easiest to write the text in an open A4 layout, and re-format it at the end;
- It must contain at least one drawing/scheme/picture drawn with a chemical drawing package;
- One additional graphic may be used (*eg* picture/graph/cartoon); and
- It should be about 300 words in length (absolute limits 200–400 words).
- Three copies of the finished article should be submitted before the deadline.
- Choose a good title;
- Use the first paragraph for a brief, catchy summary of what was achieved in the research;
- Use the next three to four paragraphs to expand on the detail – remember that chemistry jargon will need to be explained to non-experts;
- End with a punchy conclusion, possibly including an indication of how the chemistry might be developed or exploited in the future;
- Ask a friendly expert (perhaps a chemistry lecturer or a fellow undergraduate) for comments; and
- Make sure your names are on the article.
- As soon as you and your colleague have agreed on a paper on which to base the article, write the reference on the sheet provided on the notice-board, and make sure that nobody else has already selected it. The deadline for submissions is also on the notice-board.
- Disks corrupt, computer crash, and printers jam – the *New Chemist* deadline is rigorously enforced by the editor so do not leave production of the article until the last minute.

T5 New Chemist article

Provided the students have the appropriate computer keyboard skills, minimal tutor input is required for this exercise. The articles could be produced in many formats, but the style, level and length required here are ideal both for checking whether students understand the underlying chemistry and for developing their ability to explain chemistry to non-specialists in writing. This particular format also requires students to prepare computer-generated text including graphics.

There is real merit in having a very specific format for three reasons:

- chemists need to write reports of a given format throughout their careers;
- all the students produce the same length of submission; and
- it is easier to compare and assess the articles.

Finally, the exercise runs best if students work in pairs, although it could also be carried out individually. Students benefit from the joint discussion and criticism of the article as it develops – a practice that is encouraged for all written reports, even if prepared by individuals. An element of peer pressure is also introduced when working in pairs, which tends to lead to the production of higher quality articles.

Designing similar exercises

It is very easy to choose different formats and levels for similar exercises. For example, students could convert some of their laboratory results into journal format. This works well if they have carried out a research project, although it is not realistic for normal laboratory work.

An attractive extension to the exercise is actually to produce a copy of *New Chemist* using students' articles. Students will know that the format must be exactly right, and that their colleagues will read their articles, so there is a strong incentive for them to do a good job.

Other *New Scientist* articles

The *New Scientist* articles listed below are all based on short reports found in *Chemical Communications*. They cover a range of chemical topics and could be used in addition to the examples given in the student's guide.

1. D. Bradley, 'Twists of life written in the stars' *New Scientist*, 1997, No. 2064, 17.
2. D. Bradley, 'Molecular impostor uncoils DNA theory' *New Scientist*, 1997, No. 2070, 19.
3. W. Wood, 'Glowing jellyfish just what the doctor ordered' *New Scientist*, 1997, No. 2071, 17.
4. D. Bradley, 'Buckyball 'transistor' raises nanocomputing hopes' *New Scientist*, 1997, No. 2072, 18.
5. D. Bradley, 'Catalyst banishes deadly mirror molecules' *New Scientist*, 1997, No. 2074, 18.
6. D. Bradley, 'Recipe for jelly promises new catalysts' *New Scientist*, 1997, No. 2076, 20.

7. A. Coghlan, 'Water winds up the world's smallest spring' *New Scientist*, 1997, No. 2077, 16.

8. C. Seife, 'This way up – why the HIV drug AZT needs to stay in shape' *New Scientist*, 1998, No. 2129, 15.

9. P. Hadfield & R. Walden, 'Catalysts for change: could some cunning chemistry make hydrogen the fuel of the 21st century' *New Scientist*, 1998, No. 2123, 10.

10. D. Bradley, 'Ringing the changes: the hard slog of making steroids should soon be a distant memory' *New Scientist*, 1998, No. 2123, 14.

Student examples

Two examples of *New Chemist* articles produced by students undertaking the exercise are included. These indicate the sort of articles that might reasonably be expected.

Assessment

A suggested marking scheme is included, and the tutor can carry out assessment. However, peer-assessment is also effective, with each pair of students allocated two articles to assess. Average marks can be awarded (if the two marks differ by less than 10%), with tutor input only necessary if the marks differ by more than 10%. Completed assessment forms should be returned to the students concerned, to provide feedback. The following are also worth considering:

a) An open discussion to agree a marking scheme (what criteria to use, and how many marks for each one); the students enjoy and benefit from actually thinking about how to assess their own work.

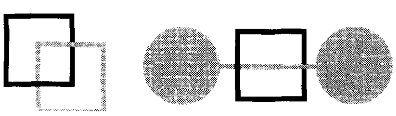
b) Asking the students to work in groups to assess several articles. The group discussion, and the chance to place a reasonable number of articles in rank order, produces more consistent marks.

Organic Chemists Redundant?

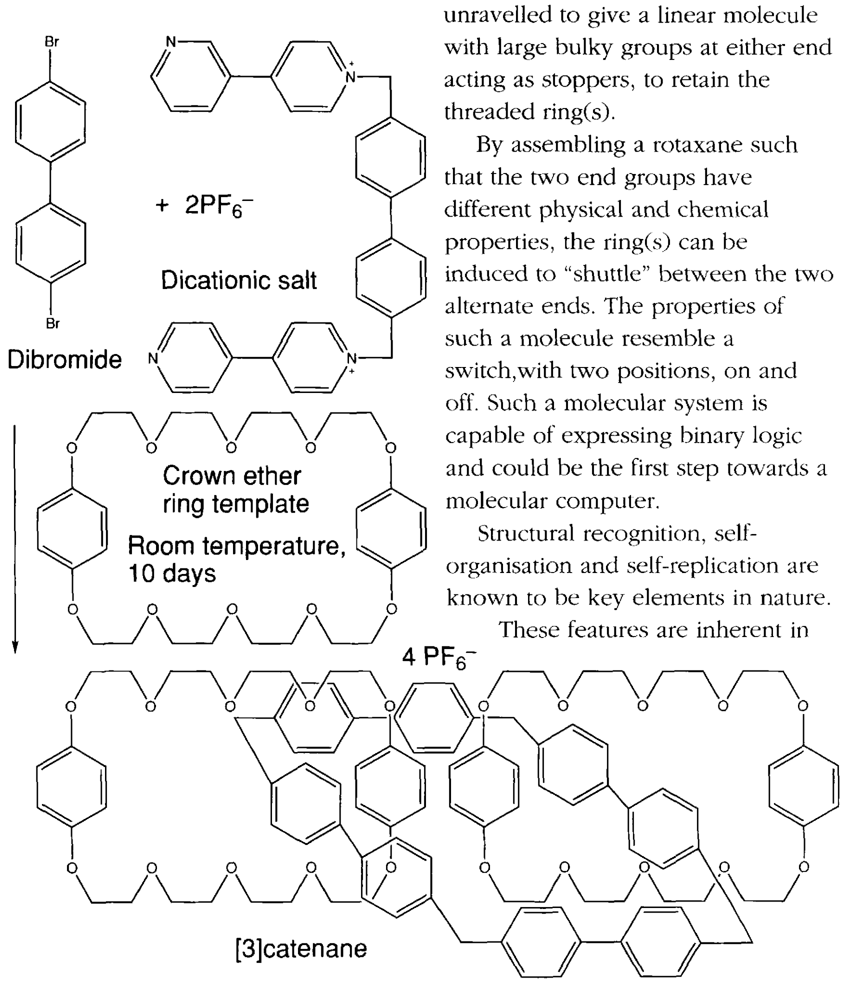
Dawn Robinson and Trish Drennan

MOLECULES that build themselves could lead to a new generation of molecular electronic devices and antibiotics. Such complicated systems could be constructed from molecules which could uniquely identify each other and self-assemble in a "jigsaw" like fashion.

Currently two classes of molecular building blocks are being used to construct primitive molecular switching devices and large molecular assemblies. These are namely the catenanes and rotaxanes, the former being two or more interlocking rings giving rise to a "chain" like structure and the latter being one or more rings threaded onto a dumbell shaped molecule where multiple threading gives rise to an "abacus" type molecule.



Catenane Rotaxane



Synthesis of the "chain" type compounds is trivial with the [3]catenane, self-assembled in 25% yield by reacting a simple dibromide with a dicationic salt, in the presence of a templating agent, such as a crown ether ring. The reaction occurs at room temperature over a period of ten days (*Journal of the Chemical Society, Chemical Communications* 1996, No. 4, p.487).

Rotaxanes can be synthesised in a similar manner where a ring is unravelled to give a linear molecule with large bulky groups at either end acting as stoppers, to retain the threaded ring(s).

By assembling a rotaxane such that the two end groups have different physical and chemical properties, the ring(s) can be induced to "shuttle" between the two alternate ends. The properties of such a molecule resemble a switch,with two positions, on and off. Such a molecular system is capable of expressing binary logic and could be the first step towards a molecular computer.

Structural recognition, self-organisation and self-replication are known to be key elements in nature. These features are inherent in chemistry and subsequently could be used, with a bit of imagination, to mimic biological processes.

So perhaps the organic chemist is not quite redundant yet?!

Helping holes make computer screens better!

Neil Polwart and Martin Melia

COMPUTER screens on laptop computers may soon be able to have full colour displays if work done at Toyota's Research and Development Labs makes it to the production line.

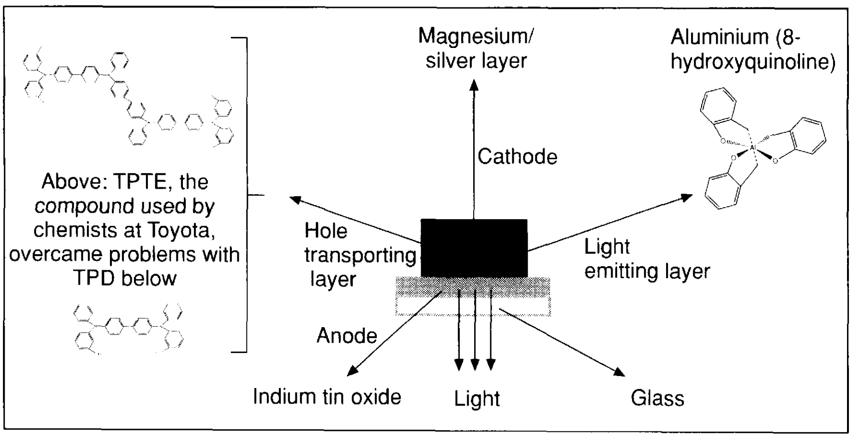
Scientists believe that electro-luminescent (EL) devices made from layers of polymer are likely to hold the future for full colour flat panel display systems. Such displays would not only offer the full range of colours detectable to the human eye but would also need to use only low voltages, and be able to operate highly efficiently. Techniques are available to produce such devices, however they degrade very quickly. This instability, which results in a reduction in luminescence and an increase in drive voltage, is believed to be the result of changes in the arrangement of molecules in a thin film which carries electronic holes – vital to the properties of these devices.

Typically such devices use *N,N'-diphenyl-N,N'-(m-tolyl)benzidene* (TPD) as the hole carrier. As the device is used it heats up and reaches temperatures close to a critical point known as its glass transition temperature; here molecules move around in the thin film and this is believed to cause changes in their electrical properties.

Recently another group of scientists fabricated devices with long life times using a starburst shaped molecule (called TCTA); unfortunately the devices require almost three times as much energy to emit light than standard TPD devices.

TPD is made up from two smaller units called TPA; the team at Toyota's lab have managed to produce a series of compounds made from two to five of these units with increasing glass transition temperatures. EL devices have been fabricated with optical and electrical properties similar to those made from TPD, note the difference being that with these devices they could operate at 100 °C for 100 hours without serious damage, whilst the TPD device broke down after a few seconds at those temperatures. Toyota's team says in *Chemical Communications* (21/09/96, 18, 2175) this is directly linked to the glass transition temperatures.

Obviously some work still needs to be done before we see full colour EL devices in mass production, but perhaps in a few years time you will be reading an on-line version of *New Scientist* on a full colour



Above: TPTE, the compound used by chemists at Toyota, overcame problems with TPD below

Assessment form

Article title:

____

Authors:

____

Assessment criteria for scientific content and presentation

- Did the title/introduction make you want to read the article? /10
- Was the article well written (ie sentences grammatically correct and easy to read)? /10
- Was the article scientifically accurate? /10
- Was the article written clearly and unambiguously? /10
- Were the graphics clear, interesting, relevant, and informative? /10
- Was the presentation and layout attractive? /10

Total mark ____/60

Total mark as a percentage ________________________________%

What was your overall impression of the quality of this report as a percentage?

(Excellent, >80%; very good, 70-80%; good, 60-70%; average, 50-60%; poor, 40-50%; very poor, <40%)

____%

If appropriate, amend the marks given until the 'impression' mark awarded matches the total percentage mark.

Final mark ____%

Brief comments on good features and areas for improvement: