Historical Group

NEWSLETTER
and
SUMMARY OF PAPERS

No. 66 Summer 2014

Registered Charity No. 207890

COMMITTEE

http://www.chem.qmul.ac.uk/rschg/
http://www.rsc.org/membership/networking/interestgroups/historical/index.asp

RSC Historical Group Newsletter No. 66 Summer 2014

Contents

From the Editor

Welcome to the summer 2014 RSCHG Newsletter. If you have received the newsletter by post, the electronic version can be found at: http://www.rsc.org/historical or http://www.chem.qmul.ac.uk/rschg/

The autumn RSCHG meeting on Chemistry and World War One at Burlington House on Wednesday 22 October will be a first for the group in that it will be streamed live to Catalyst in Widnes, Cheshire. Full details on how to register for either the London or the Catalyst event can be found in the flyer enclosed with the hard copy newsletter and also in the online version.

This issue contains a wide variety of news items, articles, book reviews and reports. The first short essay, "Whatever happened to 'Dropsy'?" is by Alan Dronsfield and Pete Ellis. Stephen M. Cohen's article "Yiddish Chemical Literature: A Brief Introduction" follows. Debbie Radcliffe and Jim Birkett have written about "Dr Alphonse René le Mire de Normandy (1809-1864) – A Brief Biography". Duncan Thorburn Burns follows his article on Thomas Andrews, with another biography of a chemist from the Queens' University of Belfast: "Edmund Albert Letts (1852-1918): A Pioneer Environmental Analytical Chemist". The final short essay is by Chris Cooksey and it continues his occasional series of articles with "Mauveine - The Final Word?"

There are two book reviews in this issue: Jay A. Labinger, *Up From Generality: How Inorganic Chemistry Finally Became a Respectable Field* and André Authier, *Early Days of X-Ray Crystallography*. Both the latter and the report on the RSC Chemical Landmark Plaque at the University of Oxford to honour Dorothy Hodgkin link into 2014's status as the International Year of Crystallography. Reports also appear of the two recent RSCHG meetings: "A Revolution in Chemical Analysis and Instrumentation" and "Chemistry as a Hobby".

Finally I would like to thank everyone who has sent material for this newsletter, with particular thanks to the newsletter production team of Bill Griffith and Gerry Moss. If you would like to contribute items such as news, articles, book reviews and reports to the newsletter please do contact me. The guidelines for contributors can be found in the summer 2012 edition or at: http://www.chem.qmul.ac.uk/rschg/Guidelines.html
The deadline for the winter 2015 issue will be Friday 12 December 2014. Please send your contributions to a.simmons@ucl.ac.uk as an attachment in Word. All contributions must be in electronic form.

Anna Simmons
University College London

ROYAL SOCIETY OF CHEMISTRY HISTORICAL GROUP NEWS

Outbreak! Education Project launches at Catalyst Centre

On 14 February 2014, RSC past President David Phillips and twenty eight children from Victoria Road Primary School in Runcorn had a chance to try out the brand new Outbreak! Education project at the Catalyst Science Discovery Centre in Widnes, Cheshire. The project was designed to promote team-building skills in a chemistry context, with teams working together to discover what the outbreak is (a deadly disease) and how they can prevent it.

In 2012, the RSC Historical Group and the RSC Chemical Information and Computer Applications Group, won £10,000 from the International Year of Chemistry Challenge Fund, to carry out a project in collaboration with Catalyst to promote public understanding and awareness of chemistry. Outbreak! was subsequently developed with that prize money and plans for the project include the Outbreak! Package being distributed to schools and science centres across the UK. For more information please visit www.catalyst.org

Adapted from an item in *RSC News*, April 2014, 4.

MBE awarded to Dr Diana Leitch

Dr Diana Leitch, a long standing member of the Historical Group, was awarded an MBE in the Queen's Birthday Honours for "services to chemistry". Diana, an Edinburgh graduate, made her career in the field of chemical information, and since retiring as Assistant Director of the John Rylands University Library of Manchester is helping to promote her original academic discipline. She is Treasurer of the RSC Chemical Information and Computer Applications Group (CICAG). She has always been keenly interested in the history of chemistry, especially the history of the chemical industry in the North West of England, where she was brought up. She is a Trustee of Catalyst at Widnes, which is both a science discovery centre and a museum of the chemical industry. Last year she acted as joint organiser for the Historical Group's successful conference at Catalyst on the history of the chemical industry in the Runcorn-Widnes area. She played a major role in developing the recent very successful *Origins* and *Outbreak!* projects at Catalyst, which aim to introduce children to chemical experimentation in an exciting and challenging manner. Many congratulations to Diana on being awarded this well-deserved honour.

MBE awarded to Dr Peter Wothers

Congratulations also to Dr Peter Wothers, Chair of the International Chemistry Olympiad and another Historical Group Member, who has been awarded the MBE for services to Chemistry in the Queen's Birthday Honours. Peter is a Teaching Fellow in the Department of Chemistry at Cambridge University and a Fellow of St Catharine's College, Chemistry. He is heavily involved in promoting chemistry to young people and members of the public. He gave the Royal Institution Christmas Lectures, entitled The Modern Alchemist, in 2012.

John Hudson

Royal Society of Chemistry Historical Group AGM

The thirty-ninth Annual General Meeting of the Group will be held in the Council Chamber, Burlington House at 10.30 on Thursday 22 October 2014. Please note that this is before the meeting Chemistry and WWI.

Agenda

1. Apologies for Absence.

2. Minutes of AGM at Burlington House, 23 October 2013.

3. Matters arising from the Minutes.

4. Reports:

   Chairman's Report.

   Secretary's Report.

   Treasurer's Report.

5. Future Meetings.

6. Election of Officers and other Members of the Committee.

7. Any Other Business.

8. Date, time and place of next meeting.

Minutes of the Thirty-Seventh Annual General Meeting of the RSC Historical Group

Held in the Chemistry Centre, Burlington House at 14.00 on Wednesday 23 October 2013.

1. **Apologies for Absence** from Peter Morris, Anna Simmons.

2. **Minutes of AGM** at Burlington House, Friday 28 September 2012. These had been published in the summer 2013 issue of the *Newsletter*.

3. **Matters arising from the Minutes**. None.

4. **Reports**:

***Chairman's Report* (Professor Alan Dronsfield)**

The Chairman reported on another successful year, in which Group numbers continued at 617. He noted that there had been several favourable references to the Group in *RSC News* and thanked Dr Chiara Ceti (RSC staff member) for help in this connection.

The Chairman reported that we had held four conferences during the year, all at zero or minimal cost. One included the presentation of a *Wheeler Award* for excellence in the history of chemistry to Peter Morris, whom he (the Chairman) had known for almost 45 years since teaching him at the Forest School. Another took place in the *Catalyst Discovery Centre*, Widnes and it recruited well, despite the need to levy a small charge. It was pleasing to attract northern-based Group members who are unable to make the trip to our usual venue of Burlington House.

The Group has continued to be involved with the RSC's *Landmark Scheme*, and in handling historical enquiries that the RSC passes on. Most recently the Group contributed to the BBC2 programme "Science Britannica".

The Group, in conjunction with the *Chemical and Information and Computer Applications Group*, secured an award of £10,000 to the Catalyst Science Discovery Centre in Widnes to set up a permanent exhibition on the origins of the elements and to support weekend workshops for families at the Centre. This proposal won first prize and was warmly commended by RSC President Lesley Yellowlees. The Chairman congratulated John Hudson (RSCHG) and Diana Leitch (CICAG) on masterminding this project.

Next, the Chairman reported that, sadly three distinguished UK historians of chemistry died during this year: Professor Colin Russell and Dr John Shorter (both former chairmen of the Group), and Dr Frank Greenaway, formerly *Keeper of Chemistry* at the Science Museum.

Finally, the Chairman noted that it was his last AGM as Chairman, and ended with a few personal reflections and thanking the officers and committee members of the Group, who have made his job easier through their help and support.

***Secretary's Report* (Professor John Nicholson)**

The Secretary reported that in the past year we held a total of four 1-day or ½-day meetings during the year, as follows:

(a) Under the Influence: Famous Textbooks and their Authors - 1 day meeting at Burlington House in October 2012 (60 attendees).

(b) History of the Chemical Industry in the Widnes-Runcorn Area - 1 day meeting at the Catalyst Museum, Widnes also in October 2012 (85 attendees).

(c) History and Chemistry of Fluorine - 1 day meeting at Burlington House in March 2013 (80 attendees).

(d) Robert Woodward, Chemist Extraordinary, half day meeting at Burlington House in May 2013 - this meeting included the Group's Wheeler Lecture by Dr Peter Morris.

In addition, the Group was represented at the most recent *RSC National Chemical Landmark* event, which was held at Queen's University of Belfast on 15 October 2013, and commemorated the work of Thomas Andrews on the liquefaction of gases.

Two Newsletters were produced during the year, edited by Anna Simmons. They included a wide variety of items, with meeting reports, summaries of papers, book reviews and other articles.

***Treasurer's report* (Dr John Hudson)**

The Treasurer reported that the Group's funds were currently healthy, with £6728.87 in the current account and £4497.29 in the deposit account. The latter is ring-fenced money from the Wheeler bequest, which is used to fund that annual award of the Wheeler lectureship to mark outstanding scholarship in the field of History of Chemistry. The Treasurer noted that income had exceeded expenditure by £1454.01 in 2012, but that we were still awaiting the bill for printing the January 2012 Newsletter.

The Treasurer reminded the meeting of the decision that had been taken to distribute our Newsletter electronically to as many members as possible, though we continue to offer a hard-copy version to those who specifically request it. This policy has been introduced during the current year, and early indications are that it has been very successful. The majority of members had agreed to receive the Newsletter electronically, and the resulting savings on print costs were substantial.

5. Future Meetings

We have plans for other meetings in 2014 and 2015, as follows:

(i) *Revolution in Analytical Methods* (for 19 March 2014).
(ii) *Chemistry as a Hobby* (for June 2014).
(iii) *Wartime Research* (for October 2014).

6. Election of Officers and other Members of the Committee.

In the light of the present Chairman, Alan Dronsfield, indicating his desire to stand down, Dr John Hudson had been proposed by the committee as his successor. This was carried by the meeting.

This leaves a vacancy for Treasurer, and the committee had proposed Dr Peter Morris for the position. This was also carried by the meeting

It was proposed that John Nicholson continue as Secretary, and this was carried *nem con*.

There were two other resignations from the committee, Professor Jack Betteridge, former Chairman, and Dr Stephen Robinson. Dr Chiara Ceti was proposed as associate committee member by Alan Dronsfield (seconded by Peter Reed), and this was carried *nem. con*.

7. Any Other Business

Professor Jack Betteridge proposed a vote of thanks, which was carried, for the outstanding work done by Alan Dronsfield as Chairman of the Group. He noted that he took over at a difficult time when finances were less sound, and relations with the RSC less satisfactory than they are now. Improvements in the latter were due to the excellent relations established by Alan with key staff of the RSC in both Cambridge and London.

8. Date of next AGM. It will form part of our autumn 2014 meeting on Wednesday 23 October 2014.

John Nicholson

Dr Patricia Swain

The Historical Group has lost a long-standing member and regular attender of our London meetings in the form of Dr Pat Swain. A former school teacher, she had a particular interest in the history of iodine. Indeed, I collaborated with her on at least two papers: she dealt with its discovery and the controversies that surrounded it, and I covered its early use in medicine. We extend our condolences to her family.

Alan Dronsfield

MEMBERS' PUBLICATIONS

If you would like to contribute anything to this section please send details of your publications to the editor. Anything from the title details to a fuller summary is most welcome.

Chris Cooksey, "Quirks of dye nomenclature. 3. Trypan blue", *Biotechnic & Histochemistry,* 2014, **89**, 384–387
DOI: 10.3109/10520295.2014.916415

Trypan blue is colorant from the nineteenth century that has an association with Africa as a chemotherapeutic agent against protozoan (Trypanosomal) infections, which cause sleeping sickness. The dye is still used for staining biopsies, living cells and organisms, and it also has been used as a colorant for textiles.

Chris Cooksey, "Quirks of dye nomenclature. 2. Congo Red", *Biotechnic & Histochemistry,* 2014, **89**, 384-387
DOI: 10.3109/10520295.2014.880513

The history, origin, identity, chemistry and uses of Congo red are described. Originally patented in 1884, Congo red soon found applications in dyeing cotton, as a pH indicator for chemists and as a biological stain. Unlike the majority of the nineteenth-century synthetic dyes, it is still available commercially.

Alwyn Davies, "J. Norman Collie, the inventive chemist", *Science Progress*, 2014, **97**, 62-71.

Michael Jewess, *Inside Intellectual Property – Best Practice in Intellectual Property Law, Management, and Strategy* (London: Chartered Institute of Patent Attorneys, 2013), 516 plus xxviii pages, £ 40.

Although primarily targeted at legal professionals, this book *en passant* records current and historical practices in research, development, and commercialisation of new products and processes, as well as in lobbying on relevant law. Chemical examples used include the "hydrogen problem" in optical fibres, the Persil Power disaster, the patenting of ibuprofen, and the branding of Viagra. Historians of chemistry using patents as sources are referred to the index entry "Patents – technical literature, as". A copy of the book has been deposited with the RSC Library.

Peter Reed, *Acid Rain and the Rise of the Environmental Chemist in Nineteenth Century Britain* (Farnham: Ashgate, 2014), 226 pages, £70.

Robert Angus Smith (1817-1884) was a Scottish chemist and a leading investigator into what became known as 'acid rain'. This study of his life and work sheds light on the evolving understanding of sanitary science during the nineteenth century and of the need for regulation and enforcement of the chemical industries. It offers a fascinating insight into the changing landscape of British politics and is essential reading for historians of science, technology and industry in the nineteenth century as well as environmental historians seeking background context to the twentieth-century environmental movements. A review of this book will appear in the winter 2015 *RSCHG Newsletter.*

Anna Simmons, "Stills, Status, Stocks and Science: The Laboratories at Apothecaries' Hall in the Nineteenth Century", in *Ambix* Special Issue, "Sites of Chemistry in the Nineteenth Century", 2014, **61**, 141-161.

This paper focuses on one site of chemistry, the Society of Apothecaries' premises in Blackfriars, London. Over their lifetime these premises served multiple functions and played a pivotal role in the development of British pharmaceutical manufacturing. At the beginning of the nineteenth century, they housed the largest pharmaceutical manufacturing laboratories in London and supplied drugs for use throughout the British Empire. Under the guidance of William Brande, the laboratories developed as sites of teaching, research and consultancy, activities which shaped the Society's public image and enhanced its commercial, regulatory and professional roles. However, as competition from other pharmaceutical firms increased, inherent contradictions in the Society's various remits, combined with its conservative approach to business, meant that there was no clear direction for the laboratories' development. In an era of growing specialization, this multifunctional site became increasingly outdated by the end of the nineteenth century.

FEEDBACK FROM THE WINTER 2014 NEWSLETTER

A Choshu Five postscript

The last edition of the Newsletter contained articles about the five Japanese students (the Choshu Five) who were smuggled out of Japan in 1863 and put into the care of Alexander and Catherine Williamson. When they went back, these students became the founders of the modern Japanese state. Out of the blue, I received a message from Mr John Fison, saying that he is Williamson's great grandson, and that he and his niece, Mrs Sally-Anne Lenton, had some items relating to Williamson which might interest us.

These items are Williamson's Royal Society Royal Medal from 1862, and a bronze plaque commemorating his election to the Italian Accademia dei Lincei in 1883, but the most intriguing is a silver incense burner in the shape of a lion, which was presented by the Japanese students to the Williamsons in appreciation of their help. It is 97 mm high and weighs 470g and has been given to the UCL Chemistry Department on long-term loan.

Incense Burner presented to Alexander and Catherine Williamson

As yet we have not been able to find any other reference to such an object. It is inset with small rubies or garnets and one emerald, a second one being missing. The head is removable and inside the body of the lion is a dish for burning incense, the smoke exiting through the lion's mouth, nose, eyes, and ears. On the underside it has the artist's name, Joun Ohshima, in Japanese characters. He lived from 1858 to 1940 and was a master craftsman of the Meiji era, so it seems likely that the lion dates from the last quarter of the nineteenth century.

Alwyn Davies
University College, London

Eine fehlende Prüfungsaufgabe (A Missing Examination Paper)

The last issue of our Newsletter published some questions from Edward Turner's UCL chemistry examination of 1829-30 [1]. I should like to make the case that had it not been for a certain student's surprising facility in chemistry exams in 1892-1893, German might now be the official 'state' language in the British Isles. The student was Winston Spencer Churchill and his examination success gave him entry to the Sandhurst Military Academy and to a career that started in the army and finished as prime minister. Such was his despondency at ever failing to achieve the necessary marks for Sandhurst entry, he was even contemplating a career in the Church [2]. Without Churchill ready to step in as successor to Neville Chamberlain in 1940, the wartime leadership of the country might have fallen to Lord Halifax who conceivably might have sought a settlement with Hitler. With Britain then a vassal state of Germany, whose language would have dominance today?

Churchill never excelled academically at Harrow School, though he managed to pass the Preliminary Examination to Sandhurst. However, it was the 'Further' examination that had to be passed to achieve entry to the Academy. Eight papers were taken, presumably in the candidates' strongest subjects and in aggregate had to yield a maximum of 12,000 marks. Churchill's score of 5,100 put him 390th out of 693 candidates: a score of 6457 was required for the least demanding access to the army – a commission in the cavalry. A breakdown of his June 1892 scores is Mathematics 568/2000, Latin 601/2000, French 1218/2000, English History 987/2000, Chemistry 829/2000, English Composition 305/500, Freehand Drawing 196/500 and Geometrical Drawing 495/1000. He then tried the exam again in November 1892. He obtained a higher overall score of 6106 marks, coming 203rd out of 664 candidates, but still failed to achieve entry. Noteworthy, though, is his chemistry score of 1229/2000, now his second-highest subject (his history mark was 1273/2000). Of the 134 candidates who took the chemistry examinations, Churchill was 8th. He said "I did the chemistry practical quite correctly and shall get good marks". His third attempt (June 1893) at Sandhurst entry was successful, although his chemistry score of 825/2000 was this time unimpressive [2].
He clearly had a fascination for our subject. Writing to his mother, Lady Randolph Churchill in 1885 (aged 11) he said "A master here is going to give a lecture in chemistry. Is it not wonderful that water is made of two gases, namely hydrogdgen and nitrodgen (sic). I like it, only it seems so funny that two gases should make water" [2]. Chemistry appears to have had little, if any, impact on Churchill after passing the entrance examination. He displayed an interest in technological aspects of warfare and he had Frederick Lindemann [3] both as a friend and scientific advisor, but this seems to have been the limit.

From time to time I have tried to track down the January 1893 paper(s) to see the type of chemistry at which Churchill excelled. Harrow School's archives do not supply an answer and those relating to Sandhurst were dispersed for safety at the outbreak of WW2 and seem then to have been lost. The Sandhurst entry examinations were actually run by the Civil Service rather than the Military Academy "and in the quite unlikely event than any of these records have survived, they should be in the National Archives" [4]. So, I invite readers within easy travelling distance of Kew to take up the challenge and see if, in fact, any record of Churchill's chemistry remains.

References

1. A. Davies, *Historical Group Newsletter*, Winter 2014, **65**, 15-17.
2. R. Churchill, *Winston Churchill, Youth 1874-1890* (London: Heinemann, 1966).
3. See http://www.scientificamerican.com/article/the-most-powerful-scientist-ever/
   Perhaps readers will best know him as the co-originator of the Hinshelwood-Lindemann mechanism in reaction kinetics.
4. A.R. Morton, Archivist, the Sandhurst Collection, personal communication.

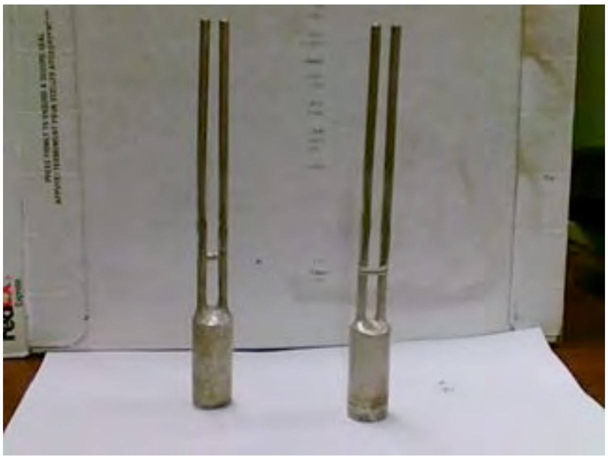
Alan Dronsfield
University of Derby

CAN YOU HELP ?

Unidentified Items

In clearing out the old contents of a safe in the UCL Chemistry Department we have come across two items which we cannot identify. The first is a pair of sterling silver conical flasks, each 117 mm at the base and 185 mm tall, one weighing 260 g and the other 280 g. The picture shows them wrapped in Clingfilm to keep them clean. They are stamped S.B. & S.L.D. (Presumably S. Blanckensee & Sons, Birmingham) and are hallmarked with a lion passant (Sterling silver), Anchor (Birmingham), and year (1923). We can find no reference to them in the literature and can think of no chemical use for silver conicals. Perhaps they were a presentation to mark some occasion but, if so, it is surprising that we can find no departmental record of them.

The second is a set of seven metal devices, two of which are shown in the picture. The cylindrical base is 20 mm in diameter and 45 mm high and the surmounted tubes are 145 mm long with 4 mm od and 3 mm id. Each weighs 150 g. XPS analysis by Daren Caruana shows that, remarkably, they are pure silver. Presumably they were made for some experiment, but why in such a soft, reactive, and expensive metal as silver? They probably date from before the 1939 War. Again we can find no reference to them in the literature or in Departmental records.



We would be very grateful for any suggestions as to what either of these puzzling items might be.

Please email Alwyn Davies at a.g.davies@ucl.ac.uk if you can help identify the mystery objects.

Alwyn Davies

NEWS AND UPDATES

The 2014 HIST Award in the History of Chemistry awarded to Ernst Homburg, RSCHG Committee Member

The History of Chemistry Division of the American Chemical Society is pleased to announce Professor Ernst Homburg as the winner of its 2014 HIST award. This international award for contributions to the history of chemistry has been granted since 1956 under sequential sponsorships by the Dexter Chemical Company, the Edelstein Foundation, the Chemical Heritage Foundation, and the History of Chemistry Division. The event, consisting of a monetary presentation, a plaque, a symposium honouring the work of Professor Homburg, and a lecture by the awardee, will take place on 12 August 2014 at the American Chemical Society's annual meeting in San Francisco, California.

The 2014 winner, Ernst Homburg, was born in 1952 in Venlo, The Netherlands. After studying at the Protestant Lyceum, he studied at the Municipal University, Amsterdam, where he received a M.Sc. in chemistry and at the University of Nijmegen where he received a Doctoral degree in History. From 1972 to 1993 he served at various posts in history and technology at the Universities of Amsterdam, Groningen, Nijmegen, and Eindhoven. From 1993 to the present he has served as Assistant Professor, then Professor, in the Department of History at the University of Maastricht, The Netherlands. With his broad background, Dr Homburg is one of the leaders in the history of modern chemical industry and technology. He has been involved as a co-organizer and writer in two multi-volume book series on the history of European technology in the nineteenth and twentieth centuries, as well as a multitude of other books and papers. He has been president of a number of organizations that have promoted the history of technology and science throughout Europe and other parts of the world. As an influential speaker, Dr Homburg is known for his conciseness and fresh viewpoints, with an ability to change viewpoints without any display of ego or discourtesy.

ARCHIVE NEWS

The Brunner-Mond Film Archive

Sir John Tomlinson Brunner (1842-1919) was a British chemical industrialist and politician. At Hutchinson's alkali works in Widnes he rose to the position of general manager. There he met Ludwig Mond (1839-1909) who was working as a research chemist, initially on the recovery of sulfur from the waste products of the Leblanc process.

Together they formed a partnership in 1873 to create the chemical company Brunner Mond & Co., initially making alkali by the Solvay process. By the turn of the century it was the wealthiest chemical firm in the UK. In 1926 it merged with three other companies to form the conglomerate *Imperial Chemical Industries*. In 1991-1993 ICI began a series of acquisitions and demergers which some saw as 'the beginning of the end' of this once great company.

In its heyday ICI was keen to record its activities on film. I remember my chemistry teacher at school being particularly keen on the 1943 film *The Discovery of a New Pigment: The Story of Monastral Blue* and showing it to us on several occasions. I suppose this production (not yet identified in the Brunner Mond film archives) would be classified as a public information film, perhaps with a bit of a product information slant. Other films were simply records of what was going on in ICI, with a particular emphasis on the processes that were essentially north-west based.
Some of these are available in a variety of film libraries (e.g. the British Film Institute) though trying to browse for items in a particular category is far from straightforward, a fact not unique to the BFI collection.

The Catalyst Discovery Centre, Widnes (http://www.catalyst.org.uk/) has within its archives a collection of items constituting the Brunner-Mond Film Collection. There is a list of the 196 films, and more details of each film are available on their handwritten "comments" sheets from http://www.catalyst.org.uk/collection/collection.htm.

These relate mainly to the condition of the film stock and running time and whether they are duplications of other films in the collection. Little information, other than the title itself, is given about the film content.

This collection is an important part of our industrial chemical heritage and we must be grateful to Catalyst for curating it, and to the volunteers who are continuing the documentation of the films. Items are available for viewing, without charge, but only on Catalyst's premises. It is important to note that viewings are by appointment only, and that film requests should be made well in advance of visits.

It would be nice if the material here could be made more easily accessible to historians of our chemical industry, but it's a question of cost (and maybe copyright). Commercial conversion of 16mm film to DVD costs about £36 for a ten minute film and £108 for a single reel 30 minute film so the cost of converting the entire archive might be about £7,000. It would, of course, be much less if local enthusiasts could be persuaded to tackle the task on a 'do it yourself' basis. Finally, once the collection had been digitised, then consideration could be made as to making the items available through the Internet – YouTube or by direct links to Catalyst's website.

Alan Dronsfield

Editor's Note: Coincidentally, Philip Ball has written about Monastral Blue in the July 2014 Issue of Chemistry World (on page 34) and includes a link to part of the film which Alan refers to: http://bit.ly/1huZUwy

SOCIETY NEWS

Society for the History of Alchemy and Chemistry

The Partington Prize 2014

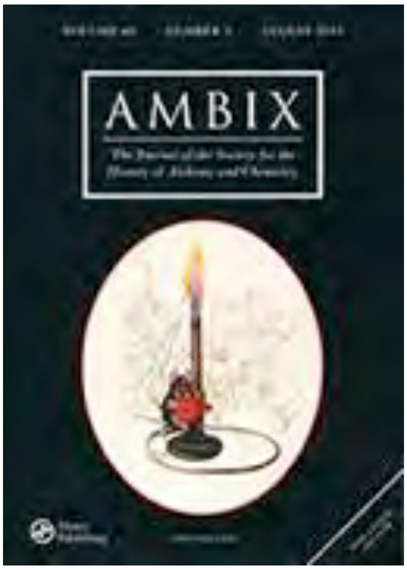
The Society for the History of Alchemy and Chemistry is delighted to announce that the 2014 Partington Prize has been awarded to Evan Hepler-Smith (Princeton University), for his article "'Just as the Structural Formula Does': Names, Diagrams, and the Structure of Organic Chemistry at the 1892 Geneva Nomenclature Congress".

SHAC is also pleased to announce that Joel Klein (Indiana University, Bloomington) has been highly commended for his essay, "Daniel Sennert, the Philosophical Hen, and the Epistolary Quest for a (Nearly) Universal Medicine". Both essays will be published in the Society's journal, *Ambix*.

The Partington Prize was established in memory of Professor James Riddick Partington, the Society's first Chairman. It is awarded every three years for an original and unpublished essay on any aspect of the history of alchemy or chemistry. The prize consists of five hundred pounds (£500). The Partington Prize and certificate of commendation will be presented at a ceremony at the History of Science Society Annual Meeting, held this year from 6-9 November 2014 in Chicago.

Ambix: Journal of the Society for the History of Alchemy and Chemistry

Ambix is an internationally-recognised, peer-reviewed journal that facilitates the publication of high-quality research and discussion in all areas relevant to the history of alchemy and chemistry: including ancient, medieval and early modern alchemy, the Chemical Revolution, the impact of atomism, the rise of organic chemistry, the chemical industry, quantum chemistry, and interactions between the chemical sciences and other disciplines. The Journal's scope extends to the history of pharmacy and chemical medicine, environmental studies of the chemical industry, and the material and visual culture of chemistry. *Ambix* regularly publishes special issues; these may address a specific historical period, a significant theme in the history of alchemy and chemistry, or historiographical and methodological approaches. Recent special issues have focused on environmental history, ancient and early medieval alchemy, and chemistry in the aftermath of the World Wars. For more information, please visit the journal homepage: www.maneyonline.com/amb



Ambix is the journal of the Society for the History of Alchemy and Chemistry which was founded in November 1935. The Society, chaired by the eminent physical chemist and historian of chemistry, James Riddick Partington, held its first meeting the following year and launched *Ambix* in May 1937 under the editorship of the distinguished historian of Greek alchemy (and later Director of the Science Museum), Frank Sherwood Taylor.

SHAC Individual Membership

Alternatively you can join the Society for the History of Alchemy and Chemistry. Full Membership costs £35 for 2014 (students £22). All members receive four issues of *Ambix* per year and can access the complete *Ambix* back catalogue online. In 2014 members also receive a copy of the supplement *Sources of Alchemy and Chemistry*. Full details can be found at www.ambix.org or email membership@ambix.org

Editor's Choice articles free to read online

Maney Publishing is offering five free articles online for the duration of 2014. These articles have been hand-picked for their quality, high citations and topical content, and collectively they demonstrate the breadth of the journal:

Resurrected Bodies and Roger Bacon's Elixir, Z. Matus

Sir Kenelm Digby and His Alchemical Circle in 1650s Paris: Newly Discovered Manuscripts, Lawrence M. Principe

Enlightenment Chemistry Translated by a Brazilian Man of Science in Lisbon, Fernando J. Luna and Lorelai B. Kury

Before and After Silent Spring: From Chemical Pesticides to Biological Control and Integrated Pest Management — Britain, 1945–1980, Hannah Gay

Chemistry in the City: The Scientific Role of Female Societies in late Eighteenth-Century Madrid, Elena Serrano

To read these articles online, please visit the journal homepage: www.maneyonline.com/amb

Neu-Whitrow Bibliography Prize

The Neu-Whitrow Bibliography Prize has been awarded to Jennifer M. Rampling, the editor of *Ambix*. Her winning article, from Ambix 57.2, is available online to institutional subscribers and SHAC members: *The Catalogue of the Ripley Corpus: Alchemical Writings Attributed to George Ripley (d. ca. 1490)*.

New Online Submission System

SHAC is pleased to announce that *Ambix* will have a new online submission system in 2014. Benefits to authors include ease in online submission, the ability to track the status of an article and our Advance Article service which means papers can be published online prior to being placed in an issue. Authors can submit their paper online at www.editorialmanager.com/amb.

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SHORT ESSAYS

Whatever happened to "Dropsy" ?

On 11 February 1784, the famous essayist and dictionary compiler, Samuel Johnson, was an unhappy man. He wrote to Boswell: "*The breathlessness, however, is not the worst. A dropsy gains ground on me; my legs and thighs are very much swollen with water which I should be content if I could keep it there, but I'm afraid it will soon be higher*". Indeed, his prediction was correct and he died on 13 December that year. Dropsy features prominently in contemporary medical texts and those of the succeeding century, but it is unheard of today. This is not because it has been eradicated like smallpox. Rather, instead of referring to dropsy (swelling due to fluid retained in the body), we now talk about its causes, such as congestive heart failure, renal failure, widespread cancer, diseases affecting the lymphatic system, etc. The most common of these is *congestive heart failure (CHF),* which in the USA contributes to some 287,000 deaths per year [1].

Moreover, about half the patients diagnosed with CHF will be dead within five years. Prolonged high blood pressure can lead to thickened (hypertrophied) heart muscle, and this thickening means the heart cannot relax enough to fill with blood before it contracts again, leading to inefficient pumping and thus impaired circulation. Impaired blood supply to the kidneys damages them, leading to fluid retention, which leads to swelling of the lower parts of the body, particularly the ankles and lower legs if the left side of the heart is more damaged, or in the lungs if the right side is more damaged. Commonly, both sides are damaged to some degree. Additional fluid in the lungs causes breathlessness, which is even worse if the patient lies down. But the more the patient sits up, the more evident is the accumulation of fluid in their legs.

We know that Johnson was treated ineffectually with squill (a diuretic and purgative, from the leaves of a member of the lily family) and opiates, although the latter would have provided only symptomatic relief by dulling the sensation of breathlessness. He may have had his abdomen "tapped" to run off some of the fluid, but this would give only very temporary respite.

This gloomy prognosis was revolutionized the following year (1785) by treatment recommended by chemist and physician William Withering. While not curing the condition, it dramatically improved the quality of life of sufferers in their remaining years. Doctors of the time were reasonably adept at diagnosis, predicting the likely outcome, and providing reassurance. But effective treatments were not common: chalk for indigestion, some purgatives for constipation, opiates for pain relief, ground willow bark for headaches, quinine for malaria and perhaps a few others. Withering's discovery was an important addition to these few.

His treatise, *An Account of the Foxglove, and Some of its Medical Uses: Practical Remarks on Dropsy and Other Diseases* [2], details the treatment of some 158 patients with the herb and their outcomes. About two thirds did well, particularly those with classic dropsy, but those suffering from phthisis (tuberculosis of the lungs, also characterized by breathlessness and hence their inclusion in his study) had a bleaker outcome.

The purple foxglove, *Digitalis purpera L,* is a poisonous plant: an overdose will kill. Unfortunately, near-toxic doses were required to relieve symptoms of dropsy effectively. A further complication was that the roots, flowers and leaves were all effective, but to varying degrees. The potency of the leaves varied depending on whether they were fresh or dried, and on the time of year they were gathered. Withering's regime was to administer the herb (usually as an infusion or "tea") until the patient experienced persistent nausea and/or a copious flow of urine. If vomiting ensued, this indicated trouble ahead and the dosing was stopped.

How did he chance upon his discovery? There are two strands to this. Firstly, he was aware that a Dr Cawley, Principal of 'Brazen Nose' College Oxford had been cured of *hydrops pectoris* (dropsy affecting mainly the lungs) by the use of the root of the herb.... "after some of the first physicians of the age had declared they could do no more for him". Secondly, it was due to a chance meeting with an old woman in Shropshire who had a folk remedy for the disease [3]. He records: "In the year 1775 my opinion was asked concerning a family receipt for the cure of dropsy....This medicine was composed of twenty or more different herbs, but it was not very difficult for one conversant in these subjects to perceive that the active herb could be none other than the Foxglove". This led to his case series, recorded in his *Treatise*:

Two Successful Cases

Case 115, 20 June 1783. Mrs H---, aged 46. A very fat, short woman; had suffered severely through the last winter and spring from what had been called asthma, but for some time past a universal anasarca (= generalised swelling) prevailed and she had not lain down for several weeks. After trying vitriolic acid (= H_2SO_4), tincture of cantharides, squills etc without advantage, she took half a pint of infusion of digitalis in three days. In a week afterwards the dropsical symptoms disappeared, her breath became easy, her appetite returned and she recovered perfect health.

Case 154, but dated 3 November 1781. Mary Crockett, aged 40. Ascites (= accumulation of fluid in the abdomen) and universal anasarca. For one week she took *sal diureticus* (= potassium ethanoate) and tincture of cantharides, but without advantage. On the 10th (she took) the infusion of digitalis, an ounce every fourth hour. The urine began to be discharged copiously. The medicine was stopped.... and on the 24th she was discharged, cured.

One might well question whether ‘cure’ was really achieved, but these women would have achieved a remarkable improvement, at least for a while.

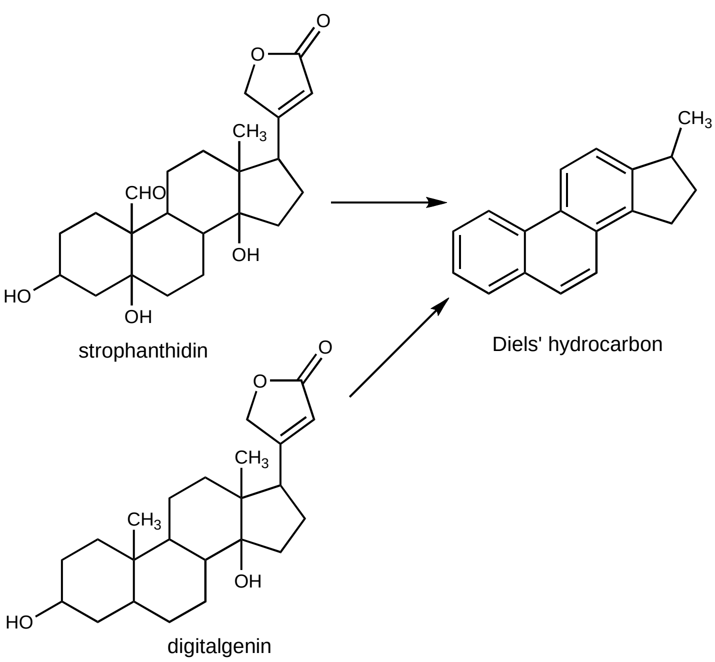
The Chemists get to Work

In 1820 the French pharmacists, Pierre-Joseph Pelletier and Joseph-Bienaimé Caventou isolated the active principle from the bark of the cinchona tree and named it quinine. Having a pure compound available made accurate prescribing possible for the first time, making treatment more predictable and safer. This stimulated attempts to isolate a similarly active principle from the foxglove, but this proved difficult. In 1835 the Société Pharmacie Parisian offered a 500 franc prize to encourage progress, doubling this five years later. The following year, in 1841, chemists Eugène Homolle and Théodore Quevenne of the Hôpitale de la Charité were deemed to have made enough progress to earn the award for isolating a partly crystalline material from the plant leaves. It was undoubtedly impure - probably a mixture of closely-related compounds - however it showed a remarkably ‘concentrated’ pharmacological effect.

Further progress remained a challenge over the next 120 years. The first step was determining the correct molecular formula. Then, from about 1870, chemists began to use bonds to show atom-to-atom connectivity, so the goal became to ‘elucidate’ its full structural formula. Heinrich Kiliani of the University of Freiburg is generally accepted as being the first chemist to achieve a reasonably pure product, by now named digitoxin, by using a multistep procedure that, in part, involved dialysis. In the late 1890s he used combustion analysis to calculate its molecular formula: $C_{35}H_{56}O_{14}$. Moreover, he was able to break down his material into two glucose-like sugars, and a sugar-free ‘core’, an aglycone, which he named digitalgenin ($C_{23}H_{34}O_5$) [4]. Some 30 years were to elapse before the true picture emerged. The famous natural product chemist and later Nobel laureate, Adolf Windaus, re-analyzed the purest digitoxin he could obtain, and obtained a molecular formula $C_{41}H_{64}O_{13}$. On hydrolysis this gave digitalgenin and three, not two, glucose-like molecules: [5]

$$C_{41}H_{64}O_{13} + 3H_2O = C_{23}H_{34}O_4 + 3C_6H_{12}O_4$$

The connection between digitalgenin, strophanthidin and Diels' hydrocarbon



Somewhat surprisingly, it was the digitalgenin, not the sugar residue that first yielded to the chemists’ probings. It is one of a host of similar structures isolated from related plant materials, many of which have an effect on the heart.

Insight into one product's structure can sometimes provide clues pertaining to another. So in 1934, strophanthidin (a digitalgenin equivalent, obtained from an African arrow poison) was dehydrogenated by heating with selenium dioxide to form Diels' hydrocarbon [6]. This confirmed what had hitherto been mere speculation: that sterols and the bile acids shared with the cardiac glycosides the same fused four-ring 'core' structure. Further comparative work showed the location of two methyl groups, two –OH groups (one of which linked the sugar moiety) and a lactone ring.

The sugar problem

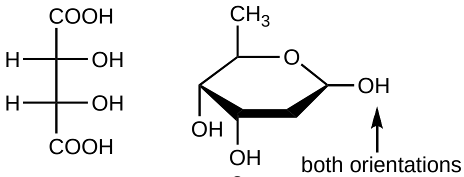
The sugar residues, each identical, of formula $C_6H_{12}O_4$, were investigated by Kiliani. He found that:

they reacted with phenyl hydrazine in a manner suggesting the presence of an aldehyde group

oxidation with silver oxide yielded ethanoic acid

oxidation with nitric acid gave *meso*-tartaric acid.

The first and second points indicated the presence of $–CH_2CHO$ in the molecule. *Meso*-tartaric acid has the formula **1.**

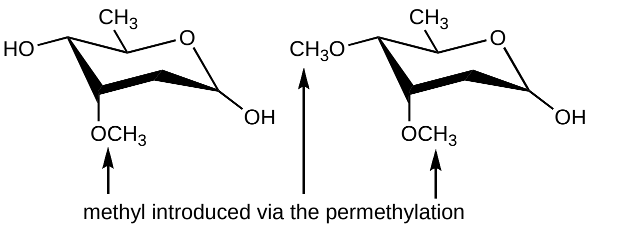


1 **2**

This indicates a four carbon unit within the sugar, with the end atoms occurring as groupings capable of being oxidised to carboxylic acid group. Moreover it suggests that two adjacent OH groups in the sugar have a similar stereochemistry.

Putting these facts together suggested a formula $CH_3(CHOH)_3CH_2CHO$. This is correct as far as it goes, but as written, it gives no indication of the stereochemistry of the material. Moreover, by the late 1800s there was increasing evidence that hexose sugars were in equilibrium with ring structures. Rewriting the previous molecule in its ring form, and incorporating the 'tartaric acid conclusions' about the orientation of two of the OH groups gives **2**.

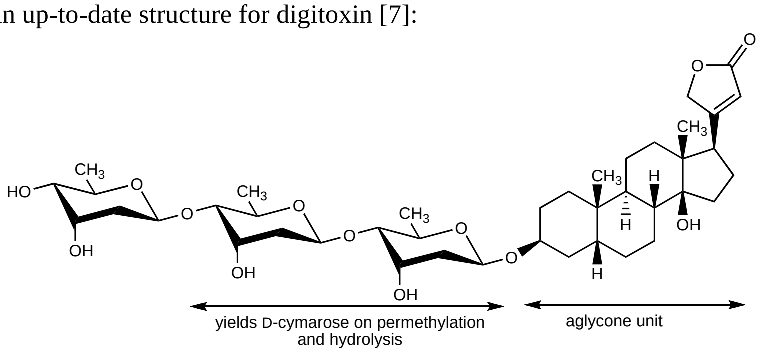
Clearly the three hexose units must be linked via their –OH groups. Nowadays these linkages would be established by NMR spectroscopy in one or more of its several pulsed forms, but in the early 1960s these were unavailable and recourse had to be made to more classical 'chemical' methods. Dr H. Lichti, working in the Sandoz laboratories in Switzerland, permethylated a sample of digitoxin, and then degraded the product by means of hydrolysis. They obtained two molecules of the sugar D-cymarose to one of 3,4-di-*O*-methyl-D-digitoxose. Writing these in their 'chair' forms we have:



D-cymarose. The presence of the two "free" OH groups suggests linkage to other parts of the molecule

3,4-di-*O*-methyl-D-digitoxose. The presence of a single "free" OH group suggests that this unit terminates the sugar chain.

Thus we can arrive at an up-to-date structure for digitoxin [7]:



Biochemical mode of action

This is a mixture of fact and speculation and we start with the facts. The three-unit sugar tail to the molecule, if isolated, has no effect on the heart at all. The aglycone portion is described as being 'weakly cardiac-active'. Together, though, they have a profound effect on the heart [8]. Only one sugar molecule need be attached to the aglycone and indeed this species has the greatest cardiac action. The full sequence is:

Monoglycoside > diglycoside > triglycoside >> aglycone (least active)

This indicates that the sugar *adjacent* to the aglycone unit is of crucial importance for good binding to a target cellular site within the body, but the nature of this binding, and what happens next, is still not entirely clear.

In heart muscle cells digoxin inhibits the Na^+/K^+ ATPase pump, which results in an increased level of sodium inside these cells. This increases the amount of sodium then swopped, through an exchange protein, for calcium. This increases the amount of calcium released with each electrical excitation, increasing the force of each contraction of the heart. Digoxin also reduces the activity of the sympathetic nervous system and increases the activity of the vagal nerve, so slowing the heart. It also has a direct effect on the heart's pacemaker (the Atrioventricular node) and conduction system, also slowing the heart. This all results in more time for the heart to fill with blood between contractions, and stronger contractions when they do occur [9].

Digoxin remains a valued drug in the second line treatment of heart failure with normal heart rhythm, and in chronic atrial fibrillation, when contraction of the atria loses synchronization with ventricular contraction. It is a first line agent when these conditions occur together. However, its place has been controversial in the recent past. Older physicians recall its place in treatment changing between sets of specialist examinations, to their frustration, and also prescribing *folia digitalis* (essentially raw dried foxglove, of varying potency) and facing the same problems in titrating the dose as Withering had, almost two centuries before. Medical progress can be very slow at times!

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Alan Dronsfield and Pete Ellis

Yiddish Chemical Literature: A Brief Introduction

As English-speaking chemists, we are largely unaware of the effect of the existence (or non-existence) of scientific terminology in a language, because English is the world-wide scientific language. For speakers of a minority language, lack of scientific vocabulary can strongly affect their aspirations and attitudes. The case of Yiddish is interesting regarding the development of chemical terminology, and may have a bearing on native minority languages in the UK such as Welsh or Irish. This brief introduction to Yiddish chemical literature is based on an article in the *Bulletin for the History of Chemistry* in 2004, where more details may be found, as well as elsewhere in both English and Yiddish [1].

Yiddish is spoken by Jews originating in Central and Eastern Europe. Circa 1900 approximately 90% of world Jewry spoke Yiddish. Yiddish and German are roughly 70% mutually intelligible; Yiddish has resemblances to southern German dialects, and may be classified in two different ways according to linguists. In Europe it is considered an official minority language, with governmental status in Sweden [2].

By vocabulary and structure, it is Germanic like English, and has developed over the last millennium in an independent but strikingly parallel way to English. A large percentage of words and phrases stem from Slavic and Hebrew/Aramaic, with a few from Romance and elsewhere, thus Yiddish is often termed a 'fusion' language. English, too, is a fusion of Anglo-Saxon, Norman French, Scandinavian, and other components. In the same way that Modern English has simplified its case-structure from Anglo-Saxon, so too has Yiddish in comparison with its ancestor, Middle High German. In the same way that erudite English-speakers often pepper their speech with foreign terms, sophisticated speakers of Yiddish can insert Hebrew or Aramaic vocabulary for a philosophical bent, or add

German words to give a sophisticated flair (called *daytshmerish*). Yiddish has a natural tendency to absorb words from other tongues in the same way that English can.

By culture and context, Yiddish is a member of 'Jewish languages': those whose primary speakers are Jewish, and are written using the Hebrew alphabet. Examples of living and extinct Jewish languages are Hebrew and Aramaic (Semitic languages); Yiddish (a Germanic language); Ladino/Dzhudezmo, Tsarfatic, and Italkit (Romance languages); and Yevanic (Judeo-Greek). Unlike most medieval populations, nearly all Jewish males, and many Jewish females, were at least minimally literate in the Hebrew alphabet, and could read a Jewish language. This created the unusual situation in nineteenth-century Europe of a somewhat literate class of people, yet ill-educated in modern subjects.

Speakers of modern Yiddish were largely poor peasants, traders and merchants, or inn-keepers in Central and Eastern Europe. Jewish access to higher education up until the Russian Revolution was nearly non-existent, so Jews' knowledge of modern chemistry was practically nil. Hence, as new chemical technologies gradually permeated eastward, the people were eager to learn about them, but there was no way to gain formal knowledge of chemistry. Simultaneously, local rabbis were often opposed to secular higher learning because they felt that such studies would distract the population from proper comportment and reverence to God. During this internal cultural struggle, life in Czarist Russia became so bad that Jews began to emigrate to the West, mostly the USA, encountering radical modernity for the first time. Thus those few Jews who were educated decided to start teaching the populace via self-instructional textbooks in Yiddish.

In 1900, the first Yiddish book on a chemical topic was a monograph for home-learning on water - to which everyone could relate - by physician Dr Abraham Caspe (1861–1929), called *Onfang fun Khemye* (Beginning of Chemistry) [3]. Soon a variety of textbooks were published [4], written by Yiddish-speakers or translated from existing non-Yiddish works, increasing in sophistication until Sol Feinstone's complete textbook, *Tsu Lezen un Tsu Lernen* (To Read and to Learn) just after World War I [5]. Feinstone (1888–1980), a native Yiddish speaker and immigrant who received Bachelor's and Master's Degrees in Chemistry and joined the ACS, went step-by-step through general chemistry and organic chemistry for the self-learner in a non-mathematical way. He even included a glossary of terms, though his Yiddish itself suffered from extensive *daytshmerism* (direct German vocabulary), and now sounds stilted to the modern ear.

With more freedom for Jews in Eastern Europe after the Great War, Jews began to organize their own secular schools, and therefore needed curricula, instructional materials, and natural-sounding vocabulary. Even the Soviet Union nominally treated Jews as another of many minorities, with Yiddish as the Jews' national language, and created a government-run Jewish school system. Within a decade and a half, linguists were actively struggling in Eastern Europe to create a consistent chemical vocabulary for these schools [6]. Textbooks and teacher's guides for Jewish schools began to appear in Poland and the USSR [7]. Of these, perhaps the most important was Shmuel Brokhes's book, *Khemye: Loytn Laboratorishn Metod* (Chemistry: According to the Laboratory Method), published in two editions in 1929 and 1931. This was a complete high-school chemistry course, including all basic chemical laws and properties, but given from a practical, hands-on perspective: nearly all the topics were demonstrated via laboratory exercises. One oddity about the book is a chapter devoted to chemical warfare (because of the horrifying experience of World War I), in which the first page was written in an entirely different style, probably by the local Communist commissar, decrying the capitalist West and clergymen.

Unfortunately such a flowering of scientific Yiddish was doomed for two reasons: Stalin's anti-Semitism from the 1930s to the 1950s, and the Holocaust. Thus scientific curricula in Yiddish ceased after the 1930s, though a few science books for the laymen continued to be published [8].

Another unusual type of chemical literature was chemical propaganda, mainly from the Soviet Union. Propaganda based on chemistry (as briefly mentioned above) was devoted to instructing the local people in how to identify chemical weaponry and about what antidotes and protective measures were available. Included were political rantings about how the West was ready and willing to use these chemical agents against the peaceful working classes of the Soviet Union. Such books were published in the late 1920s and early 1930s [9].

After the European Holocaust and simultaneous assimilation of immigrant Jewry in North America, use of Yiddish in schools declined rapidly, so the remaining chemical literature to this day is primarily in journalism: that is, discussing current discoveries in the scientific world. Jacob Tolpin, an immigrant Yiddish speaker, chemist, and ACS member with a PhD from Columbia University (New York, USA) [10], wrote scientific columns in the literary journal *Di Tsukunft* (The Future) in the 1970s [11]. Currently one main source of occasional vocabulary is the *Forverts* (Forward), a left-leaning biweekly newspaper published in New York, USA, recently gaining readership via use of its website and video channel (http://yiddish.forward.com/).

The vastly shrunken Yiddish-speaking population still retains an educated elite, who actively research and create neologisms to update the language as new technology appears. A journal run by the academic League for Yiddish is *Afn Shvel* (On the Threshold). This journal has begun publishing lists of scientific terminologies [12], including my Periodic Table in Yiddish [13]. Other post-Holocaust sources of Yiddish chemical vocabulary include Nahum Stutchkoff's venerable thesaurus [14], which contains a huge source of technical terminology for all the sciences, as well as recent dictionaries with occasional terms [15].

The final category for chemical literature is, of course, original research. No scientific journals are published in Yiddish, so there is no reporting of chemistry research in Yiddish. Apparently, though, at the first meeting of the International Union of Crystallography in 1948, where many scientists were Jews, their common tongue was Yiddish, so some informal discussions of research were held in the Yiddish language [16].

What is the prospect for Yiddish chemical terminology? The majority of current Yiddish speakers are Hasidim, the insular group of Jews who eschew secular studies. Hence chemistry (other than what chemicals might be used as food additives for kosher foods) holds no interest for them. There is a tiny but growing cadre of younger people (including myself) in the Jewish secular world who have begun raising their children in a Yiddish-speaking environment, promoted by Yugntruf - Youth for Yiddish (http://yugntruf.org/), based in New York, USA. In my own case, I often give chemistry demonstrations for young and old at Yugntruf's annual *Yidish-Vokh* (Yiddish Week - a family-oriented retreat) to expand the attendees' chemical awareness and their Yiddish chemical vocabulary [17]. We hope that they take the work on chemical vocabulary begun by previous generations, and use it to enrich their lives, both culturally and scientifically.

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Stephen M. Cohen

Dr Alphonse René le Mire de Normandy (1809-1864) – A Brief Biography

In the summer of 1850 a French-born chemist moved with his young family into a house in Judd Street, Brunswick Square [1]. It was from this Bloomsbury address that Dr Alphonse René le Mire de Normandy wrote several books on analytical chemistry [2], taught chemistry to students [3] and registered a number of patents for improvements to a wide variety of items [4] including the development of an apparatus to turn seawater into drinking water [5], which became the foundation of a successful family business.

Alphonse René le Mire (the 'Normandy' was added later) was born in Rouen in 1809 [6]. He was descended from a reasonably wealthy mercantile family and initially trained as a surgeon. As the industrial revolution gained momentum, there was a surge of interest in chemistry and Alphonse seems to have followed this trend, moving first of all to Germany to study under Leopold Gmelin [7] and then to London some time during the late 1830s. Alphonse Normandy lived with his wife and two children in Cripplegate and Dalston during the 1840s, at 67 Judd Street from 1850 to 1859 (his third son, Frank was born in 1851) and died at Odin Lodge, Clapham Park, in 1864 [8].

Dr Normandy's first English patent was taken out in 1839 and was concerned with inks and dyes [9]. He followed this with a number of inventions and improvements relating to soap, thimbles, balloons and the design of playing cards. His interest in making money from his inventions led him to be involved in several business partnerships, which did not always succeed, such as the Patent Elastic Pavement and Kampulicon Company [10].

In 1851 he patented an apparatus to apply a pioneering multi-effect process to seawater desalination. This was developed and improved during the 1850s and resulted in the formation, in 1856, of Normandy and Co., which manufactured and distributed seawater stills from a factory in Hollybush Place, Bethnal Green.

In 1858 Alphonse applied for the registration and incorporation of his firm under the formal name of Normandy's Patent Marine Aërated Fresh Water Company. At that time he published a prospectus, including testimonials and a report on his technology, which showed he was supplying ships, naval vessels and isolated forts in the USA, South America, Aden, Suez, Heligoland and elsewhere [11]. The company was awarded a medal for this apparatus at the International Exhibition of 1862. The factory eventually moved to Phillip Street, near Custom House, Victoria Docks in the east end of London. Following Alphonse's early death in 1864, the business was run by his sons until it folded in about 1910.

Alphonse Normandy's literary accomplishments included the translation, with additions and amendments, of two volumes of work written by Professor Heinrich Rose [12]. Dr Normandy was the author of several chemistry textbooks, one of which, *The Commercial Handbook of Chemical Analysis* (1850) became a valuable aid in exposing the perils of food adulteration in the nineteenth century. To quote from one of many flattering reviews, as advertised in his subsequent book *The Farmer's Manual of Agricultural Chemistry*: "Very ably executed...Of universal interest....We strongly recommend it to our readers as a guide alike indispensable to the housewife as to the pharmaceutical practitioner". - *Medical Times* [13]. This Commercial Handbook was reprinted in 1875, eleven years after Alphonse Normandy's death, with a preface and additional information provided by his friend and colleague, the chemist Henry Minchin Noad. The latter was among those (including Michael Faraday, John Barlow, Jacob Bell, J.H. Gladstone, and Warren de la Rue) who recommended Alphonse Normandy for membership of the Royal Institution in March 1857 [14]. Noad was also a witness at the wedding of Normandy's daughter in 1862 [15].

As a well-known analytical chemist, Dr Normandy was asked to provide evidence on the contamination of food (especially bread) to a House of Commons Committee in 1855. In his view, "adulteration is a widespread evil which has invaded every branch of commerce; everything which can be mixed or adulterated, or debased in any way is debased" [16]. He was often asked to endorse products [17] and to be an expert witness in cases relating to food adulteration [18]. He was very concerned about the cleanliness of London's drinking water and submitted a proposal (not accepted) for purifying the water of the river Thames with activated charcoal [19].

In addition to being a member of the Royal Institution from 1857, Dr Normandy was elected as a Fellow of the Microscopical Society on 26 October 1853. He was elected as a Fellow of the Chemical Society on 20 May 1854 and was a member of its Council between 1860 and 1863. Alphonse Normandy's personal life seems to have been complicated and unhappy. We have not found any document that records his marriage to Louisa Taynton, although he acknowledges her as the mother of his three children in his will, which leaves her nothing, and rants at length about her relatives. It is possible that Louisa separated from Alphonse sometime between 1851 (when she appears as his ‘wife’ in the census) and October 1860, when he writes his will. She is not registered as living with the family in Clapham Park in the 1861 census.

In 1866, two years after Alphonse’s death, there is however a certified marriage record of Louisa Taynton Normandy to a Scot called Alexander Fotheringham [20], whose wife died in 1865. The certificate states she has been living in Islington as a spinster, not a widow. Perhaps this relationship with Alexander caused the rift between Louisa and her husband. Their three children moved with Alphonse from Bloomsbury to Clapham Park late in 1859, and were presumably looked after by their French grandmother, Eugenie le Mire, as the youngest son, Frank Normandy was only 8 at the time.

Louisa was not married to Alexander for long, as in April 1872 he apparently committed suicide one night by cutting his own throat in the WC [21]. Louisa lived for another twenty years. Alphonse Louis Normandy, her eldest son, was present at his mother’s death in 1892 so despite the break-up of the family in the 1850s, there appears to have been a level of ongoing contact [22].

Dr Alphonse Normandy died in May 1864 and was buried in West Norwood Cemetery. His gravestone was destroyed by Lambeth Council in 1991 but eventually reinstated in 2002, under pressure from the Friends of West Norwood Cemetery, English Heritage and Elizabeth Panourgias-Morrison, Dr Normandy’s great-great-granddaughter, who wrote a detailed article about her distant relative in the *Friends of West Norwood Cemetery Newsletter* in January 2003 [23].

The obituary in *The Lancet* describes Dr Normandy as having formed “an intimate friendship with the late Dr Ure, with whom he was subsequently associated in many important chemical analyses” [24]. Normandy did indeed contribute material to Andrew Ure’s posthumous fifth edition of *Dictionary of Arts, Manufacturers and Mines*, published in 1860. However, exploration of Ure’s papers in Glasgow and contact with the Royal Society of Physicians has produced nothing of relevance. Normandy and Ure were both consultant analytical chemists in London during the 1850s; they lived relatively close by (Bloomsbury and Fitzrovia) and were both asked to endorse commercial products. As such, they had much in common and it is very likely they met socially and professionally. However, we have as yet discovered no specific evidence to support the theory of a close friendship, which is a frustrating anomaly.

Unfortunately, the living descendants of Dr Normandy - some of whom we have contacted - are unable to provide any letters or further information about his personal or professional life and it is possible that all relevant material was destroyed during the nineteenth century. Although he does have an entry in the *Oxford Dictionary of National Biography*, we are keen to revive interest in Dr Normandy and would welcome any suggestions of sources of further information, particular in connection with any research currently being carried out about the lives of chemists such as Andrew Ure and Henry Minchin Noad.

This research has been carried out by Debbie Radcliffe in collaboration with Jim Birkett, a USA-based researcher with a focus on industrial archaeology of desalination processes. In October 2013 a paper that included some of their findings was presented by Dr Birkett at the World Congress of the International Desalination Association in Tianjin, China. This has subsequently been published as “Normandy’s Patent Marine Aërated Fresh Water Company: A Family Business for 60 years, 1851-1910”, *IDA Journal of Desalination & Water Reuse*, 2014, **6**(1), 24-32.

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Debbie Radcliffe and Jim Birkett

Edmund Albert Letts (1852-1918): A Pioneer Environmental Analytical Chemist

Letts is one of the less well-known and undervalued chemists who practised in Ireland in the late Victorian period, being in the shadow of his famous predecessor in the Belfast Chair of Chemistry, Thomas Andrews.

Education and Career prior to Appointment at Queen's

Letts was born at Clare Lodge, Sydenham, Kent in 1852[1-7]. His education began at Bishop Stortford School from where he went to King's College, London. After this he undertook further studies at the Universities of Vienna and Berlin. In 1872 he was appointed chief assistant to Professor Crum Brown in Edinburgh. Four years later, Letts was selected to be the first Professor of Chemistry at University College, Bristol. In 1879, he was appointed to succeed Thomas Andrews at the Queen's College, Belfast, a post he held until retirement in 1917. He was also a Lecturer in Sanitary Science at the Medical School from 1896 to 1909. He was chosen for the Queen's Chair of Chemistry on Andrews' advice from a short list containing William Ramsay and W.A. Tilden. A retrospective view suggests that Ramsay might have been the better choice [8]. To sustain such a view, however, requires the gift of combined fore and hindsight and that, Ramsay's work was, or would have been, independent of his environment. E.A. Letts, FRSE (1874) arrived in Belfast with an excellent pedigree as indicated later in the citation for the *Keith Prize* of the Royal Society of Edinburgh, 1887-1889. He was active in the Institute of Chemistry and its Vice-President in 1904-1907.

Scientific Work

Letts' scientific work can be divided into three main sections [9].

a) Up to 1890: on the organic compounds of phosphorus and sulphur.

b) From 1895-1902: on the accurate determination of carbon dioxide in air and in water.

c) From 1900 onwards: on the analyses of estuarine and tidal waters for environmental purposes.

Letts' research up to 1890 concerned organic compounds of phosphorus and sulphur. His most important contribution being that on benzyl phosphines and their derivatives [10], for which he was awarded the Keith Prize of the Royal Society of Edinburgh. At the presentation it was stated "the work was difficult (due to the spontaneous inflammability of most phosphine derivatives), very thoroughly done, and the results are of great interest". It also noted that he overcame the difficult analytical problem of determining their phosphorus contents [11, 12].

He then studied the determination of carbon dioxide in great detail [13] and became the recognized 'master of the subject'. This followed from a request, to determine the carbon dioxide in the air of a linen weaving shed when the initial sets of results were not reproducible. His first paper on carbon dioxide was in effect a monograph of 163 pages. Letts studied the random and systematic errors meticulously until he was satisfied he had obtained a method able to produce accurate and precise results. In Watson's detailed review it was described as a very valuable paper [14]. He was asked to devise methods to be employed on the first Scott Antarctic Expedition [15]. He developed the use of sealed glass ampoules to store the standard alkali solution for use on such expeditions.

Letts was best known as an authority on questions connected with the pollution of rivers, especially estuarine and tidal waters. He was initially concerned with the increased growth of the seaweed *ulva latissima*, 'sea lettuce', which caused problems after it was washed ashore [16]. Banks of the weed, several feet thick, extended for miles in Belfast Lough and also in Dublin Bay. The *ulva* decomposed in warm weather giving rise to an overpowering smell. Over the years the various nutrient and decomposition parameters were studied and appropriate analytical methods devised [17-22]. At the request of the Royal Commission on Sewage Disposal, as one of the authorities on the subject, Letts, along with W.E. Adney, was asked to make extensive studies of the important estuaries round the British Isles [21, 22]. At the behest of the Belfast Public Health Committee, Letts along with L. Smith and later with W. Mair [23] undertook respectively the chemical and bacteriological studies of an experimental sewage treatment plant which resulted in the design of a new sprinkler based system [24-26]. Letts was assisted in his applied chemistry researches by several former students, for example Robert F. Blake, Joseph H. Totton and John Hawthorne, who all became important in official analytical posts in Northern Ireland [27], and Florence W. Rea, with whom he wrote his last four papers [7] .

The Teacher

Letts was known to irreverent students as Teddy. It is reported that he was the only Professor in the Faculty at the time who could keep order in his classes. His method of entry to lectures has come down in legend. Entering in his gown he strode to the lecture desk, called the register and then, with due ceremony, his gown was removed by the lecture attendant before Letts commenced the lecture proper. He was well regarded as a lecturer and interested in student affairs, taking a large part in establishing the Students Union in Belfast [5]. According to F.G. Donnan, one of Letts more famous students, "I owe him a great debt of gratitude for his splendid course of lectures, which were most inspiring and gave many generations of fascinated students an insight into the real meaning and nature of chemical science"[8].

Letts was a first class practical worker and keen to pass on his skills, but his analytical interest was so strong that the students often ran the risk of being starved of practical work. When demonstrating to students Letts was inclined to take over and complete the tasks himself. His *Qualitative Analysis* ran to two editions [28]. In addition to the usual inorganic reactions and separations, it contained procedures for the detection of alkaloids, the examination of urine, calculi and stomach contents, topics all needed by medical students at the time. It is clear from the book's preface of Letts' concern to teach his students good practical skills within the time available.

His monograph, *Some Fundamental Problems of Chemistry, Old and New* [29], was based on his advanced lectures and shows a mind alert to discuss the importance of the new physics and radiochemistry upon chemical science. He was also concerned with the dissemination of modern science to the general public, and a prominent member of the Belfast Natural History Society, being its President from 1886 to 1889. The list of the titles of his lectures to the Society illustrates his wide interests in chemistry and its philosophy [5].

Portrait of Professor Edmund Albert Letts taken in 1906 (reproduced with the permission of the archives of The Queen's University of Belfast)

The Head of Department

Letts was active in the affairs of the University and concerned with the well-being of his Department. From 1888 he demonstrated the tenacity of purpose, shown in his researches, to what was almost a second career: that of pleading, cajoling or bludgeoning the Lord Lieutenant, the Treasury and all bodies and individuals that he, and the Principal, Thomas Hamilton, thought might listen to the pressing need for a new building for chemistry [30]. In the end they won the battle. A new building was provided, but in stages which can be followed via the *Book of the Fair 1894* [31]. This publication shows photographs of parts of the new, but incomplete, building. In 1905 a saviour appeared, Sir Donald Currie, a Scottish ship builder, who offered the college £20,000 provided that an equal sum was raised elsewhere before Christmas of that year. It was. The *Book of the Fete* from 1907 [32] shows the completed building and the interior of the new laboratories, named in honour of their patron. The building, with subsequent expansions, remained in use until Chemistry moved to its present home in the David Keir Building in 1958.

Retirement

When Letts retired in 1917 he left an excellent tradition of scientific endeavour and a list of significant contributions to applied science, including a new sewage purification scheme for Belfast, and the expanded facilities for the Department. He died on 19 February 1918, shortly after retirement, following a bicycle accident on the Isle of White. Several obituaries record his unfailing kindness to new and younger colleagues. He had complete trust in his staff and showed unfeigned pleasure in the research output of his department whether it was his own or carried out by others, for he had not a spark of that jealousy which sometimes prevents a senior appreciating the work of a colleague. He was one of that almost extinct species ‘a fine old English gentleman’

His permanent memorial within the University is the Letts Chemical Research Studentship. This was set up by his will of 24 October 1914. This left everything to his wife, but £2100 was entailed, to be paid after her death, to found a scholarship for chemical research. Mrs Letts died in 1934. Wisely, Letts had agreed the terms of the studentship with the then Vice-Chancellor, although regrettably for financial reasons they are not currently being followed exactly as Letts intended.

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Mauveine - The Final Word? (4)

In the last final word, we speculated that a sample of mauveine which belonged to (Henry) Edward Schunck (1820 – 1903) and which is now in the Museum of Science and Industry in Manchester was given to him by William Henry Perkin (1838 – 1907) [1]. Now, a new publication suggests an alternative interpretation [2]. Schunck's sample of mauveine was unusual in that it was shown to contain a large amount of pseudomauveine (C24, no methyl groups) in contrast to the other samples previously examined which contained almost none, <0.5% [3]. Now, a new sample with a similar composition has been located at the Deutsches Museum in Munich. This sample was known to have been made by Heinrich Caro (1834-1910). The newly determined values for the pseudomauveine content are 51.71% (Schunck) and 56.11% (Caro). Caro's method was patented by John Dale and Heinrich Caro in 1860. They said "We take one equivalent of a natural salt of aniline, as, for instance, sulphate, nitrate, chloride or acetate of aniline, and six equivalents of perchloride of copper, or a mixture containing six equivalents of a soluble copper salt, as, for instance, sulphate, nitrate, chloride or acetate of copper, and from six to twelve equivalents of an alkaline chloride, such as chloride of potassium, sodium or ammonium. These salts are then dissolved in a suitable quantity of water, say, thirty parts of water to one part of aniline contained in the mixture. By heating these solutions to their boiling point a black or dark purple precipitate is formed containing the purple colouring matters" [4]. The above text "natural salt of aniline" most likely should be "neutral salt of aniline" [5]. Success appears to depend on "the judicious addition of a moderate amount of alkali", but this is not mentioned in the patent [6]. Schunck's sample of mauveine was most likely made using Caro's method and consequently is unlikely to have originated from Perkin.

Not content with this revelation, the authors then proceed to dispel long-held beliefs about the composition of dyes used to print British nineteenth-century postage stamps. Some, but not all, of the Victorian 6d postage stamps issued from 1867 to 1880 were found to be printed using mauveine. A variety of shades exist. Out of six examples, three (mauve, dull violet, bright violet) were Perkin's mauveine, one (purple) Caro's mauveine, one (lilac) was probably carminic acid and one (deep lilac) was not identified. The much more common 1d lilac (1881–1901) was also tested and in nine samples, only carminic acid was found. Carminic acid is a major component of the insect dye cochineal and was probably employed with an iron mordant to give the lilac colour.

In another revelation this year, John Plater has shown that oxidation of a mixture of N-tert-butyl-p-toluidine, aniline and o-toluidine (1 : 1.5 : 1.5) with acidified potassium dichromate solution at 70-80°C followed by de-tert-butylation with acid (HCl in methanol) gave a mixture of mauveine A (dimethyl-pseudomauveine) and mauveine B (trimethyl-pseudomauveine) [7]. Mauveine B was the major product, judged by TLC (illustrated) on silica gel, eluted with secBuOH : EtOAc : H_2O : HOAc (60 : 30 : 9.5 : 0.5) whereas Perkin's samples contain more mauveine A. The yield of the mixture before deprotection was 8%, an improvement over the reaction using non-alkylated starting materials, and the reaction proceeded faster.

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BOOK REVIEWS

Jay A. Labinger, *Up From Generality: How Inorganic Chemistry Finally Became a Respectable Field* (New York: Springer, 2013). Pp 77, ISBN 978-3-642-40120-6. £44 (paperback).

Ernest Rutherford is reputed to have said "All science is either physics or stamp collecting" which many assume that, despite his Nobel Prize for Chemistry awarded in 1908, he didn't have a particularly high regard for our subject. I think he was being a bit unfair to us organic chemists as our particular sub-discipline had, by the end of the nineteenth century, developed a coherence thanks to a knowledge of bonding, structure and the way that functional groups could be preserved or manipulated, much according to will. But it was a different matter with respect to inorganic chemistry and there was much about it to deserve Rutherford's implied scorn. I suppose we had Mendeleev's Table, with its periods and groups and a bit of chemical prediction, but largely the subject was a collection of facts: extraction processes, colours and shapes of crystals, and uses of this, that and the other.

The change came, at least as far as I was concerned, in 1962 with the publication of the text *Advanced Inorganic Chemistry* by F. Albert Cotton and Geoffrey Wilkinson. True, the facts were there, but much reduced in number. The stress was on the *explanation* of why things happened in the discipline. But such a text must have had a genesis and author Jay Labinger provides a personal perspective as to how the change to inorganic chemistry "finally becoming a respectable field" came about. There are a few nods across the Atlantic, with brief mentions of Frankland, Mendeleev, Werner and Ronald Nyholm. However, as the author admits, the focus (much of it anecdotal) is chiefly on the goings-on within US academia and the chemistry department within the highly-respected California Institute of Technology (Caltech) in particular. Labinger states "…one is tempted to select the most colorful incidents for their entertainment value – a temptation I have only occasionally resisted" and the career of Caltech Professor Don Yost (1893-1977) gives him plenty to draw upon. Yost is described as having an attitude towards institutions "and occasionally behaviour, somewhere between idiosyncratic and curmudgeonly – probably tending toward the latter". Certainly, he was one to seek out cause for disputes and he seems to have had a personality clash with colleague Linus Pauling, indisputably the leading light within the department.

The book is an entertaining read and I recommend it to inorganic chemists who want to engage with the history of their subject. But whether they will be inclined to put their hands in their pockets and come up with £44 for just 77 pages of text is another matter….

Alan Dronsfield

André Authier, *Early Days of X-Ray Crystallography* (Oxford: Oxford University Press, 2013), Pp. xiv + 441, ISBN 978-0-19-965984-5, £45.

This year (2014) marks the centenary of the award of the Nobel Prize in Physics to Max van Laue for the discovery of the diffraction of X-rays by crystals. Some fifty scientists have been associated with the twenty-nine Chemistry and Physics Nobel Prizes which have so far been awarded for some aspect of X-ray investigations. The very first prize, in Physics, went to Wilhelm Röntgen in 1901 for his discovery in 1895 of these mysterious rays. Laue's prize of 1914 was swiftly followed in 1915 by one shared by the Braggs (Sir William Henry and his son William Lawrence) for "analysis of crystal structures by X-rays".

This highly detailed, compendious and handsomely produced book of twelve chapters introduces the subject, describes various historical approaches to the concept of space lattices, and considers the dual nature of light from earliest times up to Einstein and the photoelectric effect (1905). The last part of this introductory material deals with Röntgen, the discovery of X-rays, and their wave or corpuscular nature. It is not until the sixth chapter some eighty pages later that we reach the heart of the book, "The discovery of X-ray diffraction and the birth of X-ray analysis": this and the next three chapters concern the early fundamental work.

In April 1912 Max von Laue (with Paul Knipping and Walter Friedrich) showed that X-rays directed on to a crystal would produce on a photographic plate diffraction patterns from $CuSO_4.5H_2O$ (the first crystal to be studied), and also from ZnS, NaCl and diamond. By October that year, William Henry Bragg had contacted Laue, and a few months later he and his son used the new technique for the first time to elicit molecular structures. They performed structural X-ray analyses of KCl, NaCl (which showed different diffraction patterns because of their different structures); work on ZnS, diamond and other materials followed. Many other famous names were involved in the early development of the subject including Moseley, de Broglie, Brillouin, Bravais, Compton, Wychkoff, Debye, Scherrer, Lorentz, Compton, Weissenberg, C. G. Darwin, and a multitude of others, most of whom make an appearance in this book.

Early applications of X-ray crystallography are reviewed in chemistry, mineralogy and biology. The last two chapters take several steps backwards in time and might more logically have been placed much earlier in the book: they cover the history of crystals from earliest times to the eighteenth century, and finally the birth and rise of the space lattice concept.

This is a long, detailed and authoritative book, well-written but, historically, oddly-arranged. It gives a good overview of the subject, and is well-referenced and well-indexed. An attractive feature is the use of many boxed figures covering major contributors to the subject with a monochrome photograph, brief biographical details, summary of their contributions to the topic and a list of a few main publications (though disappointingly only the titles of these are given). Recommended for those with a deep interest in the history of X-ray crystallography.

Bill Griffith
Imperial College, London

RSC NATIONAL HISTORICAL CHEMICAL LANDMARKS

RSC Chemical Landmark Plaque to Honour Dorothy Hodgkin

In May 2001 the RSC affixed one of their stainless steel Landmark plaques to the entrance to Oxford's Inorganic Chemistry Laboratory to mark the work of Dorothy Crowfoot Hodgkin. Thirteen years on, to the month, the RSC decided to "re-honour" this eminent crystallographer with one of its new, hexagonal, blue plaques especially to draw attention to the fact that 2014 is both the *International Year of Crystallography* and the fiftieth anniversary of the award of Dorothy's Nobel Prize for Chemistry. Present were some of her relatives, former colleagues, ex-students and a gratifying number of current students wishing to know more about this famous chemist.

The celebration took the form of a half-day symposium in which Professors Susan Lea, Paul Raithby and Andrew Goodwin discussed their work in crystallography, and how the field had changed in the 50 years since the Nobel Award. Hodgkin's biographer, Georgina Ferry, outlined some aspects of Dorothy's life with a special emphasis on the period that encompassed her schooldays and early research career.

Dorothy Crowfoot was born in 1910 and spent most of her childhood in Norfolk. She became interested in chemistry at the age of 10, encouraged by Dr A.F. Joseph, a friend of her parents. She studied at Somerville College, Oxford, initially combining chemistry with archaeology. However, on the advice of her tutor, F.M. Brewer, she decided to specialise in x-ray crystallography. On graduation she studied briefly at the University of Heidelberg, but the turning point came when, in 1932 in Cambridge, she worked for that doyen of crystallographers, J.D. Bernal. Two years later, Dorothy returned to Oxford and started to collect money for her own x-ray apparatus, initially with the help of the distinguished professor of organic chemistry, Robert Robinson. She continued the research that she began at Cambridge with Bernal on sterols and other biologically interesting molecules, including insulin. She progressed to penicillin in 1942 and to attack the problem of the structural elucidation of vitamin B-12 in 1948. Despite suffering from severe rheumatoid arthritis, she spent her entire career pushing the limits of x-ray analysis and is regarded as a pioneer in the study of biomolecules using x-ray crystallography. She announced the first three-dimensional structure of penicillin in 1949 and in 1954 began to publish the results of her researches into the structure of the vitamin. The outstanding nature of her work led to the award of the 1964 Nobel Prize "for her determinations by X-ray techniques of the structures of important biochemical substances". She was the third woman ever to win the prize in chemistry (after Marie Curie and Irène Joliot-Curie). A year later, she was made a member of the *Order of Merit* (she was only the second woman recipient of this Award, which is restricted just to 24 living individuals). Insulin was perhaps the most extraordinary of her research projects. It began in 1934 when she was offered a small sample of crystalline insulin by Robert Robinson. The hormone captured her imagination because of the intricate and wide-ranging effect it has in the body. However, at this stage X-ray crystallography had not been developed far enough to cope with the complexity of the insulin molecule. She and others spent many years improving the technique and in 1969 – five years after the award of her Nobel Prize – the structure of insulin was finally resolved. Dorothy Hodgkin, kindly mentor, mother and grandmother, was not only a brilliant scientist and a woman with broad cultural interests; she was also a fighter for peace. From 1976 to 1988, she was president of the Pugwash Conferences, an international organisation devoted to working against armed conflicts and making the world a safer place.

The Plaque was presented by Robert Parker, Chief Executive Officer, RSC, and unveiled by Professor Tim Softley, Head of Chemistry, and reads:

National Chemical Landmark
Dorothy Crowfoot Hodgkin
OM, FRS
(1910-1994)
Led pioneering work in this building from 1956-1972
and elsewhere in Oxford on the structures of
antibiotics, vitamins and proteins including
penicillin, vitamin B12 and insulin, using
X-ray diffraction techniques for which she
received the Nobel Prize in Chemistry
in 1964.
6 May 2014

The Historical Group was represented by Michael Jewess, Ron Neal and Alan Dronsfield.

Readers might like to know that the RSC has also honoured Dorothy by naming one of its second-floor meeting rooms after her. This is the present site of the Barbara Robinson portrait of her. Some of us feel that this picture ought to be given a greater prominence. Until the refurbishment of our main rooms, it was displayed on the wall of our first-floor corridor. Georgina Ferry's 1999 book *Dorothy Hodgkin - A Life* is available on the second-hand market from Amazon at less than £20.

Alan Dronsfield

MEETING AND CONFERENCE REPORTS

A Revolution in Chemical Analysis and Instrumentation

This meeting was held on Wednesday 19 March 2014 in the Chemistry Centre at Burlington House, with forty attendees. After coffee and registration at 13.30, attendees were welcomed by Jack Betteridge, who also chaired the first session. The aim of the meeting was to examine the rise of the new physical instrumentation for important chemical techniques between 1950 and 1980, although in practice the papers variously covered the period between 1800 and the present day.

Peter Morris

Infra-red Spectroscopy

William Coblentz was a physicist who worked at Cornell University, and later at the National Bureau of Standards. Over a period of some two years between 1903 and 1905, he assembled the spectra of 132 organic compounds, but IR took another fifty years to become part of mainstream organic chemistry.

The astronomer William Herschel had discovered the infrared region in the solar spectrum using a mercury thermometer with a blackened bulb in 1800. His thermometers were replaced by thermocouples of dissimilar metals developed by Thomas Seeback in 1823. Working in France in 1834, the Italian physicist Macdeonio Melloni studied the transmission of infrared light through a variety of substances (e.g. ice) using a thermocouple of 27 junctions. He discovered that rock salt transmits infrared radiation and used a salt prism to study the infrared spectrum of the sun.

William Abney and Edward Festing were military officers working in the Department of Science and Art in South Kensington. They studied 52 compounds (using a glass prism) and noticed similarities between their spectra which could be linked to functional groups in the compounds. Furthermore they stated that the spectra agreed with the structures adopted by chemists, thus linking physical instrumentation and chemical structure for the first time.

Coblentz made a more sensitive detector using the principle of Crookes' radiometer and he used the rock salt prism invented by Melloni. He could now detect the whole IR spectrum of any organic compound, but only point by point. It is therefore not surprising that it took him two years to gather the spectra of 132 compounds. Coblentz was able to show how the IR spectra were related to the compounds' structure and that structural isomerism changed the spectra whereas optical isomerism did not. He even used IR spectroscopy to study the course of a reaction. However Coblentz was a physicist and hence did not realise the potential of IR for organic chemistry. He even put the correlation of bands with functional groups in a negative way, each spectrum is different "with the exception of certain lines within them".

The lack of use of IR in organic chemistry began to change once the new petroleum chemists in the 1930s needed a way of identifying the different fractions of petroleum, just as Coblentz had hoped to do in 1903. During the Second World War, Harold Thompson, a physical chemist at Oxford, used IR to work out what kind of aviation fuel German aircraft were using. Similarly when the USA set up its synthetic rubber programme in 1942 there was a need to monitor the C4 hydrocarbons in petroleum refineries. The task was given to Robert Brattain at Shell Development in California and he worked with nearby National Technical Labs (soon to become Beckman Instruments) to develop an easy to use and robust IR spectrometer, the IR-1.

However Beckman was sworn to secrecy and it was on the other side of America that IR was first commercialized. Since 1937, American Cyanamid in Connecticut had been using IR spectrometers made by General Electric, but then it decided to collaborate with a small nearby optics firm called Perkin Elmer. PE first produced the Model 12A in 1944 and it was soon supplanted by the 12B which had a chart recorder unlike the IR-1. As IR became established in organic chemistry, textbooks on the use of IR began to appear and the second wave of IR use around 1960 was spurred by the introduction of cheaper easy-to-use IR spectrometers, such as the PE Infracord 137 in 1958.

Peter Fellgett of Cambridge University recorded the first Fourier transform infra-red (FTIR) spectrum in 1949. Block Engineering launched the first commercial mid IR FTIR instrument in 1963, but the full development of this technique only took place after the Cooley Tukey fast Fourier transform algorithm was applied to interferometry in 1966 and powerful micro-computers became available in the late 1960s. Digilab introduced the first micro-computer controlled FTIR (the Model FTS-14) in 1969.

Peter Morris, Science Museum

Atomic Absorption Spectroscopy

A review was presented of the development of Atomic Absorption Spectroscopy (AAS) in the period 1950-1990. The origins of AAS as an analytical technique were shown to be based on the work of astrophysicists. This included an early instrument utilising a continuum light source devised by Sir Joseph Norman Lockyer, the first editor of *Nature*, in the late nineteenth century. However, atomic absorption was regarded as a curiosity during the first half of the twentieth century until the pioneering work of Walsh (and independently by Alkemade and Milatz) in the 1950s. The key insight of Walsh was to use a spectral line light source instead of a continuum source thereby avoiding the need for a high resolution spectrometer. Atomic absorption offered advantages of both sensitivity and selectivity in comparison to the prevailing technique of flame photometry of the time. The subsequent rapid development of AAS was described in the context of the key enabling developments of instrumentation and the contributions of leading researchers of the period (including those of Walsh, L'vov, Willis, Manning, Koirtyohann, Massmann, Slavin, Ottaway, Hieftje, O'Haver and Harnly). These advances included the use of hollow cathode lamp and continuum source light sources, spectrometer design (single beam, double beam, high resolution echelle optics, and spectral background correction), and atomisers - including nitrous oxide/acetylene and air acetylene flames (1960s), and electrothermal devices, cold vapour and hydride generation (1970s-1980s). The causes of chemical, physical and spectral interference effects on analytical measurements and strategies for overcoming them were also briefly considered. The advent of instrument automation and sequential/simultaneous multi-element AAS analysis in the 1980s were also noted. Finally, a prediction of the death of AAS (Hieftje, 1989) by the year 2000 was shown to be somewhat premature following the commercial introduction of a new high-resolution continuum-source based AAS instrument in 2004.

John Marshall, Glasgow Caledonian University

Mass Spectrometry from the 1940s to the 1980s

In the late 1940s, the first widely-available British commercial mass spectrometer was the Metropolitan-Vickers MS2, aimed primarily at the petrochemical industry for the analysis of gases and light hydrocarbons. The main requirement was reproducibility with little interpretation of the 'cracking patterns' produced. The MS8 built for ICI led to the MS9 high resolution instrument around 1960; this was capable of very accurate mass determinations which yielded elemental composition information. During the following decade, these instruments provided accurate molecular weights of gases and volatile liquids and solids, replacing microanalysis. Many types of mass spectrometer were successfully interfaced to packed column gas chromatographs and a greater understanding of the principles of ion fragmentation led to their increased use for structure determination during the 1970s.

The 1980s brought many important advances including new ionisation methods (FAB, MALDI and ESI), and the triple quadrupole instrument which facilitated tandem mass spectrometry, whilst the use of capillary columns led to improved performance in GC-MS and the successful implementation of LC-MS. Increased use of FT-ICR and improvements in time-of-flight, quadrupole and ion trap mass analysers led to a decrease in the dominance of magnetic sector instruments. By the end of the decade, most instruments were under computer control and had a sophisticated data processing system.

The use of high resolution mass spectrometry and tandem mass spectrometry in the detection of TCDD in human tissue and effluents from pulp and paper mills was followed by the detection of the fungicide imazalil on lemon peel by means of desorption ESI and tandem mass spectrometry. Other applications included peptide sequencing, the detection of blood disorders, diagnosis of phenylketonuria in new-born infants and the detection of lipid and protein distributions in human single tissue sections.

Keith R. Jennings, University of Warwick

Developments in NMR Spectroscopy from the 1940s to the 1980s

NMR is unique among chemical spectroscopies in the ease with which standard instrumentation can drive the nuclear spins into a nonlinear response, and in the long lifetimes of the quantum states involved. These seeming technicalities have had profound consequences for the development of the subject, and are responsible for the sometimes bewildering variety of different ways in which chemical and structural information can be derived from the phenomenon of NMR.

The early years of condensed phase (as opposed to atomic/molecular beam) NMR were dominated by physicists, in particular Felix Bloch (who within a few months of the first successful experiments presented a simple semi-classical description of the quantum dynamics involved) and Erwin Hahn (who discovered the spin echo, one of the most useful building blocks of modern NMR techniques). The discoveries of the chemical shift (regarded by physicists as rather a nuisance) and of scalar coupling rapidly made clear the chemical utility of NMR spectroscopy, and by the late 1950s commercial NMR equipment had become a standard feature of chemical laboratories.

In the early 1960s, two developments greatly increased the chemical scope and power of NMR, the introduction of higher magnetic fields through superconducting magnets and the successful demonstration of pulse Fourier transform NMR. Of the two, it was the latter that was to have the most profound effects. The first was to increase the sensitivity of NMR to the extent that chemically informative experiments became possible for almost any element in the periodic table. The second effect, slower in its impact but equally important in the long run, was the burgeoning of multiple pulse experiments such as 2D NMR that allow the experimenter to control the chemical information content of spectra. An early example is the COSY (correlated spectroscopy) experiment, that maps out in a two-dimensional display the scalar coupling relationships between spins, and hence the network of bonding connectivities, in a molecule.

Subsequent developments, many driven by chemists, have opened up a very wide range of science, including the use of NMR to follow chemistry in real time in living systems and to allow the three-dimensional imaging of brain function.

Gareth Morris, University of Manchester

The History of Partition Chromatography

Chromatography is generally considered to have started with the pioneering work of Mikhail Tswett (1872-1919). He was a botanist from Russia and, while working as an assistant at the University of Warsaw, in 1901 he developed column chromatography to separate plant pigments. The column he used was filled with powdered silica, and eluting with organic solvents separated the pigments.

There was little progress until the pioneering work of Archer Martin (1910-2002) and Richard Synge (1914-94) around 1940. They were both Cambridge PhD graduates in biochemistry and working at the Wool Industries Research Association in Leeds. Martin was, by one year, the senior of the two, and he had had a long fascination with fractional distillation. As a youth, he had undertaken fractional distillations at home using a column made from old coffee tins, welded together and filled with powdered charcoal. He had made himself familiar with the theory of fractional distillation and the method of determining column efficiency as used by chemical engineers. This involves assuming that a column comprises a series of theoretical 'plates' rising to the top, each with liquid in contact with its vapour at equilibrium. The vapour at a particular theoretical plate is assumed to condense to form the liquid of the plate immediately above it, and there to establish a new equilibrium with vapour of the appropriate composition. In this way the vapour becomes increasingly rich in the more volatile component as the mixture rises in the column. Column efficiency is then determined by measuring the "height equivalent to a theoretical plate".

Martin and Synge's particular interest was the separation of amino acids from wool, for which they attempted to use a counter-current separator. It was messy, leaked badly and gave unusable results. Next they moved to a system in which a liquid was bound to a silica powder support, and a different liquid passed down the column. They got excellent separations. Moreover, Martin recognised the analogy with fractional distillation and saw that the process could be viewed as involving partitions of the components between the bound and the mobile liquids, which differed in polarity. Their classic paper describing this work (Martin and Synge, *Biochem. J.* 1941, 35, 1358) discusses not only the separations but also the underlying theory. This paper won them election as Fellows of the Royal Society in 1950 and the Nobel Prize for Chemistry in 1952.

Both Martin and Synge moved on from the Wool Industries RA relatively quickly, and by 1952 Martin was at the National Institute for Medical Research at Mill Hill. There, he turned again to chromatography. Working with A.T. James, he developed gas-liquid chromatography, expanding on an idea suggested in his 1941 paper. In this early work, they used a 4-foot long, 4-mm internal diameter glass tube, packed with Celite, on which they put a liquid paraffin stationary phase. Using nitrogen as the carrier gas, they separated a series of closely related volatile fatty acids, with detection by titration. Titration was time-consuming, as it involved many hundreds of samples. As James wrote, "Although the resolving power was high, it took an inordinate amount of time and nearly drove the assistant staff mad when they had to sit doing the multiple titrations day in and day out". The work was published (Martin and James, *Biochem. J.* 1952, 50, 679) and this marked the origin of the technique of gas-liquid chromatography, GLC.

GLC was taken very readily by industry, with BP Research at Sunbury under D.H. Desty and the ICI Alkali Division under N.H. Ray being very early into the field. There was also significant activity at the Chemical Research Laboratory, Teddington, led by Douglas Ambrose.

Then, in the 1960s, there was renewed interest in the process of liquid chromatography. It offered the advantage of being applicable to non-volatile substances, but as originally used by Tswett, was far too slow. However Martin and Synge showed that this could be improved by reducing the particle size of the column packing considerably and maintaining throughput by applying pressure. Thus HPLC (high performance liquid chromatography) was born. A crucial development was the use of small particle column packing as pioneered by Dr Joseph Huber of the Technical University of Eindhoven and reported firstly at a lecture at what is now Liverpool John Moores University in 1965. A fuller account was presented at the International Symposium on Physical Separation Methods in Analytical Chemistry held in Amsterdam in April 1967, and this is usually considered to mark the beginning of HPLC.

This technique was also quickly taken up by industry, with notable pioneers being J.J. Kirkland and Lloyd Snyder. Kirkland, who worked at Du Pont, developed improved column packings and soon afterwards Snyder developed gradient elution as a means of shortening overall run times and sharpening later peaks. Kirkland and Snyder co-operated on books about the technique, and in running workshops to promote the technique to practitioners, mainly in industry.

By 1977, HPLC had become routine across both industrial and academic laboratories, and no less an authority than R.B. Woodward (1917-1979) could write "The power of these high pressure liquid chromatographic methods hardly can be imagined by the chemist who has not had experience with them".

John Nicholson, St Mary's University, Twickenham

Chemistry as a Hobby

This half-day meeting was organized by the RSC Historical Group on Thursday 19 June 2014 and was held at Burlington House, though not at the RSC but at the Society of Antiquaries of London (opposite). About 40 people attended the meeting and shared their many experiences of chemistry. There were four talks addressing different aspects of "chemistry as a hobby" and each talk was followed by a lively session of questions and observations.

Discussions continued over tea and coffee in the library. The Historical Group is grateful to the Society of Antiquaries of London for hosting the meeting and to Jola Zdunek (Executive Assistant) for her help with the organization.

Peter Reed

From Candles to Cabinets

'Familiar chemistry' flourished in early Victorian Britain. This set of texts and practices advocated drawing scientific lessons from the habitual activities of daily life, in which the hidden chemical contents of common objects and quotidian processes were revealed. Through sensory interactions in the family environment – enlightening conversation and hands-on explorations – a wide range of phenomena could be introduced to childish bodies and minds. In this talk, Dr Keene argued that familiar chemistry succeeded by reworking the popular literary genre of the familiar introduction with an emphasis on embodied interactions with emphatically real things, and gave a central role to the familial domestic context. In these ways, children could first learn elementary chemistry from candles and cups of tea, before moving on to specialist chemical cabinets and youth's laboratories, and even to a chemical career.

Melanie Keene, University of Cambridge

Michael Faraday and the Chemical History of a Candle

Frank James talked about Faraday's *The Chemical History of a Candle* which must count as one of the most successful science books ever published. It has been continuously in print in England and America since it was first published in 1861 and has been translated into many languages including French, German, Polish, Japanese, Bulgarian and Basic English. More recently it has been translated into Portuguese and a new Japanese edition has been issued, since the first 1930s edition was translated from the German text.

James outlined how the series of Christmas lectures at the Royal Institution, on which the book was based, came to be delivered. It was not inevitable that Faraday would give the Christmas lectures during the 1860-61 season, but the internal politics of the Royal Institution forced this outcome. Faraday was thus given short notice that he would be delivering them and so used a notebook for a course that he had delivered twice before. The notebook, which has been published in facsimile in James's sesquicentenary edition of the *Candle* shows signs of having been too close to a candle.

Professor James considered how Faraday's attitude towards publishing lectures changed: he was opposed to this in 1859, but shortly after changed his mind. This was probably a response to the rise of spiritualism during the decade and illustrates how the lectures fitted in with Faraday's deeply theistic view of the world. Finally Professor James discussed the reasons why this book remains so popular, something which he attributed to it covering a wide range of basic scientific knowledge, much of which is still correct and of relevance today. For example Faraday's calculation of the amount of carbon dioxide produced in London each year. Furthermore, many of the experiments that are described in it are spectacular, if not dangerous, and involve loud bangs, always attractive to an audience.

Frank James, Royal Institution

When Chemistry sets Became Toys

This talk examined the transition from the first commercial 'chemical cabinets' produced during the nineteenth century to the mass-produced and more affordable toy 'chemistry sets marketed from around the First World War. Concentrating on the dominant American brands A.C. Gilbert and Porter Chemcraft, the talk described how toy manufacturers initially sought to exploit early twentieth-century enthusiasm for conjuring by advertising their sets as 'chemical magic' kits. But these companies quickly expanded the range of sets they sold, from basic kits for younger users to large-scale and more expensive 'laboratories' intended to encourage older children to see themselves as 'junior chemists' on the path to a career in professional science.

Marketing their kits as 'career toys', Gilbert and Chemcraft appealed to middle-class parents' aspirations for their families by presenting chemistry sets as 'an important, worthwhile investment' in a child's future. Part of a wider effort to combine the appeal of toys with the nation's needs for industrial scientists, these companies presented the chemistry set as crucial for teaching their young users the connection between the 'things we use every day' and the world of industrial manufacturing. Reflecting on the iconic status of chemistry sets in the twentieth century, the reasons for their decline in the 1970s were also outlined. In conclusion, it was argued that in order to appreciate how chemistry sets were perceived and to understand their appeal, we need place them in the wider context of histories of leisure, toy manufacturing and advertising, and the status of chemistry in the twentieth century.

Salim Al-Gailani, University of Cambridge

My Home Laboratories: one, two, three, four, five, six and seven

This talk began with a 10-minute video presentation (with acknowledgement to Roly Jamision for the recording and editing) about the speaker's background and present laboratory. This was followed by a visual tour of the seven laboratories he has owned to date. His chemistry fascination began with being given a Salters chemistry set when he was 11 (he's now 40!). After being kicked out of the roof space lab by mother for making obnoxious hydrogen sulphide gas, it expanded to a purpose-built shed with a small fume cupboard. A few years later it then expanded into an old converted dairy and a few years after that to an old house on the farm - including lab fixtures and fittings of beautiful teak benches from his School Methodist College which was refurbishing its old labs. After amassing an amount of chemicals and equipment from old schools and hospitals and setting up a charity called Saving Science, which sends old lab equipment to Ugandan Schools, it was time to build the lab of his dreams - including at one end a large 2 manual 30 stop pipe organ from St. Peter's College, Oxford. It was during this phase that the speaker posted many videos on his YouTube channel (plasticraincoat1) showing many unusual and exciting chemical demonstrations. After a serious robbery and break-in, the lab was closed and the speaker moved house. He then went on to set up his present laboratory (including a smaller pipe organ and grand piano!). It was a lot of hard work and taught him many DIY skills, but the amount of enjoyment it has brought has been well worth it.

Adrian McLaughlin

FORTHCOMING MEETINGS

Royal Society of Chemistry Historical Group Meetings

Chemistry and World War 1

Wednesday 22 October 2014

Venues: *Burlington House, Piccadilly, London AND Catalyst, Mersey Road, Widnes, WA8 0DF (live streaming)*

Programme

10.15 Registration and coffee (both venues)

10.30 RSC Historical Group AGM (Burlington House venue only)

10.50 Welcome (Dr John Hudson, Chairman of the Historical Group) & Introduction (Peter Reed)

11.00 Dr Michael Freemantle (Science Writer)
The Chemists' War: 1914–1918

11.40 Professor Roy MacLeod (University of Sydney)
The Great Munitions Feat: Reflections on Kenneth Quinan, Gretna, and the Imperial Chemical Effort.

12.20 Wheeler Award Lecture: Dr Tony Travis (The Hebrew University of Jerusalem)
Nitrogen, Novel High Pressure Chemistry and the German War Effort

13.00 Lunch. This is **NOT** provided at Burlington House, but there are many cafes and bars nearby.
Lunch **IS** provided at Catalyst and this is included in the cost.

14.20 Peter Reed (Independent Researcher)
The British Chemical Industry and WW1: The United Alkali Company

15.00 Dr Erik Langlinay (Ecole de Hautes Etudes en Sciences Sociales, Paris)
The French Chemical Industry and WW1

15.40 Tea (both venues)

16.00 Dr Viviane Quirke (Oxford Brookes University)
Chemistry, Patents and the Transformation of the European Pharmaceutical Industry in WW1

16.40 Colin Chapman (Chairman, RSC Bristol & District Section)
From Bunsen to POWs in Britain: Dr K.E. Markel, a Chemist in the Great War

17.20 Concluding Remarks (Professor Alan Dronsfield, Past-Chairman of the Historical Group)

17.30 Close of meeting

NB: A free booklet will be available remembering the members of the Chemical Society who gave their lives in WW1.

Registration for Burlington House Venue

The cost of this meeting is £15. To register, please send your name, address and a cheque for £15 payable to the Royal Society of Chemistry Historical Group to Professor John Nicholson, School of Sport, Health and Applied Science, St Mary's University College, Waldegrave Road, Strawberry Hill, Twickenham TW1 4SX, by Monday 6 October. Please enclose a SAE or email address if you require an acknowledgement.

Registration for Catalyst Venue: www.catalyst.org.uk

The cost of the meeting is £20, which includes lunch and free parking. To register, please send your name, address and a cheque for £20 payable to the Royal Society of Chemistry Historical Group to Dr Diana Leitch, 11 Wingate Drive, Didsbury, M20 2RT, by Monday 6 October.

Newcomen Society Meeting

Wednesday 12 November 2014 at 17.45

Science Museum Offices, South Kensington

Lecture: "The Derbyshire Oilwells of 1918 – Britain's first oilfield", by Cliff Lea. Further details from the Newcomen Society: office@newcomen.com

Society for the History of Alchemy and Chemistry Meetings

Brazil Meeting

SHAC is delighted to announce that its first meeting in Latin America, *Crossing Oceans: Exchange of Products, Instruments, Procedures and Ideas in the History of Chemistry and Related Science*, will take place on 24-28 August 2014. This international conference will be hosted and organised by CESIMA (Centre Simao Mathias of Studies in the History of Science) and co-sponsored by SHAC and the Centre of Logic, Epistemology and History of Science, Unicamp (CLE). The conference will mark the occasion of CESIMA's twentieth anniversary in 2014.
http://www4.pucsp.br/pos/cesima/

December 2014 Meeting

SHAC will also be holding a meeting jointly with the ADHOC Discussion Group on December 2014 at University College London. The Society's AGM will also be held on this day. For further information see www.ambix.org nearer the time or contact SHAC's Honorary Secretary, Simon Werrett on s.werrett@ucl.ac.uk

FORTHCOMING CONFERENCES

International Conference on the History of Physics

4-5 September 2014, Trinity College, Cambridge

Organised by the Institute of Physics History of Physics Group in collaboration with the EPS History of Physics Group

This conference will inaugurate a new international series, bringing together professional historians of science, practising physicists, science museum staff, lecturers, teachers and others with interests in any aspects and periods of physics history. The leading theme of the conference will be "Electromagnetism: the Road to Power". The registration deadline is 15 August 2014. For more information see: http://historyofphysics2014.iopconfs.org/home

Tenth International Conference on the History of Chemistry

9-13 September 2015, Aveiro, Portugal

The 10ICHC, organised by the Working Party for the History of Chemistry of EuCheMS, will start on Wednesday 9 September 2015 with the traditional welcome reception. It will close late afternoon on Saturday 12 September, leaving Sunday 13 September for an excursion. The conference will be hosted by Isabel Malaquias as Chair of the Local Organising Committee, while Peter Morris has agreed to act as the Chair of the Programme Committee. Further details in future *RSCHG Newsletters*.