RSC | Advancing the Chemical Sciences

# Historical Group

# NEWSLETTER and SUMMARY OF PAPERS

## No. 62 Summer 2012

**Registered Charity No. 207890**

## COMMITTEE



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

# Contents



## From the Editor

Welcome to the summer 2012 RSCHG Newsletter, the first to be distributed electronically and, for those who have requested it, by post. If you have received the newsletter by post and wish to look at the electronic version it can be found at: http://www.chem.qmul.ac.uk/rschg/Newsletter/ or http://www.rsc.org/historical

The flyer for the RSCHG autumn meeting, "Under the Influence: Chemistry Textbooks and their Authors" on Friday 28 September 2012, can be found on page.

This issue contains a wide variety of news items, feedback from the winter 2012 issue, articles, book reviews and reports. There are three short essays: the first by Anthony Travis on what analytical chemistry owes to Rachel Carson's *Silent Spring*; the second by Richard Toon on German patent dominance; and the third, part of the Historical Reminiscences series, by Derry W. Jones on John Wilson (1890-1976), Research Association Director. There are book reviews of Colin Russell and John Hudson's *Early Railway Chemistry and its Legacy,* Alan Rocke's translation of Kopp's *Molecular World* and of a biography of the physician Jan Ingen Housz. There is a report on the RSC Chemical Landmark Plaque that has been unveiled to mark the contribution of James 'Paraffin' Young, at The Bennie Museum, Bathgate, West Lothian. An article also appears on the highly successful RSCHG meeting "Where there's muck there's brass!! Reclamation of Chemical Sites", which took place on 23 March 2012.

I would also like to draw readers' attention to the guidelines for contributors to the RSCHG newsletter. These appear at the beginning of the newsletter and online at both the websites above. If you are submitting a contribution to the newsletter, please do follow the guidelines.

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 deadline for the winter 2013 issue will be 14 December 2012. Please send your contributions to (a.simmons@ucl.ac.uk) as an attachment in Word or rich text format, or on CD-Rom (post to Epsom Lodge, La Grande Route de St Jean, St John, Jersey, JE3 4FL). All contributions must be in electronic form.

Anna Simmons
University College London

## Royal Society of Chemistry Historical Group News

### Guidelines for Contributors to the Royal Society of Chemistry Historical Group Newsletter

Please send contributions to a.simmons@ucl.ac.uk as an attachment in MS Word or rich text format or on CD-Rom (post to Epsom Lodge, La Grande Route de St Jean, St John, Jersey, JE3 4FL). It is the author's responsibility to clear all copyright issues before submitting contributions to the RSCHG newsletter.

**Short Essays and Historical Reminiscences**

**Word Length**: Articles should not exceed 2,500 words except in exceptional circumstances. Shorter articles are very welcome.

**References:** Please list references at the end of the article. Do not use formatted footnotes or endnotes. Use square brackets for footnote numbers in the text [1] not superscripts.

For example:

1. W.H. Brock, *The Fontana History of Chemistry* (London: Fontana, 1992).

2. Noel G. Coley, "Forensic Chemistry in 19$^{th}$ Century Britain", *Endeavour*, 1998, **22**, 143-147.

3. Peter J.T. Morris, "The Eighteenth Century: Chemistry Allied to Anatomy", in *Chemistry at Oxford: A History from 1600 to 2005*, eds. Robert J.P. Williams, John S. Rowlinson and Allan Chapman (Cambridge: RSC Publishing, 2009), 52-78.

Standard journal abbreviations (*J. Chem. Soc., Brit. J. Hist. Sci., Chem. Brit.*) should be used and *ODNB, DSB, OED* used for standard biographical works.

For a list of current scientific journal abbreviations see:

http://www.cas.org/expertise/cascontent/caplus/corejournals.html

**Illustrations:** Please email images as separate files, with typically a maximum of four images per article. Colour images are very welcome but will only be reproduced in colour in the online version of the newsletter. All images in the hard copy newsletter will be in black and white and reproduction quality is dependent on the quality of the original image. It is the contributor's responsibility to obtain written permission for the use of any images reproduced from previously published sources or where copyright is owned by a third party. If no digital image is available please contact the editor.

**Book Reviews**

**Word Length:** approximately 500 words.

Please give full publication details at the beginning of the review.

Please contact the editor, Dr Anna Simmons, at a.simmons@ucl.ac.uk if you have any queries.

### The RSCHG Newsletter is now held in the British Library

With the help of a number of generous RSCHG members I have managed to accumulate a complete run of RSCHG *Newsletters* since their inception in 1981, and have deposited these in the British Library. There is also a complete run of our *Occasional Papers.* New issues will be sent to the BL as they appear. The Library has now catalogued them and they have been assigned unique ISSN (International Standard Serial Numbers); these are 2050-0432 for the *Newsletter* and 2050-0424 for the *Occasional Papers.*

Even if you are not a member of the BL you can check the holdings. Go to http://explore.bl.uk/ and in the Main Catalogue box enter 'RSC Historical Group' and click SEARCH. The first three items concern our Newsletter (**No. 1** is *Newsletter and summary of papers / Historical Group, Royal Society of Chemistry,* covering the run from July 1988 to the present; **No. 3** is *Newsletter / Historical Group, The Royal Society of Chemistry* and represents the 1981 - January 1988 run (there was a slight change of title in 1988); **No. 2** covers the *Occasional papers / Historical Group, Royal Society of Chemistry*, from 1999 to the present. To get further information click DETAILS under these items. If you are a registered BL reader and want to consult a Newsletter, go to http://explore.bl.uk/ and enter your BL number and password under Login. Then, by selecting No. 1, 2 or 3 as appropriate, identify the Newsletter(s) you want, click 'I want this' and specify the issue(s) needed. They are held at the St. Pancras site so delivery should occur to you there within an hour. For details on how to become a registered reader go to http://www.bl.uk/.

Bill Griffith

## Royal Society of Chemistry Historical Group AGM

The thirty-seventh Annual General Meeting of the Group, will be held in the Council Chamber, Burlington House at 13.45 on Tuesday 28 September 2012.

**Agenda**

1. Apologies for Absence.
2. Minutes of AGM at Burlington House, Wednesday 26 October 2011.
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-Sixth Annual General Meeting of the RSC Historical Group

Held in the Chemistry Centre, Burlington House at 13.45 on Wednesday 26 October 2011.

1. **Apologies for Absence** from Jack Betteridge, Ernst Homburg, Peter Morris, Steve Robinson, Colin Russell.

2. **Minutes of AGM** at Burlington House, 19 March 2010. These were published in the August 2011 issue of the *Newsletter,* pp. 5-8.

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

4. **Reports**:

**Chairman's Report**: Alan Dronsfield said that the Group had had a very satisfactory year and paid tribute to the officers and the meetings' organisers who had made this possible. Membership numbers were increasing as a result of the RSC's new policy of 'no-cost' group membership. The increase in membership is both welcome and manageable. We have continued to forge good relationships with RSC officers, especially Pauline Meakins in connection with the Chemical Landmark scheme. We have a list of Historical Group members prepared to give talks to all sorts of organisations on all sorts of historical topics, and this results in several bookings each year.

He said that the online publication of the *Newsletter* was aired at our last AGM. The printed version would still be available, but only if members personally requested it. The 'no-cost' alternative would be to download it from either of our two websites and access it on our computers. A flyer would be put in the next edition of the Newsletter to register to continue receiving issues in hard copy.  The committee will keep the outcome under review and will, if necessary, consider alternatives to maintain a reasonable working balance in our accounts.

**Secretary's Report:** Bill Griffith distributed his report for the year March 2010 – October 2011:

**Meetings:** There were five, all well-attended and well-received by their audiences.

**The Rise and Fall of ICI:** A one-day meeting on Friday 19 March 2010 in the new Chemistry Centre, Burlington House organised by Bill Griffith and Jack Betteridge, with an accompanying exhibition by Diana Leitch. Reported in the August 2010 *Newsletter,* pp. 28-33.

**The History of Chemical Information:** A one-day joint meeting with the Chemical Information Group (CICAG) at the Chemistry Centre, Monday 29 November 2010 organised by Chris Cooksey and Diana Leitch. Reported in the January 2011 *Newsletter,* pp. 27-31.

**Marie Curie and Aspects of the History of Radiochemistry**: Friday 18 March 2011, organised by Alan Dronsfield and Bill Griffith. A one-day meeting in the Chemistry Centre, jointly with the RSC Radiochemistry Group. Reported in the August 2011 *Newsletter,* pp. 36-43.

**Dyes in History and Archaeology** (joint meeting), Wednesday to Saturday, 12-15 October 2011, University of Derby. Organised by Alan Dronsfield and Chris Cooksey. To be reported in the January 2012 *Newsletter.*

**Environmental Chemistry – an Historical Perspective** (today's meeting). Joint meeting with the Environmental Chemistry Group, Wednesday 26 October 2011, organised by Rupert Purchase and Peter Reed. To be reported in the January 2012 *Newsletter.*

**RSC Landmark plaques***:* The Group had been represented at all of these.

At Sanofi-Aventis (formerly May and Baker), Dagenham, East London on 2 July 2010 (see report, August 2010 *Newsletter*, pp. 223-25); at Pfizer in Sandwich, Kent on 15 October 2010 (see report, January 2010 *Newsletter*, pp. 24-25); at the Inorganic Chemistry Laboratories, Oxford (John Goodenough Landmark plaque) on 30 November 2010 (see report, January 2010 *Newsletter*, pp. 25-26); at Unilever Port Sunlight Research, Port Sunlight, Cheshire, on 30 March 2011 (see report, August 2011 *Newsletter*, pp. 35-36); for Sir Ernest Rutherford at Manchester University on 8 August 2011, commemorating the centenary of his proposal that atoms had their masses concentrated in a nuclear core; there will be a report in the January 2012 *Newsletter*; at the Catalysis Science Centre, Runcorn, Cheshire, to mark the discovery of the anaesthetic Halothane, on 22 October 2011; there will be a report in the January 2012 *Newsletter*.

There was also an English Heritage blue plaque to Sir William Ramsay at his house at 12 Arundel Gardens, Notting Hill, London on 9 February 2011 (see report, August 2011 *Newsletter*, pp. 36-7)

**Treasurer's report**: John Hudson reported that the Group's finances were healthy. We had a surplus of £1,711 this year: we have £3,548 in the current account, and £4,322 in the ring-fenced Wheeler account, the latter now being held in a special RSC deposit fund.

**5. Future Meetings** Bill Griffith announced two:

(i) *Where there's Muck there's Brass – the decontamination of chemical sites.* Chemistry Centre, Burlington House, Friday 23 March 2012. Organised by David Leaback and Peter Reed.

(ii) *Under the Influence – Famous Textbooks and their Authors.* Chemistry Centre, Burlington House, organised by Peter Morris. Autumn 2012 (the AGM will also be held then).

We have plans for meetings extending into 2013 and 2014; the Group will also be represented at RSC Landmark plaque unveilings.

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

Alan said that members of the committee were prepared to continue for 2011-12. He himself had served six years as chairman, so is eligible to serve for another two years if requested. Our treasurer is happy to continue in post. In theory our secretary, Bill, had served longer than the RSC's rules permitted, but the committee valued his services and no-one on the committee wished to see him stand down. The way round this has been to invite him to serve as 'acting secretary', as he had done for 2010-11, and we are grateful to him for continuing to offer his services in this capacity 2011-12.

A proposal that the present committee continue to guide the group's activities 2011-2012 was made by Keith Robinson, seconded by Martyn Berry and approved *nem. con.* A second proposal that Alan Dronsfield, John Hudson and Bill Griffith should serve in 2011-2012 as chairman, treasurer and acting secretary was made by John Hudson, seconded by Frank James and carried *nem. con.*

**7. Any Other Business.** There was none.

**8. Date, time and place of next AGM**. This will form part of our Autumn 2012 meeting, details of which will be published in the Summer 2012 Newsletter. These minutes, as was the case last year, will also be published in the summer *Newsletter.*

The meeting closed at 13.55; some thirty-five members were present.

## Winter 2012 Newsletter Feedback

### Identification Query: F.W. Westaway's Fellow of the Royal Society Identified

In the last issue of the *Newsletter* (61, Winter 2012, pp. 5-6) I asked if any reader could identify a chemist and mineralogist who was described by his friend Frederick William Westaway in 1942 as obsessively determined to gain an FRS even if it meant working in his spare time day and night. The only clues to identification were that the anonymous chemist was one of His Majesty's Inspectors for Secondary Education based in Oxford, and that he had studied at the Royal College of Science in South Kensington. Quite by chance, as the query went to press, I was able to discover the answer while going through some of J. R. Partington's chemical publications. One of these was an obituary of the crystallographer Alfred Tutton (1864-1938) that Partington had written for *Nature* in August 1938. As I read the obituary it dawned on me that Tutton was Westaway's exemplar of a man whose dedication and obsession with research and glory blinded him to social, cultural and moral values and put *Science in the Dock* – as Westaway described it in his book of 1942.

Alfred Edwin Howard Tutton was born at Stockport, Cheshire, on 22 August 1864. He was, therefore, some twenty years older than Partington, who was also born in Stockton. Like Partington later, Tutton left school at 14 and worked for the Town Clerk in Stockport. Both men attended evening classes to improve themselves. The two chemists must have met later in life and their shared early experiences created a bond between them.

In 1883 Tutton gained a scholarship to study at the Royal College of Science where he proved an outstanding student. In 1889 Edward Thorpe made Tutton a demonstrator in the chemistry department and they joined forces in an investigation of how phosphorus oxides caused 'phossy jaw' in matchmakers. Tutton's preparation of phosphorus tetroxide $P_2O_4$ and the lower phosphorus (III) oxide $P_4O_6$ turned his attention to crystallography – a subject which, apart from a few private conversations with H. A. Miers at the Natural History Museum, he was self-taught. During the early 1890s Tutton also assisted Thorpe and his physics colleague Arthur Rücker in a magnetic survey of England and Scotland that was published by the Royal Society in 1896. Tutton had left South Kensington the year before on appointment as HMI for Technical Schools, the same year that Westaway received a similar appointment after leaving a headmastership in Bristol. They became firm friends, with Tutton inspecting technical education establishments in Oxfordshire and Westaway in nearby Bedfordshire.

During his ten years in Oxford, where Westaway visited his private laboratory in Bardwell Road, Tutton took BSc and DSc degrees by thesis at New College, and was made FRS in 1899 at the young age of 34. Following his marriage, in 1905, his inspectorate took him to London until 1911 when he was moved to Plymouth. He finally retired as HMI in 1924 and moved to Grange Road, Cambridge. Following each move he built himself a private home laboratory (Ladbroke Square, London; Yellerton on Dartmoor; and Grange Road in Cambridge). His final years were spent at Dallington in Sussex where he died on 14 July 1938.

In his investigation of crystals, Mitscherlich had realised that the angles of isomorphic crystals were not exactly the same. Tutton spent some forty years making very precise measurements of how molecular volumes and crystal angles were affected by replacing one element in a crystalline salt by another. His initial studies of the sulphates and selenates of K, Rb, Cs, $NH_4$ and Th, and then their double salts with the metals Mn, Cu and Cd (usually known as Tutton's salts) led to the conclusion that crystal properties varied regularly with the atomic weight (later atomic number) of the interchangeable elements. This was the "obsessive" work that Westaway found Tutton doing day and night in Oxford when he was not engaged in his job as an HMI, and which led to the FRS. Interestingly, his two initial proposers were Lazurus Fletcher, Keeper of Mineralogy at the Natural History Museum, and William de W. Abney, Tutton's supervisor in the Department of Science & Art. Other signatories included Roscoe, Thorpe, Tilden, Miers, Harcourt, and Odling. The citation stressed that Tutton had invented a special instrument for grinding section plates and prisms of crystals and another for producing monochromatic light of any desired wavelength.

Tutton's dedicated part-time research continued until 1929 by which time he had published precise data on over 90 salts in over 50 papers. Much of the early work and accounts of the goniometric and optical instruments he devised were described in his books *Crystalline Structure and Chemical Constitution* (1910), *Crystallography and Practical Crystal Measurement* (1911), and *Crystalline Form and Chemical Constitution* (1926).

Despite Westaway's critical assessment, Tutton seems to have been a well-rounded individual. A keen Alpinist, he also published the charming *Natural History of Ice and Snow* in 1927. Even so, Partington's obituary ends with an enigmatic statement: Tutton's research "exhibits that peculiarly British character which is seen in the researches of other distinguished men of science who have laboured in like circumstances". I wonder what he meant.

*Bibliography:* Besides Partington's account in *Nature*, 1938, **142**, 321-2, the Royal Society published Tutton's autobiography, together with a striking photograph, in *Obituary Notices of Fellows of the Royal Society*, 1936-38, **2**, 621-6. Note also that Douglas McKie's son, Duncan McKie (1930-99), compiled the rather derivative notice in *DSB.*

W.H. Brock
University of Leicester

## Postscript to Alan Dronsfield's review of *The Case of the Poisonous Socks*

I reviewed Bill Brock's book in the last issue of the Newsletter remarking that it was the first book on the history of chemistry that actually made me laugh out loud. This is the story. Chapter 5 deals with the American philanthropist Thomas George Hodgkins who was anxious to leave some of his fortune to further the cause of science. He favoured supporting activities both at the Smithsonian Institution in the USA and at a similar institution in Great Britain, with the former overseeing that the British made use of the money in a way that Hodgkins would have approved. The focus of Hodgkins UK generosity became the Royal Institution. It proved difficult, if not vexing to meet its benefactor's conditions, but the RI decided it was able to accept the money and eventually (if not a little dubiously) decided that it could go to support James Dewar's research into liquefied gases and the attainment of temperatures close of absolute zero. I'll let Bill take up the story:

"*One delicious irony remains to be noted. It may well be that Hodgkins had never intended that part of his fortune should go to the Royal Institution. One valid reading of Hodgkins's, his doctor's and his lawyer's surviving correspondence is that he had intended that his money should go to the Royal Society, but due to his lawyer's unfamiliarity with British scientific institutions and plagued by the resonance of the Smithsonian Institution's title, he telegraphed the Royal Institution by mistake…"* And it was at this point I put down the book and burst out laughing.

Publication Details: William H. Brock, *The Case of the Poisonous Socks: tales from chemistry*, (Cambridge: RSC Publishing, 2011); £19.99. ISBN: 978-1-84973-324-3, pp 348.

Alan Dronsfield

## Copperas Manufacture in Essex

In a recent RSC Historical group Newsletter, Dr Chris Cooksey gave an account of the production of copperas (ferrous sulphate) at Tankerton. It was stated that the first industrial-scale chemical production in England was at the Whitstable works. However, there is evidence that Copperas was being made at Brightlingsea as early as 1542 when John Beriffe, in his will, left his "copperys" to his wife. In 1564 and again in 1567, letters patent were granted "to dig, search and work" alum and copperas. Dr Dickin, in his history of Brightlingsea, described the process. Copperas stone ($FeS_2$) was gathered on the shore or dredged up from boats near the coast and then processed in the same way as Dr Cooksey described as was practised in Kent. Copperas Road, Brightlingsea is near the site of the copperas house. Copperas was also produced at other sites in Essex. The most important was at Walton-on-the-Naze. The Walton copperas house was mentioned by Defoe in 1724.

Copperas Bay is situated on the South Bank of the river Stour about four miles East of Harwich and the Copperas House is marked on the first edition one inch OS map. (Grid reference on modern maps is TM204319). The manufacture ceased about 1840 but copperas stone was still collected and sent to Packard's chemical works in Ipswich until 1880.

**Further Reading**

A.K. Wakeling, *Essex Countryside*, June 1976, 47.

John S. Davidson, *Essex Journal*, Summer 1980, 15(2) , 40.

Mary Jones, *The History of Chemistry in Essex and East London*, 22, (published by the Essex Section Trust of the RSC, circa 1990).

John S. Davidson

## 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.

Robert G.W. Anderson and Jean Jones, *The Correspondence of Joseph Black*, (London: Ashgate, 2012).

Joseph Black (1728-1799) was one of the central figures of the Scottish Enlightenment. This publication includes more than eight hundred items of Black's extensive correspondence, most of them published for the first time. It reveals relationships with businessmen, entrepreneurs and former pupils, as well as with prominent scientific and cultural figures of the day, including Antoine-Laurent Lavoisier, James Watt, Benjamin Rush, Josiah Wedgwood and Robert Adam. With an important introduction, extensive annotation and a comprehensive index, these volumes form an indispensable resource for all those interested in medicine, teaching, the growth of scientific ideas, the social fabric, and the rise of industry in the eighteenth century, and in the Enlightenment itself.

A review of this publication will appear in a subsequent newsletter.

Dr Stephen Cohen writes: I work on chemical literature in the Yiddish language: most of whose writing exists from ca. 1900 to 1940. The latest issue of *Afn Shvel* (which means "On the Threshold", the academic journal in Yiddish), No. 354-355, Winter-Spring 2012, includes my article, "Dos Khemishe Loshn: Di Tsveyshprakhike Problem af Yidish" (Chemical Language: The Bilingual Problem in Yiddish) at http://docs.leagueforyiddish.org/afn-shvel-354-355-koyen-artikl.pdf.

The thesis of the article is that chemistry is one of the very subjects which itself is multilingual, even in English (viz., rock salt/table salt/sodium chloride), and this presents a special problem for Yiddish speakers (and presumably for speakers of any minority language in the European Union), in whose native tongue no chemical research appears to have ever been performed. Yet lexicographers and educators in the early twentieth century worked very hard on creating a consistent chemical vocabulary in Yiddish, to be used in secular Jewish schools, primarily in Eastern Europe between the World Wars.

Derry W. Jones, "Physics Letters: The Stokes Thomson Effect", (essay review of D.B. Wilson's collection, vols 1 and 2, of *The Correspondence between Sir George Gabriel Stokes and Sir William Thomson, Baron Kelvin of Largs), Contemp. Phys.*, 2012, **53**, 247-250.

Derry W. Jones, "The Royal Society and Science in the Twentieth Century", (essay review of *Supplement to Roy Soc Notes and Records*, Peter Collins ed.), *Cryst. Rev.*, 2011, **17**, 223-237.

### Recent publications by Historical Group Committee Members

Alan Dronsfield, Peter Ellis and David Zuck, "Nitrous oxide: the early medical use of the gas", *Education in Chemistry*, 2012 (March), **49**, 26-29. Nitrous oxide was discovered by Joseph Priestley and exhaustively researched by Humphry Davy. Most "popular" accounts of early anaesthesia present a humanitarian view, namely that the early workers advanced their work solely to relieve patient pain. However it is suggested here that *financial profit* was perhaps the main motive behind the introduction of nitrous oxide (and ether) anaesthesia.

John Nicholson and Rafaelle Nicholson, "Martha Whiteley: Pioneering woman chemist", *Journal of Chemical Education*, 2012, **89**, 598-601.

Peter Reed, "The Alkali Inspectorate, 1874-1906: Pressure for Wider and Tighter Pollution Regulation", *Ambix,* **59**, 131-151.

### Correspondence of Michael Faraday

The sixth and final volume (covering 1860-1867, undated and earlier letters) of Frank A.J.L. James' edition of the *Correspondence of Michael Faraday* has now been published. The dominant topic of the 1860s (covered in nearly 40% of the letters) is Faraday's involvement with the lighthouse service relating in particular to his advice to Trinity House and the Board of Trade on matters such as electric light and the controversial issue of fog signals. Also detailed is the complex process by which his various posts were transferred to John Tyndall. Similar issues existed with Faraday's gradual withdrawal from his duties at the Royal Institution, including the misguided attempt to make him President. And, of course, running through many of the letters are comments on his declining health and impending death.

Major correspondents include the Astronomer Royal G.B. Airy, the Secretary of Trinity House P.H. Berthon, the Birmingham glassmaker J.T. Chance, the Assistant Secretary of the Board of Trade T. H. Farrer, the German mathematician Julius Plücker, the Cambridge trained mathematical natural philosophers James Clerk Maxwell and William Thomson, Faraday's colleagues at the Royal

Institution Henry Bence Jones, John Tyndall and Benjamin Vincent, the Swiss chemist Christian Schoenbein and the astronomer James South.

Further details can be found at:

http://www.theiet.org/resources/books/history/cmfv6.cfm

## NEWS AND UPDATES

### Society for the History of Alchemy and Chemistry

The Society for the History of Alchemy and Chemistry's journal *Ambix* celebrates its 75th birthday this year and various changes are taking place. From 2013 the journal will be published quarterly to showcase more of the high-quality work in the field which is being produced. Dr Jennifer Rampling, Wellcome Trust Research Fellow at the University of Cambridge and Fellow of Clare Hall has been appointed Editor of *Ambix* from January 2013. Dr Peter Morris, Keeper of Research Projects at the Science Museum will continue as Editor for 2012 and will serve as Deputy Editor for two years from January 2013.

### News from the Chemical Heritage Foundation (CHF)

"Between Material Substances and Abstract Ideas: Chemists' Objects of Inquiry, 18th-21st Centuries", will take place at the Chemical Heritage Foundation, Philadelphia, USA on 4-6 October 2012. Organized by Ursula Klein and Carsten Reinhardt, this conference aims to track down the history of scientific concepts and objects such as formulae, ordering of reactivities, models and groupings of substances and contribute to the understanding of their working models.

The CHF's podcast Distillations recently crossed the Atlantic to the UK with episode 148 "Across the Pond". This explores how to make the perfect cup of tea and describes Marmite as "a controversial condiment with unexpected health benefits". Other recent episodes of the podcast feature babies, the history of mass spectrometry and asbestos. The podcasts and details of all of the CHF's activities can be found at: www.chemheritage.org

### Commission on the History of Modern Chemistry

As a result of the transfer of CHMC's seat from Regensburg, Germany, to Villanova, Pennsylvania, USA, the Commission on the History of Modern Chemistry has a new website. Please change your bookmarks accordingly. For some time there will be an automatic forward from the old URL to the new one: www.chmcweb.org

### Science and Society Picture Library

Those in academic circles interested in using images from the Science and Society Picture Library for use in academic talks and lectures, please feel free to get in touch with Selina Pang, Collections Coordinator at the Science Museum, who can provide larger images without the watermark. Her email address is: Selina.Pang@sciencemuseum.org.uk

These images should be credited to "Science Museum, London". The images can be used in presentations as long as the Science Museum is aware of the use and they are not used commercially. http://www.scienceandsociety.co.uk/

### Forum for the History of Chemical Sciences

The History of Science Society has approved the formation of the Forum for the History of Chemical Sciences (FoCHS).The Forum for the History of the Chemical Sciences is a group of scholars and students whose aim is to promote research, education, and communication on the historical, social, and philosophical aspects of chemistry and related chemical sciences and technologies. FoHCS advances this goal by encouraging innovative research and teaching in the history of chemistry and the chemical sciences, improving the visibility of such research within the History of Science Society, fostering international communication and collaboration between individuals and institutions with an interest in chemical history, and identifying and creating new opportunities and resources for scholars who study the chemical sciences. There will be a FoHCS-sponsored session at the Three Societies Meeting in Philadelphia: "Transatlantic Reactions: Translating Chemistry between Continents". FoCHS will be sponsoring two sessions at the November History of Science Society meeting in San Diego and organising a symposium with SHAC and the Chemical Heritage Foundation at the 24th International Congress of History of Science, Technology and Medicine at Manchester in July 2013.

## Short Notices

### What happens to our experimental data?

Derek Palgrave writes: When I first began working in a chemical research laboratory it was soon made clear to me that the results of my research were of no use unless they were passed on. The implication was obvious: not only should we record all the details, but also we should be able to interpret their significance so the findings can be better appreciated. Consequently I was introduced to the concept of the *technical report* as an extremely valuable document.

A great deal of time, effort and resources had to be consumed to generate experimental data so it was important that it was made available to other specialists within the organisation. The data generated often had commercial implications in which case the *technical report* could form the basis of a draft patent specification. On the other hand, the findings were sometimes of sufficient general interest to be worthy of publication in the scientific literature. In such an instance the structure of the original report often needed to be modified in the light of a specific publisher's requirements.

Not all *technical reports* led to instant patent applications or inspired scientific papers although they often pointed the way to future research. Sometimes, subsequent developments in a given field required a reappraisal of earlier data in so it was essential that the appropriate *technical reports* remained accessible. For this reason, a suitable arrangement to establish an archive for them, needed to be implemented. Furthermore as, in this day and age, organisations are liable to change hands, this provision seems even more important. I have always believed that it is essential for technical organisations to establish and maintain a technical archive with a view to ultimate deposit in a convenient Record Repository referenced in the National Register of Archives.

An article by Derek A. Palgrave based on technical reports from J.W. Chafer Ltd will appear in the winter 2013 newsletter.

## Useful Websites and Addresses

**American Chemical Society Division of the History of Chemistry**

http://www.scs.uiuc.edu/~mainzv/HIST/index.php

Access to the Bulletin for the History of Chemistry at:
http://www.scs.illinois.edu/~mainzv/HIST/bulletin_open_access/bull-index.php

**The British Society for the History of Science**

http://www.bshs.org.uk

**Chemical Heritage Foundation**

http://www.chemheritage.org/

**CHEM-HIST: History of Chemistry Electronic Discussion Group**

http://www.uni-regensburg.de/Fakultaeten/phil_Fak_I/Philosophie/Wissenschaftsgeschichte/CH.htm

**Chemist of the Month**

Monthly during the academic year, a vignette of a prominent chemist is announced in the Chemist of the Month Newsletter that is sent to students, alumni and faculty of the Catholic University of America, Washington DC and to staff at other institutions. To read about the Chemist of the Month, go to the History Corner:

http://faculty.cua.edu/may/history.htm

**The Commission on the History of Modern Chemistry** (CHMC)

www.chmcweb.org

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## SHORT ESSAYS

### What analytical chemistry owes to *Silent Spring*

This September marks the fiftieth anniversary of the publication by Houghton Mifflin in New York of Rachel Carson's *Silent Spring*. Carson, having made her name as an independent writer and biologist after several years with the US Fish and Wildlife Service, was particularly well equipped to tell the story of how each spring in cereal-growing regions seed eating birds seeking out food at the start of a new breeding season were poisoned. The culprits were the organic chlorine-containing insecticides introduced on a large scale after 1945, in particular DDT. This powerful, persistent, synthetic product, previously credited with the conquest of typhus and malaria and increasing food production, was now, in the compelling narrative of Rachel Carson, translated into a pervasive enemy pitted against nature. The literary form that Carson deployed, and the manner of its distribution, ensured that *Silent Spring* would prove to be the one text that influenced more than any other the dramatic growth of the modern environmental movement. Questions on threats to human health from synthetic chemicals came to the forefront. Public concern in the United States led in 1963, at the behest of President Kennedy, to the formation of a special pesticide study panel of the Science Advisory Committee.

Though Rachel Carson argued against indiscriminate use of the modern pesticides, she did not prescribe their elimination (she favoured biological controls), something that seems to have been lost on chemical industry lobbyists, and even many scientists, who quickly dismissed her popular study. In fact it was the very popularity of *Silent Spring*, which appeared following serialization in *The New Yorker* during June 1962, that revealed much of what had already been fully documented and published for more specialist audiences during the previous decade. What Carson did not discuss, however, in fact she completely missed it, was the emerging role of instrumentation in chemical analysis during the years she was completing her manuscript. This instrumental analysis would become intrinsic to the understanding of our knowledge about the environment, particularly trace amounts of persistent organochlorine pesticides and solvents. Moreover, subsequent advances in analytical instrumentation would drive, and be driven by, state and federal legislative acts in the United States that arose from the political and social impacts of *Silent Spring*.

The unfortunate omission from the pages of *Silent Spring* probably arose from the fact that Carson was a biologist, with limited knowledge of, and little or no contact with, academic and industrial chemists engaged in trace analysis. This was one of the most far reaching episodes in the instrumental revolution, and certainly critical to the study of organochlorines spread over the land that contaminated surface and ground waters. *Silent Spring* triggered the engagement of the new instrumental technology with the difficult challenges posed by society's fears.

Here the leading roles played in organochlorine analysis by mass spectrometry (MS) and gas chromatography (GC), much of it prior to 1962, is delineated through work at three institutions: Dow Chemical Company at its Midland, Michigan, laboratory, with an emphasis on MS; the British National Institute of Medical Research (NIMR) at Mill Hill, north of London, that pioneered both

GC and supersensitive detectors; and Shell, in Britain, Holland and the United States, that undertook several improvements in GC and its application to environmental analysis.

**Mass spectrometry**

Mass spectrometry (MS) is based on recording the patterns created by fragmentation of compounds into ions. The record is called a mass spectrum. Dow Chemical Company was an early user of the technique which had been important during wartime research into and production of hydrocarbons. Dow's strategy for developments in mass spectrometry by organic chemist Fred W. McLafferty was based on the corporation's engagement with infrared analysis prior to 1950.

It was in 1950 that McLafferty and his colleague R.S. Gholke joined the Dow Spectroscopy Laboratory at Midland, where they were encouraged to work on MS. Though the MS work had initially focused on hydrocarbons, McLafferty was soon investigating chlorinated hydrocarbons, an important sector in the company's range of products. He realized that the presence of chlorine, in its two isotopic forms, created unique ionization patterns. It was the characteristic isotopic abundance of the halogens that made identification definitive. As with infrared spectra, MS spectra provide 'fingerprint' identification based on the characteristic peaks.

McLafferty created a data bank of mass spectra, and continued to work on mass spectrometry when he moved to the Dow Eastern Laboratory in 1956. He collaborated with colleagues elsewhere in the gathering and sharing of mass spectra. The outcome was a series of comprehensive atlases that were invaluable to analytical chemists.

**Gas chromatography**

It was also in the early 1950s that the next major development took place, this time in Britain. In 1951 Archer John Porter Martin and Anthony (Tony) James at the Mill Hill branch of the NIMR, introduced vapour-phase partition chromatography for separating mixtures of organic chemicals. Better known as gas-liquid chromatography (GLC), or gas chromatography (GC), it was, as a separation and analytical technique, the twentieth century's most important innovation in analytical chemistry. The separation of components of volatilized mixtures in a moving inert carrier gas was achieved in narrow columns packed with a stationary liquid phase coated on a refractory stationary support. The gases leaving the column were monitored by a detector. The separations were reproducible; the retention time of components under suitable operating conditions enabled tentative identification based on reference to standards. Once chart recorders were introduced, the chromatograms enabled quantitative analysis, as percentage composition, based on peak areas.

Industrial chemists, who had been called upon in 1951 to supply samples, immediately realized the power of the novel procedure. Soon there were useful exchanges between Mill Hill and researchers at Shell, which, like Dow, was a manufacturer of chlorocarbons. Shell would now play a prominent role in the development of what would become the most successful and widely used instrumental technique for trace analysis.

This happened after Martin and James were visited by A.I.M. Keulemans, of Shell Amsterdam, who upon his return to Holland set to work on a GC detector in collaboration with Hendrick (Hank) Boer. The Mill Hill work on GC also stimulated research during 1952 – in which year Martin was awarded the Nobel Prize in chemistry for his work on chromatograph – at the Shell Thornton Research Centre, near Chester, particularly by Edward R. Adlard. The novel GC technology was transferred from Shell in Europe to the corporation's research units in the United States. Shell, at its Emeryville and Houston facilities, was interested in detecting residues of chlorinated hydrocarbon pesticides in crops. By late 1954 a GC instrument, fitted with a thermal conductivity detector, was constructed in the Houston plant laboratory. Later, greater selectivity was achieved with the flame-ionization detector. These detectors, however, lacked the sensitivity required for trace analysis in environmental matrices.

**Supersensitive GC detectors**

Scientists as Shell were among the first to seek out GC detectors that afforded the greatly enhanced sensitivity and selectivity required for analysis of chlorinated hydrocarbons at trace levels. A beta-ray ionization chamber based on strontium 90 used for gas analysis was incorporated by Boer in his own novel and highly sensitive GC detector. Boer described his detector at the first International Symposium on Vapour Phase Chromatography, held in London during 1956 and organized by the Institute of Petroleum. The event was attended mainly by participants from Britain and Holland, and it was there that the term gas-liquid chromatography was introduced. Around this time Boer, perhaps as a result of his being at the symposium, visited Mill Hill, where he met with the medical researcher and inventor James E. Lovelock, a colleague of Martin and James, to exchange and glean information on sensitive detectors. Lovelock was also working on novel sensitive detectors, leading in 1956 to his argon-ionizing detector in which eluting organic molecules were ionized by collision with metastable argon ions.

The Second Symposium on Gas Chromatography, was held during May 1958, appropriately, in view of the Dutch contributions, in Amsterdam. The international event attracted several hundred participants, including Adlard from Shell Thornton, who gave one of the presentations, as did Boer, who compared detection methods. Other presentations included descriptions of novel sensitive detectors, including Lovelock's.

Lovelock's argon-ionizing detector was followed by another of his innovations, the most sensitive GC detector ever developed for pesticide analysis, the electron capture detector (ECD), dating from 1958-60. It relied on the fact that chlorinated compounds have particularly strong affinities for electrons, and readily form negative ions, an ideal property for use with the ECD.

GC analysis of trace contaminants with the new supersensitive detectors began around 1960, initially by Shell at its Sittingbourne, Kent, Research Centre, that reported as little as 0.035 ppm of organochlorine pesticide residue in crops using the argon detector of Shandon Instruments, even without clean up. The great potential of the ECD in trace analysis was also noted.

In 1963, Lovelock, after assisting NASA with work on sensitive analytical instruments – during which time he began to formulate his Gaia Hypothesis – became a consultant to Shell, and collaborated with Adlard on sensitive GC detectors. In 1971, Lovelock and R.J. Maggs (both then associated with the University of Reading) declared in *Analytical Chemistry* that "THE EXQUISITE SENSITIVITY of the electron capture detector made possible the discovery of the ubiquitous distribution of halogenated pesticides in the natural environment"[1]. Within less than a decade GC sensitivity had gone from 0.1 ppm to the low parts per trillion range. No less important was Lovelock's use of the ECD to demonstrate the widespread persistence of CFCs in the earth's atmosphere.

In the United States pesticide residue analysis had directed research into highly sensitive GC detectors. By 1960, Dale Coulson (previously at Shell Emeryville), at the Stanford Research Institute, Menlo Park, California, invented a detector in which the organic halogen was converted by microcombustion to inorganic halide, and the chloride ions were detected with microcoulometry. As with Lovelock's device, it was ideal for chlorocarbon pesticide residue analysis. Not only was it halogen-specific, but it was also well suited to sulfur and nitrogen compounds.

The new supersensitive Coulson and Lovelock detectors were adopted by the US Water Supply Program of the Public Health Service (PHS). In 1963, the Atlanta branch of the PHS used Coulson's GC detector to analyse organochlorine pesticides at an estimated sensitivity of 25 ng/liter of pesticides in water, that is, 25 parts per trillion. This work was continued from around 1964 at Athens, Georgia, in one of seven new field laboratories created as part of the US government's water pollution and control program.

**Ideal partners: GC and MS**

Coulson's microcoulometric detector was developed further into the electrolytic conductivity detector (1965), also known as the Coulson conductometric detector. Coulson's detector was subsequently improved by Randall Hall of Purdue University who invented the microelectrolytic conductivity detector (1974). Hall claimed for his device fifty times the sensitivity of the Coulson detector. The market created for instruments suitable for trace pesticide analysis led firms such as Shandon, Tracor, Bendix, Perkin Elmer, Hewlett-Packard, Varian Aerograph and Finnigan to become manufacturers.

Despite the impact of GC in analysis of organic compounds, MS remained essential for compound identification, including after separation of multi-component mixtures by GC. Direct coupling (hyphenation) of a mass spectrometer to a gas chromatograph enabled separation, quantitation, and identification of components. This was pioneered at Dow by McLafferty and Gohlke, who later recalled that around December 1955 they coupled a gas chromatograph with a time-of-flight mass spectrometer at the Bendix company's laboratory. By combining MS with GC, as Gholke described, Dow developed the most powerful method, then and now, for rapid separation and identification of chlorinated hydrocarbons in trace amounts. The advantage of combining GC with MS, directly or through an interface, was that the latter acted as a sensitive and specific detector insofar as eluting components were identified by comparison with a library of full scan mass spectra, available as a result of McLafferty's initiative.

The introduction around 1960 of capillary GC columns (rather than packed columns), based on Marcel J.E. Golay's work (1956-58), improved resolution, and became preferred in trace organic analysis. The technique became so fast that Rapid-scanning MS, continuously recording the mass spectrum of each component eluting from the chromatograph, was developed by 1963. Clean-up procedures for samples were also developed. By the early 1970s, selective-ion monitoring (SIM), of one or a few known selected ions, transformed the mass spectrometer into a sensitive and selective detector for GC in pesticide analysis.

Despite these remarkable advances, including and especially before 1962, the story behind the developments in instrumentation for environmental analysis was far less visible than Rachel Carson's story of poisoned birdlife. The analytical tools were available, it is just that Rachel Carson missed them, as was soon noted in industry. After *Silent Spring* was published in Britain during 1963, Shell's head science coordinator, Lord Victor Rothschild, told his new consultant, James Lovelock, that he was "furious with [Carson] for what he thought was overstating the case, but it was significant that Shell chemists were among the very first to start measuring pesticides in all sorts of things, even before Rachel Carson's book appeared" [2].

### A silver lining

The formation of the 1963 special pesticide study panel of the US Science Advisory Committee, a direct response to the publication of *Silent Spring*, foreshadowed the implementation of other policies and acts oriented towards improving and protecting the environment. They created an urgent need for rapid, reliable monitoring of trace chemicals in air, soil and water. This not only made available research funding, but encouraged academic and industrial chemists to improve on their already proven instruments, and provided manufactures with a market-driven incentive for investing in the emerging market created by state and federal environmental regulations. Techniques for cost-effective rapid separation and quantitation of complex mixtures by GC and for identification by MS, and related methods, became available to chemists working not only within environmental studies, but also, and this is no less important, in other research areas. Without the incentive provided by the responses to and challenges of *Silent Spring* – the sharp focus created by public concern and legislation, and dollars steered toward infrastructure, research and development for analysis of pesticides and other contaminants – it would have been a far more daunting prospect. That was a silver lining to the wider chemical endeavour.

### Notes


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## Organic dyes: Germany's greatest industrial achievement?

One of the first industrial areas, involving chemical patents, was organic dyes, believed to be at least since the latter part of the nineteenth century [1]. Serious research in this area began with the German Patent Law of 1877 [3]. This prevented companies from simply copying new chemical processes and allowed German companies to rapidly overtake Britain as the leading producer of organic dyestuffs [2]. It provided a common patent regime for all German states and stimulated German companies to invent around patents [2]. It also had a strong impact on the chemical sector by supporting the industrialisation of inventions and establishing commercial interactions with academia [4].

Kekulé's discovery of the ring structure of benzene in 1865 opened up the science-based era of the chemical industry [1]. Those producers skilled in organic chemistry were able to imitate new dyes and could be guided by chemical theory [1]. The first large German chemical companies were established in the years after 1860. They invested heavily in their research and development capabilities, often copying French and British manufacturers, [1] but stimulated by the passing of the German Patent Law in 1877 [5]. Once Germany had taken the lead, German companies then used patents systematically to exclude competitors and preserve their market position [6].

Thus, small-scale laboratory experiments were transformed into large industrial-scale processes. This then spurred the integration of the engineering sciences into the chemical sector [7]. Then, the support of chemical, electrical and mechanical engineering transformed the technology of the processes [8].

German companies used a combination of know-how, patenting and secrecy to avoid full disclosure [2]. For example, the precise composition of a dyestuff was kept secret, but the individual compounds were protected by patents [2]. Another example included patenting entire groups of compounds with only a fraction having properties similar to the dye of interest [2]. A competitor would have to undertake a substantial amount of work in order to discover the dyestuff taken to market. German firms also issued misleading 'evasion' patents, which made it very difficult to link the patents with the market products [2]. These sold for 40-50 % more than standard colours, where the composition was known [2].

The largest German dyestuff producers were established between 1863 and 1872 [1]. By 1877, half the world production of dyestuffs had a German origin [9]. Their success lay in the ability to study and modify structures [1]. This led to a substantial innovative performance in the last quarter of the nineteenth century. One estimate put German imports into the United States at 90% of the dyestuff consumption before the War, with Germany owning a corresponding percentage of American dyestuff patents [10]. The Swiss supplied the rest. It has been described as, "Imperial Germany's greatest industrial achievement" [11].

At the beginning of World War I, nearly all of the larger chemical companies in Germany produced inorganic chemicals, which were used in agricultural chemicals [1]. The Haber-Bosch process (a high pressure process) influenced the production of fertilisers and explosives. The latter has blighted Haber's name ever since [12]. The Haber-Bosch process has been credited with keeping Germany supplied with munitions during World War I [12].

However, during World War I, the British blockade prevented German dyestuffs from reaching the US [2]. This encouraged Du Pont, an extremely important link in the history of dyes, to enter the dyestuffs business [2]. In 1919, Du Pont managed to gain access to all German patents, from the Chemical Foundation in the US. The Foundation offered non-exclusive licenses on German patents, due to World War I [2]. The Chemical Foundation was, at that time, a newly-established entity, which was incorporated with the objective of licensing and managing intellectual property assets for the benefit of the chemical industry in the United States [11]. In 1918, the United States confiscated virtually all German-owned intellectual property assets within its jurisdiction [11].

There remains some controversy surrounding the role of the Chemical Foundation. The office of Alien Property Custodian was created under the US's Trading with the Enemy Act of October 6, 1917. Industrial and political confrontations then followed [11]. German chemical company agents worked with American bankers and government officials to get the patents back. However, the banks and their allies could not overcome protectionist opposition [11]. The Attorney General at the time was indicted for taking a bribe to help the return of the German assets [11]. J. Edgar Hoover was appointed to purge the FBI of suspected German Agents and the Government lost the suit it brought to force the Chemical Foundation to return the patents [11].

The actual procedure used by the Chemical Foundation involved identifying German property, sequestering it, valuing it and then holding it in a separate trust [11]. As of 5 December 1918, over 32,000 separate reports of enemy property had been received and 29,000 trusts were administered, which amounted to a value of over $500 million [11]. There was actually no provision in the Trading with the Enemy Act which authorised this action [11]. However, the Act authorised the Federal Trade Commission to grant licences at a flat rate of 5%. The royalties were held on trust for the owner until after the war [11].

High pressure methods very much supported the development of the sector in Germany [1]. The Haber-Bosch process, for the production of ammonia, was protected by over 200 patents [2]. Details of the catalyst, which was crucial to the successful process, were kept secret [13]. In 1910, Bergius developed coal hydrogenation, which allowed the synthetic production of gasoline out of coal. The Fischer-Tropsch process was developed between 1913-1925. This enabled the production of gasoline, from coal, using low-pressure mechanisms [1]. Between 1927 and 1944, large quantities of synthetic gasoline were produced in Germany (14). This, along with inorganic chemicals, made between 35-50% of the patent volume in chemicals in the 1910s and 1920s [1].

The development of plastics then followed. In 1920, Hermann Staudinger started theoretical research activities on the molecular structure of polymers. Important discoveries included the syntheses of styrene (1929) and caprolactam, the latter being used in the production of perlon [1]. Large companies, such as Hoechst, owned 530 patents in the plastics sector, accounting for 13% of the total patents in plastics in Germany [1]. German and American companies shared the lead in the plastics' patent field, until World War II [8].

By the twentieth century, this had spread to other sectors, such as the production of nylon, polyester fibres, plastics, pharmaceuticals and artificial sweeteners [1]. The production of dyes required large amounts of sulphuric acid and this prompted the production processes for this and other required materials, such as soda [1].

Patenting in the chemical industries has its origins based in Germany, around organic dyestuffs. Germany dominated such areas, due to a strong German patent law and skilful patenting, which prevented the entry of competitors into the organic dyestuffs markets. However, the end of World War I allowed large companies in the US to obtain a foothold into such markets. The skilful use of patents, established by Germany, has now spread into many areas of the chemical industry.

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## Historical Reminiscences

## John Wilson (1890-1976): Chemist, Research Association Director and Talent Spotter

As a chemist and a visionary research director, John Wilson, CBE, MC, MSc, FRIC, made substantial scientific contributions in three materials industries: glass, rubber, and textile fibres. What may have been of even wider influence, however, was his ability to identify, attract and encourage promising young scientists, especially chemists, who subsequently achieved eminence in a variety of fields elsewhere. Wilson's inexhaustible energy, scientific conviction and persuasive powers ("You see" was a frequently used phrase) enabled him to canvass influential people in an industry for finance, advocate the direction of research, and have trained or recruit discerning scientists and technologists. These enabled his organizations both to make significant scientific advances and to devise processes and instruments of value to the industry. As Wilson at his peak drove his Jowett Javelin or Morris Oxford while facing the back seat, passengers soon learned to put the current target of his argument in the co-pilot's seat. He may have been fortunate to be directing Research Associations (RA) in the mid-twentieth century when government support of co-operative fundamental research across an industry was in vogue. Indeed, George Jeffrey, one of his staff and later a consultant, took the view that some of the most difficult problems in basic research were being investigated in co-operative RAs rather than Universities. The RSC has drawn attention to the sequence of descent from successive chemical supervisor grandparents and other forebears in its project, Chemistry Connections. JW, as he was always known outside the family, could perhaps be said to have been a chemical uncle or godparent to many emerging scientists.

John Wilson was born in Edinburgh to Isabella and Richard Wilson (who had been a regular army officer and later became a policeman in Pocklington, Yorkshire) on 6 September 1890 and he had an elder brother, James. John was at school in Shipley and Bingley and so spoke (some would say shouted) with a Yorkshire accent. He retained a link with Bingley Grammar School into his eighties, attending the annual dinner or more often, in the 1970s, having to cry off because of work on bamboo in Ireland. From 1908, he was teaching in schools and eventually became a science lecturer at Borough Polytechnic, London. In World War I, John Wilson served with great distinction, 1914-19, in the Yorkshire & Lancashire Regiment, being Mentioned in Dispatches and twice awarded the Military Cross for bravery as an Infantry Captain; he was involved afterwards in Ireland. He was gassed twice and wounded three times, once so severely that he wore a surgical boot for the rest of his life, though this never prevented him doing what he called stomping up the hillsides of North Yorkshire. During the War, JW married Edith Leech (died 1963). Their six children all acquired an ability to make their views, and especially disagreements with HP (for honourable parent, as he was known within the family), unambiguous. Of the two boys, John (known as Jack) went out as an engineer to Australia, and Bernard (known as Nick), aiming to be a farmer, spent his later career in the countryside, while one artist daughter, Isabel (known as Ish), married a physicist and went with him to Australia. During World War II, the family lived on a farm, Sion House, near Bishop's Stortford, Essex, and absorbed as an evacuee relative JW's niece Dorothy (later to be my wife).

After gaining a First Class Honours Degree in Chemistry at Sheffield University, and an MSc for research on hydrazine derivatives, Wilson went to Oxo. From 1927 to 1937, he was works chemist at the Triplex Safety Glass Company. Although Edouard Benedictus had invented safety glass in 1903, car manufacturers were reluctant to regard it as needed for other than luxury vehicles. In Wilson's time, Triplex developed a mass production process for safety glass and he was also involved in the development of 'Perspex 'and 'Quickfit' and 'Quartz products'. The concept of co-operative research for an industry, jointly supported by a levy across the industry and, at least initially, by the government, arose at the end of World War II. Thus Research Associations were set up for many industries, including incidentally one for glass. In the early 1930s almost all rubber products were made of natural rubber although synthetic rubber was being developed. For the natural rubber industry, an inter-governmental agreement was made in 1934 for setting up partner research and development institutes in Paris, Amsterdam and the UK. In 1937, Wilson was invited to initiate the British Rubber Producers' Research Association (later to undergo several name changes), which was founded in 1938. Within the next decade under Wilson's Directorship, the British Rubber Producers' Research Association (BRPRA) at Tewin Road, Welwyn, was to become a world-renowned institute for fundamental research on rubber and polymers. By 1947, the RA had produced over 100 papers, many in the Chemical Society or Royal Society journals.

From Birmingham University, Chemistry Nobel Prize-winner Sir Norman Haworth was invited on to the board. The X-ray crystallographer E. Gordon Cox, who was tackling organic structures by three-dimensional methods at Birmingham, also became a consultant. Among the earliest publications of the staff were those from experienced researchers Geoffrey Gee on polymer solutions, L.R.G Treloar (from GEC) for physics, including crystallography, organic chemist E.H. Farmer as Deputy Director, with J.L. Bolland on kinetics. JW not only recruited some more junior staff, but also established BRPRA research scholarships with mentors whom he respected to produce bright younger members of "teams", a favourite word. The last BRPRA scholar that JW appointed (in crystallography with E.G. Cox, who was now at Leeds) was S.C. Nyburg, whose later career was as a full professor at Toronto University. Gee, attracted from Eric Rideal at Cambridge at age 28 by JW, saw the immediate rubber problems as those of molecular size and behaviour in solutions and swelling agents. JW's fundamental aims were wider, encompassing oxidation, vulcanization, thermodynamics, kinetics, molecular structure and spectroscopy. In 1948, Gee became Director of BRPRA and, following FRS election in 1951, began a long stay at Manchester as Professor of Physical Chemistry in 1953. Treloar continued his association with JW when another Research Association was set up in Manchester for rayon.

During World War II, two objectives of BRPRA were to work towards the best use of the important strategic material natural rubber and to keep track of German synthetic rubber developments as presented in shot-down *Luftwaffe* aircraft. The Technical Section worked for the Ministry of Supply on, for example, latex flame-thrower fuel and also produced a mass of secret rubber devices including components for submarine detector equipment. George Jeffrey, with a PhD under Cox at Birmingham, was directed to BRPRA in 1939 but continued the laborious determination of rubber-related crystal structures at Birmingham until 1941, when he went to Welwyn. In 1945, he followed E.G. Cox to the Chemistry Department at Leeds University, from where, after a 1951-52 Fulbright year in the USA, he went back to a chair in Pittsburgh and set up the first University Department of Crystallography in the US. Before L.R.G. Treloar returned from secondment to the Telecommunications Research Establishment (TRE) in late 1944, he had suggested that JW recruit Ronald S. Rivlin. First tackling the adhesion of Scotch tape, Rivlin was encouraged by JW to work on vulcanization at BRPRA over the next decade. In his later career in the States, he was awarded several medals and was inducted into the International Rubber Hall of Fame. His name was also recognized in the Mooney-Rivlin theory of solids and the Rivlin-Erickson expansion. Leslie Bateman also joined during the War to work on oxidation and sulphuration reactions, becoming Director for 1954-62. By then, the Institute was the Natural Rubber Products RA, later called the Malaysian RPRA and eventually it became the Tun Abdul Razak Research Institute at Brickendonbury, funded by the Malaysian government.

Andrew Donald Booth, who had been a BRPRA scholar at Birmingham, joined the RA staff in 1945 and concentrated on devising both means for reducing the tedium of X-ray analysis calculations, mainly by analogue calculators, and Fourier techniques to improve determination of atomic positions. From 1945, in work as a Fellow under J.D. Bernal at Birkbeck, but actually undertaken at BRPRA, Booth turned to digital computation using telephone relays, unaware of American work and *a fortiori* of Colossus at Bletchley Park. A Rockefeller year in the States, partly with John von Neumann, convinced him of the importance of magnetic processes and led to designing the pioneering All-Purpose Electronic Research Computer (APERC) and producing the world's first full-scale magnetic storage drum (now at the Science Museum) in 1947. One of his BRPRA mathematical assistants was Kathleen Britten, later Professor Mrs Booth at Lakefield University, Ontario. Booth's 1948 book *Fourier Techniques in Organic Structure Analysis* is datelined Princeton, 1947, and acknowledges JW and Cox for inspiration. JW had visited the US as early as 1946 in the Queen Mary, still fitted out as a troopship. In the early 1950s, Booth supervised computer construction both at Birkbeck and at JW's British Rayon Research Assocation (BRRA), but he later emigrated to Canada where he ultimately became President and Vice-Chancellor of Lakefield University.

During World War II, Wilson resumed his association with glass, initially helped by his son Jack. JW was a Director of Tyneside Safety Glass, Gateshead, making periscopes for tanks, and also of Colmore Adhesives, who made gas-mask components. The experienced scientist Ronald N. Haward became research manager at Tyneside. He was later a Visiting Reader at UMIST and then a professor at Birmingham University and, in retirement, continued to publish in refereed journals into his nineties.

In 1946, the British Rayon Federation formed, with joint DSIR funding, the British Rayon Research Association (BRRA) to investigate the chemistry and physics of rayon (regenerated cellulose) and rayon fabrics. In 1947, JW took on the tasks of confirming the financing, setting up the organization, recruiting the staff and then directing the research for a completely new large RA for rayon; man-made fibres were added later. The industry was composed of a few large organizations, most of which had considerable research laboratories, including, Courtaulds (with C.H. Bamford's Maidenhead laboratory), British Celanese, British Bemberg, and British Nylon Spinners. Envisaging both technological and fundamental scientific arms, JW set up temporary laboratories in the single-storey shadow factory buildings of Platts (Barton) on the edge of Trafford Park Estate, Manchester. There was an emphasis on structural techniques, X-ray crystallography, the newer spectroscopies (Jack Mann and Harry Marrinan developed the infra-red deuteration technique), optics (under Roy C. Faust, who went to ICI), fluidized beds and computing; Booth oversaw an APERC computer at the BRRA in 1952 and George A. Erskine later went to run computing at East Anglia University. There were also novel approaches to phototendering including flash photolysis. The UV flash photolysis spectroscopist N. Keith Bridge later headed the Printing and Allied Trades Research Association (Patra), while Dan Morantz became head of a Materials Department at Woolwich and then the Printing College. As before, JW recruited some experienced scientists including Emeritus Professor J. Kenner, FRS (father of G.W. Kenner), H.G. Howell (later to direct a new research institute for the plasterboard industry), L.R.G. Treloar, Arthur S. Lodge and J.L. Bolland, together with Derek W. Saunders from BRPRA, and Jack Mann and Dorothy Brooker (nee Fisher) from the RA of British Rubber Manufacturers. Much later, Treloar went to a Chair of Polymer Science at UMIST while Saunders headed Materials at Cranfield where he became Pro-Vice-Chancellor. On the technical side, JW also recruited non-UK scientists whose PhDs had been at Dublin, Warsaw or Vienna. The economics of new automatic looms was a topical matter, especially for man-made fibres. In the mid-1950s, BRRA cellulose chemist Geoffrey N. Richards went to a chair at Townesville while organic chemist Michael V. Lock and mathematician Arthur D. Lodge went to the States, the latter to help found the Rheology Research Centre in Wisconsin. The senior physical chemist Alan Sharples eventually left the BRRA to join the Arthur D. Little Research Institute, near Edinburgh.

At a time of shortage of scientists, JW set up an even more ambitious scheme of twenty scholarships over several years for young graduates to undertake PhD research within groups at various universities. There was a corresponding set of 16 technological scholarships tenable in the Textile Departments at Leeds and Manchester. Thus Michael P. Barnett worked with Charles Coulson, in London and Oxford, B.B. Goalby was at Oxford, and Harry Marrinan did his PhD with Norman Sheppard in Cambridge. Goalby became JW's assistant on personnel and eventually went to De La Rue. One of the most distinguished former scholars was Robin K. Bullough, who subsequently developed the theory of solitons from his UMIST chair. As they joined the BRRA staff, these talented young scientists, new to the district, contributed to a lively research atmosphere. The presence also of young, mostly female, laboratory assistants (who would nowadays be taking full-time degrees) made for an active Sports and Social Club that encompassed cricket, tennis, badminton, Scottish and ballroom dancing, as well as a film section. JW permitted the use of BRRA vehicles (I drove the Jowett Bradford van) for camping, hill-walking and pot-holing expeditions and occasionally allowed the use of his ‘cottage’ at Frostrow, near Sedbergh. An indication of JW’s continued enthusiasm for learning was his attendance, together with three of his molecular structure staff, at the two-week Summer School in Physical Chemistry at Cambridge in 1956.

In 1954, completely new laboratories for the BRRA were occupied, and formally opened by the Duke of Edinburgh in 1955, on a large site at Heald Green, not far from Manchester Airport (from where Vickers Viscounts regularly flew over). This had a large library, extensive workshops and drawing office, well-equipped technological sheds, and a canteen. The inclusion of a lecture theatre encouraged the holding of monthly seminars, attended by supported staff working elsewhere as well as by distinguished visitors such as Hermann Mark on polymer chemistry or E.G. Cox on NMR. With the staff nearing 300, ‘Flash’ George Porter, FRS, became Deputy Director before moving to a chair at Sheffield and receiving subsequent fame as a Chemistry Nobel Prize-winner. He was replaced by Leonard A. Wiseman, OBE, ARIC, who became Director when JW had to retire in 1957 at age sixty-seven, “in the prime of my life” as JW put it. When in 1961 the BRRA amalgamated with the British Cotton Industry Research Association (BCIRA) to form the Cotton, Silk and Man-made Fibres Research Association on the Didsbury site, with a total staff of 500, Wiseman became Deputy Director. In 1969, he became Director with the task of pruning staff and activities as the new institute had to become self-financing and more outward-looking and international. While the merger was not a takeover, the prospect of staff reduction and the need to concentrate on testing and more immediate technical research encouraged many BRRA fundamental staff to seek academic appointments. A further merger with the Wool Industries RA to form the British Textile Technology Group required more contraction and re-arrangement so that even the Didsbury site was lost.

In retirement, JW continued supporting work on the heat treatment of textiles by fluidized-bed techniques. He had a small terrace house in Sedbergh which ultimately became his only base. While still BRRA Director, he had for several years been trying to develop commercially the cultivation in Scotland and Ireland of bamboo as a source of cellulose pulp. These projects in Argyll and Co Mayo were pursued very actively by JW, partly by supporting research students at Loughborough, after his paid appointment ended in 1957.  In 1964-65, he made a very extensive tour to visit family in Australia, then pulp mills and research centres in India, and finally Japan with which he was much enamoured. A long letter written aboard the P&O liner *Chusan* in January 1965, tells of him pointing out to his Indian hosts the folly of replacing bamboo-growing areas by factories and ignoring the economics of the relatively simple extraction of wax. Extensive travelling meant that his occasional letters came with many different addresses. In a 1974 letter, datelined Cambridge, he reports having spent five periods of about a month each in the preceding year, ferrying people about bamboo-growing in Ireland (where he failed several driving tests) and seeing senior agricultural officials in Dublin. His utter commitment to research is implied in a 1974 letter in which he says that he is almost penniless, having spent his lump sum on bamboo. Around this time, the Printing Industries Research Association (Pira) produced a three-volume Bamboo Feasibility Study, including agricultural and mechanical harvesting aspects, while as late as 1984 a Land Use Policy enquiry was concerned that the Wilson bamboo work should not be wasted.

JW’s almost passionate enthusiasm for research and his zeal in seeing the needs of an industry in terms of chemistry and physics, coupled with a forceful ebullient personality, enabled him to argue the case externally for financial resources. His ability to assemble, without elaborate competition, and then argue fiercely with, talented researchers generated loyalty from his staff. As these scientists blossomed, ultimately over a much broader range than glass, rubber and cellulose, their exposure to JW would neither be underrated nor forgotten.

Derry W. Jones
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## Book Reviews

Colin A. Russell and John A. Hudson, *Early Railway Chemistry and its Legacy* (Cambridge: RSC Publishing, 2012) £29.99 (before RSC Members’ discount). ISBN 978-1-84973-326-7, Pp 193.

Arguably, the railway era started in 1825 with George Stephenson’s Stockton and Darlington passenger line, although steam traction had a history dating back to the end of the eighteenth century. The need to provide a regular, reliable service over what were, for the time, long distances threw up several technical problems, the most pressing of which was the establishment of adequate water supplies to provide the steam. Hard water was the problem, both temporary and permanent. The former precipitated calcium carbonate on boiling and the latter, calcium sulfate on evaporation.

These deposits coated the tubes within the boiler with scale which reduced the heat transference rate, thus causing a falling off of engine performance. Moreover, this impairment in transfer could also lead to an over-heating of the tubes themselves, sometimes resulting in catastrophic explosions. The nascent railway companies needed to identify supplies of soft water from those which were available, and (in their absence) to devise methods to minimise the effects of the hardness. For solutions to these problems they initially approached chemical consultants on a 'one-off' basis for advice. The railway chemist had come into being. For many years occasional consultative help was all that was needed. They would report on the carbon content of coal and coke, informing companies which supplies provided the best value; they would suggest the best means of preserving the timber used in sleepers and bridges from decay (originally '*Kyanizing*' with $HgCl_2$ solution, later using coal-tar or creosote).

As the problems that needed a 'chemical' answer increased, the larger companies perceived that, rather than seek solutions on a consultancy basis, they might achieve better value by employing their own in-house chemist, working in a dedicated company laboratory. The most significant impetus came from the need to provide quality control on the iron and steel used in the manufacture of locomotives and the rails upon which they ran, and in 1864 a Mr E. Swan was appointed on the modest wage (even for its time) of £2 per week as a full-time analytical chemist to the London & North West Railway, working in hut serving as his Crewe laboratory. The work expanded, as did his staff: paints, oils for lubrication, oils for lighting, greases, the labelling of hazardous materials and insurance claims for articles damaged in transit all required specialist, professional reports. Over the next half-century some thirteen further companies established in-house laboratories employing full-time analytical and research staff. These were, naturally, the larger of the many companies operating before the 1923 groupings which created the 'big four' conglomerates of the LNER, LMS, GWR and SR. The smaller pre-1923 companies managed without laboratories, but frequently had loose working arrangements with the larger outfits for the solution of chemical problems when they arose.

The authors of this fascinating book will be well-known to readers of this Newsletter. John Hudson is our present Treasurer and Colin Russell was one of those responsible for reinvigorating the Group in its early days. Both are eminent historians of chemistry, and both have the gift of imparting the fruits of their researches in a lively and accessible manner. Their enthusiasm for this topic pervades the book. This text is an important contribution to the history of our subject and to the best of my knowledge, nothing like this has been published before. Much research has gone into the extraction of chemical information from, in some cases, relatively obscure archival sources. We are presented with an abundance of references, usually 50-100 for each of the ten chapters.

Unlike some of its books on the history of chemistry, the RSC is marketing the *Early Railway Chemistry and its Legacy* an affordable price (especially taking into account the 35% members' discount) and it well deserves a place on our personal bookshelves. I will conclude with a quotation from the publisher's description: "*The book has an unusually wide appeal, being of interest to practising chemists, those interested in the history of chemistry and its role in society, historians of science and technology, mechanical engineers, and not least railway enthusiasts and railway historians. The chemist will be justly proud of the extreme importance of the subject for industry and the railway enthusiast will gain a wholly new picture of the development of the industry in Britain*".

Highly recommended!

Alan Dronsfield
University of Derby

Norman and Elaine Beale, *Echoes of Ingen Housz: the long lost story of the genius who rescued the Hapsburgs from smallpox and became the father of photosynthesis* (Salisbury: The Hobnob Press, 2011), 632pp, £25 (PB), ISBN 978 1 906978 14 3.

The question of interest to historians of chemistry posed by the Beales in this extensive biography comes in Chapter 22 (p. 520). Who would have been awarded a hypothetical Nobel Prize for photosynthesis, Jan Ingen Housz or Joseph Priestley? The answer in their opinion is in the subtitle, but the book's content leaves it open for the reader to decide.

Ingen Housz, we are told, has been neglected by historians, and his achievements unheralded, hence *Echoes*. Born in Breda in 1730, he trained as a physician at the Catholic University of Leuven. After postgraduate study in Leiden, he returned home to set up a medical practice. He specialised in treatment of inoculation against smallpox with live viruses. He travelled round continental capitals treating Royal families and became wealthy. Ingen Housz was an ambitious socialite. He became personal counsellor to Emperor Joseph II of Prussia, mixing with royalty, influential aristocrats, and ambassadors. Following the death of his father and family inheritance, aged forty-one, not having to work, he set out to tour European cities seeking adventure in high-society.

There is no record of any interest in chemistry prior to arriving in London 1771. That came when Ingen Housz and the American ambassador to London, Benjamin Franklin, during a tour of English cities, visited Joseph Priestley in Leeds for two days. Priestley's research was already known to Franklin, but his new chemistry was a revelation to Ingen Housz: "Priestley was able to demonstrate a preview of his first report on airs. He also demonstrated to his visitors his invention of the eudiometer, an instrument designed to determine the oxygen content of air". Priestley fuelled the Ingen Housz ambition: "the seed was set". They became friends and, subsequently, collaborators in the application of eudiometry to plant physiology.

Ingen Housz left London in 1775 for Italy, where he encouraged his friend Felice Fontana, Abbot to the Grand Duke of Tuscany, to improve upon the design of Priestley's eudiometer. Aged 46, Ingen Housz published his first scientific article, a review of eudiometry in 1776. Priestley, by this time, had published his discoveries of dephlogisticated air (oxygen), and several other gases. He explained how oxygen reacts, along with carbon dioxide, in animal and plant physiology, including reference to sunshine in plant growth.

Jan Ingen Housz

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had published his discoveries of dephlogisticated air (oxygen), and several other gases. He explained how oxygen reacts, along with carbon dioxide, in animal and plant physiology, including reference to sunshine in plant growth.

Ingen Housz returned to London, in spring 1778: “he and Priestley met regularly at Ingen Housz lodgings… and also at Priestley’s laboratory……in scientific terms, they were happy and profitable sessions”. In June of 1779, Ingen Housz, suddenly and mysteriously, began to write a book *Experiments upon Vegetables* [1], not having done any experiments himself at the time. His first ‘experiment’ was recorded 17 July 1779.

This begs the question, whose ideas led to Ingen Housz’s extraordinary publication? He must already have known the effect of sunlight. This would explain Priestley’s “expression of dismay” on being presented with a copy of *Experiments on Vegetables*, published on 12 October 1779, in which Ingen Housz claims to have performed an incredible 500 different experiments within two months. Co-authorship of scientific papers did not exist in those days. Sacrificing their friendship for undue recognition and patronage of prevailing powers, Ingen Housz had ‘done the dirty’.

As a scientific research report, *Experiments on Vegetables* does not withstand scrutiny. The sample of research notes in English, on page 526 of the biography, is probably a deception; he would have scribbled in Dutch. Ingen Housz’s English was minimal. He evidently acquiesced to be the author of a ‘ghosted’ book article; the biography names Richard Huck-Saunders, FRS who was “very close” to Royal Society of London President Sir John Pringle. Ingen Housz’s book cites Dr Priestley forty-five times, with page after page of review and quotations from Priestley inventions and discoveries. Yet, the only “acknowledgement” is an extraordinary ten-page preface in praise of, “Sir John Pringle, Baronet, President of the Royal Society of London 1772-1778 and Physician to His Majesty King George III of England… from your very much obliged and faithful friend and servant, J. Ingen-Hausz” [1]. Concluding the review section, before any new experiments are reported, Ingen Housz proclaims himself as “…having discovered a law of nature” [1].

In fact, the connection between sunlight and plant growth had been known for centuries. Priestley had mentioned a sunshine effect in his research reports “Experiments and Observations on Different Kinds of Airs” (first edition, 1774, second edition, 1776); but was being cautious about the distinction between heat and light. Today, we know that photosynthesis is an endothermic chemical reaction triggered by catalytic light; Le Chatelier’s principle tells us that heat, either by conduction or radiation, promotes the equilibrium in the direction of plant (carbohydrate) growth.

$6CO_2 + 6H_20 + \hbar\nu \text{ (light)} = \{C_6H_{12}O_6\} + 6O_2 - \text{heat} \quad (\Delta H = -2.8 \text{kJmol}^{-1})$

The other essential ingredient, Priestley discovered, is water.

This in-depth biography tells a story about the history of photosynthesis that has little to do with scientific achievement, but a lot to do with power and patronage of the British monarchy, King George III, and the Royal Society of London. Ingen Housz was aided and abetted by these powers, who wished to diminish Priestley, a prominent dissenter and republican libertarian who supported the American declaration of independence in 1776. They sought to eclipse his great discoveries. Their publication was a *fait accompli* in thirty days, submitted 13 September, published 12 October, a timescale even today’s editors of high-tech. RSC Journals would be envious of. It wasn’t curiosity driven research, not even *bone fide* research, it was skulduggery.

This biography provides new insights into the machinations of the then Royal Society of London, a fellowship of ‘church and king’ sycophants founded on science and funded by politics. Needless to say, *Experiments on Vegetables*, published with unseemly haste by special arrangement via Pringle’s successor as President, Sir John Banks, qualified Ingen Housz for his FRS.

Thus, the Beales of Calne, have succeeded in bringing to light much new evidence surrounding this intriguing question, alongside a colourful social profile of their neglected Dutchman, who later settled in Calne. Searching in vain the pages of the biography, and Ingen Housz’s list of publications, however, I found no evidence to suggest “genius”. Historical records prove beyond reasonable doubt that the title “father of photosynthesis”, and the hypothetical Nobel Prize, belong not to Ingen Housz, but to Priestley.

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Alan J. Rocke, Hermann Kopp, *From the Molecular World. A Nineteenth-Century Science Fantasy* (Heidelberg: Springer Briefs in Molecular Science, History of Chemistry, 2012); £44.99. ISBN: 978-3-642-27415-2 (or £42.99 as e-book 978-3-642-27416-9), pp. 104.

Imagine that you are visiting one of the microscope imaging stations that were popular at science exploratories a decade ago, but that instead of magnified images of bugs and cells you are able to see gas molecules dancing about according to the principles of the kinetic theory. This was Hermann Kopp's conceit in the science fantasy he produced as a gift for Robert Bunsen on his seventy-first birthday in 1882. Bunsen and his Heidelberg colleague Hermann Kopp had frequently enjoyed holidays together, and because Bunsen was vacationing in Naples in 1882, Kopp sets his scene in an imaginary *aerarium* where the behaviour of gaseous molecules of oxygen, hydrogen, chlorine, hydrogen chloride and other more complex molecules can be studied through exceedingly thin, but magnifying, glass balloons. Kopp imagines that he is conducting Bunsen around the exhibits keeping up a loquacious running commentary all the while. Bunsen would have appreciated the irony of Kopp, the chatterbox, scarcely allowing Bunsen to interrupt!

The result is a magnificent, amusing and instructive tale of valence-handed atoms forming bonds or exchanging partners as they move rectilinearly while simultaneously engaged in inter-atomic vibrations and rotations. Exchanges of courtesy also take place when the gases diffuse through a porous membrane like humans immigrating and emigrating from one country to another. Another exhibit of organic molecules allows Kopp to produce a delicately nuanced account of the differences between Kekulé's democratic, and Kolbe's hierarchical and rank, view of the constitution of organic molecules – a circus strongman demonstrates the latter! The work ends with the awkward problem of variable valency and the (pre-ionic theory) mysteries of electrolysis (imagined as dance formations and routines) and hydrated salts.

As Rocke's helpful introduction informs us, Kopp had planned to write a critical appraisal of the ideas and concepts of chemistry since the 1870s but probably found the topic too controversial to accomplish. It seems, however, that various drafted sections found their way into Bunsen's birthday present. The work is self-referential and good-humouredly refers to Bunsen's and Kopp's shared experiences, political and cultural events, and their mutual love of German romantic poetry and music –all of which makes translation difficult. Added to this difficulty is the way Kopp's love of puns, elliptic expressions, deliberate obfuscation, prolixity and diversion had become a standing joke with his friends and therefore deliberately included in his fantasy as an ironic gesture. Rocke succeeds brilliantly not only in bringing out, and explaining, Kopp's puns and allusions, but in capturing his ornate style in rendering Kopp's difficult prose into English. The translation is a valuable complement to Rocke's *Image and Reality* (University of Chicago Press, 2010), allowing readers to experience the scientific imagination of a brilliant physical chemist. What a shame, though, that the 100 pp translation is one-and-a-half times the price of Rocke's earlier, and much larger study of 375pp

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## RSC National Historical Chemical Landmarks

### Chemical Landmark Plaque for James 'Paraffin' Young, The Bennie Museum, Bathgate, West Lothian, 27 April 2012

This plaque will draw to public attention an individual who was responsible for starting a major chemical industry in West Lothian, but who hitherto has had no memorial in the conventional sense. However, anyone who visits the region to the west of Edinburgh cannot fail to miss the huge heaps of a pinkish colour known as 'bings'. These are the physical remains of the shale oil industry started over 160 years ago by James Young.

Young was born to a cabinet maker in Glasgow, and after a rudimentary education he initially worked for his father. At the age of nineteen he enrolled on evening classes at Anderson's University where he came to the attention of the Professor of Chemistry, Thomas Graham, later to become the first President of the Chemical Society. By 1834 he was lecturing for Graham, and in 1837 he moved to London to join Graham at University College. By 1838 he was employed by James Muspratt at his chemical works in Newton le Willows, and in 1844 he was manager of the chemical works of Tennant, Clow & Co. in Manchester. It was while there that a former fellow student at Anderson's, Lyon Playfair, told him about a spring of petroleum yielding 300 gallons per day at a colliery in Derbyshire. Young was soon refining the oil. At first the most important product was spindle oil to lubricate the machinery of the cotton mills of Manchester.

Young erroneously thought that the oil had been produced from coal by a natural underground distillation process, so he started to experiment in the production of oil by heating various coals and shales. He discovered that the best material to use was torbanite or cannel coal, found near Bathgate, which is so rich in oil that a pointed stick of it will act as a candle (the name 'cannel' comes from the Gaelic 'conneal' meaning candle). Young patented his distillation process in 1850, and opened his oilworks near Bathgate soon afterwards.

The industry flourished, but the torbanite was soon near exhaustion, so the local shale was mined instead. Although this was not so rich in oil, it was much more plentiful. Other companies were established to obtain oil from the mined shale, and Young was forced to defend his patent rights on a number of occasions. Soon after the patent expired in 1864 there was a boom in the industry, and by 1870 there were 97 firms processing oil shale in the area. Young retired at that time a very wealthy man. He devoted his remaining years to science, leisure and philanthropy. His philanthropic activities included endowing at Anderson's University the Young chair of technical chemistry which still continues at the University of Strathclyde. He also financed two of the expeditions to Africa of David Livingstone (another former fellow student at Anderson's), and he erected statues to Livingstone and Thomas Graham in Glasgow. He served as Vice-President of the Chemical Society from 1879-1881.

Eventually the industry supported some 40,000 people in the area, and the crude oil obtained in the primary distillation was being further refined into a wide variety of products including, in the early twentieth century, motor spirit. After World War I the importation of oil from overseas made shale oil uneconomic, and although the industry enjoyed a revival during World War II, the final works closed in 1962.

The unveiling ceremony commenced with an introduction by Malcolm Simpson, Chair of the Bennie Museum, which houses an interesting local collection. We then heard a presentation on James Young from Dr Robin Chesters, Director of the Almond Valley Heritage Trust. Professor Lesley Yellowlees, RSC President-Elect, then spoke about the Chemical Landmark Scheme and we also heard from Ian Blackley, a retired diplomat, who is a great-great-grandson of James Young. Then followed the unveiling of the plaque, on which the wording reads:-

**James 'Paraffin' Young**
**(1811-1883)**

In recognition of his outstanding
contribution, started on a site close to here
in Birniehill Bathgate, where in c. 1850 he
processed torbanite ('cannel coal') to
create the first commercial production
of paraffin oil in the world, leading
to the major shale oil industry
in West Lothian.

27 April 2012

The event was attended by teachers and pupils from two local schools (the James Young High School and Bathgate Academy). Also present was Graeme Morrice, MP for the Livingston Constituency, which includes Young's house and the sites of some of his later works. It was a pleasure to represent the Historical Group at this event, ably organised (as always) by Pauline Meakins. And it is nice to know that Young now has not only bings as his memorial, but a handsome plaque.

Readers of the July *RSC News* will have seen the sad announcement that the plaque has recently been stolen by scrap metal thieves. At present there is no news concerning a possible replacement, but hopefully there will be something to report in the next newsletter.

John Hudson

## Meeting and Conference Reports

# Where there's muck there's brass!!: Reclamation of Chemical Sites

This meeting was organized by the RSC Historical Group and was held in the Chemistry Centre (Burlington House) on 23 March 2012. It attracted over eighty delegates of various backgrounds and their questions helped to make it an informative and successful day.

The landscape of Britain has been transformed over many millennia, but in more recent times industrialization has had a major impact, with perhaps the chemical industry and industries using chemical processes at the forefront. The waste products are varied in their potential danger and in their quantity, but remediation of these sites has become very important in the last thirty years or so.

The meeting set out to review a number of different sites and a range of industries. Seven speakers took part in the meeting and a short summary of each talk is provided below. The meeting was brought to a conclusion by Professor Jack Betteridge with a short overview of the day's talks, some final remarks and a vote of thanks to the speakers.

### The Remediation of the Olympic Park - The First Gold Medal

*Martyn Lass and James Apted (Atkins Ltd)*

James Apted and Martyn Lass, both Technical Directors with Atkins Ltd, spoke on the successful remediation of the Olympic Park for the London 2012 Games. James was the Design Leader, and Martyn was the Project Manager for the site implementation. The remediation of the 246 hectare site of the Olympic Park was carried out as part of the Enabling Works contract, organized by the Olympic Delivery Authority (ODA) to clear and prepare the site for the venues and infra-structure. The key to the remediation project was a "marriage made in Stratford", a mix of management, science, and engineering. The site had suffered from over 150 years of industrial use and associated pollution, leaving a ubiquitous layer of Made Ground, underlain by the Terrace Gravel, and at a depth of around 30 to 40 metres the Chalk.

The remediation was organized through two principal 'Tier 1' contractors, one for the north park, and one for the south park. These Contractors then employed nine specialist 'Tier 2' contractors, including site investigation, soil treatment, and ground water treatment. Soil treatment was carried out using a mix of treatment technologies, led by soil washing, treating around 700,000 cubic metres of soil. Key secondary techniques used were bio-remediation, and chemical stabilisation. Overall, around 850,000 cubic metres of soil was treated, out of a total of 2.2 million cubic metres of general excavation.

Over 50 hectares of the site had contamination in the underlying ground water that required treatment. This was predominantly in the Terrace Gravel, but also up to 35 metres below ground level in the Thanet Sand. A range of techniques were used including 'pump and treat', barriers, groundwater capture, and the injection of chemical reagents, of which nearly 1200 tonnes was used. The remediation was successfully completed on time and to budget by a detailed programme of validation. To complete the presentation Martyn and James talked about the lessons learnt. Amongst other things, flexibility, openness and collaboration within the team and with the regulators were highlighted.

### The remediation of three London dye-works sites known to me

*Dr David Leaback (Biolink Technology Ltd. and The Royal Society of Chemistry Historical Group)*

This paper reiterates earlier publications describing why, when, how and on what kind of sites, three sequential factories of the new synthetic dyestuffs developed most successfully in East London. This followed from William and Thomas Perkin's 1856 discovery and production of mauveine at St George's in the East, London [1,2,3]. Those three dye-work enterprises were Perkin & Sons of Greenford Green, Middlesex [1,3]; Simpson, Maule & Nicholson of Victory Place, Locksfields, then Hackney Wick, London [4,5]; and Brooke, Simpson & Spiller of Atlas Wharf, Hackney Wick, Hackney [1,5]. All three terminated business about 1905 in an executive financial debacle, which was followed by asset stripping and where once-promising enterprise sites were left derelict or turned to mundane uses.

The presentation discussed any conservation or extra contamination of the four former dye-works sites that they experienced during the period of interim use, occurring before the radical redevelopment of the respective sites concerned. That is, 1937 for St George in the East; 1973, for Greenford Green; 1994 for Victory Place; and 1996 for Hackney Wick. Comparative accounts were given of both the rehabilitation methods used and any chemical, biological or social impacts on those sites thereafter.

After further work it was established that sites on this northern fringe of London, west of the Hackney Navigation Canal were, for reasons outlined earlier [1], especially attractive to scientific enterprises pioneering the new industries of petroleum, plastics, synthetic dyestuffs, etc. Here they were clustered together to form London's first logistically-convenient, potentially co-operative science park [1, 5]. It should prove interesting to compare the methods and results obtained there with those involved in the rehabilitation of sites on the other side of that same canal in preparation for the completion of the Olympic Park in 2012.

**References**


1. David Leaback, *Perkin in The East End Of London*, (Authentica: Radlett, 1991), 18, 24.
2. *East London Record*. (1988), 1-16.
3. *Chem. Brit*. (1988), 787-790.
4. *Chem. Brit*, (1992), pp. 340-343; *The Biochemist*, (2009), **31,** 45-47.
5. *RSCHG Newsletter*, (2005), pp. 15-21.


## 'Galligu' and the Alkali Industry in Lancashire, Tyneside and Glasgow


*Peter Reed, Leominster, Herefordshire*


In many parts of Lancashire, Tyneside and Glasgow, areas that were associated with the Leblanc alkali industry during the nineteenth century, there is still evidence for the presence of alkali waste or 'galligu' as it was known in the trade. The waste was also known as sulfur waste and tank waste.

'Galligu' was produced during the third stage of the Leblanc process. Every ton of soda resulted in about one and a half to two tons of waste. By the 1870s about 500,000 tons of this waste was produced annually; some was dumped at sea, some was used as a farm fertilizer but most was dumped on land surrounding the alkali works. Considerable damage was done to the environment through it catching fire for long periods of time producing sulfur dioxide and it reacted with the acidic air to produce hydrogen sulfide. These gases, added to the black smoke from coal burning, provided a toxic mix to the air.

The waste also contained most of the expensive sulfur from the sulfuric acid used in the first stage. Several attempts were made to reclaim the sulfur from the waste. These included: William Gossage (1837) which reputably cost him £20,000; Ludwig Mond (1861); James McTear (1871). The most effective treatment had to await the Claus-Chance process (1888) which adapted a process for removing sulfide components in the gas industry.

The land reclamation schemes of the 1970s and 1980s had to remove large quantities of waste. Today it is not readily seen because it now lies just beneath the surface of roads, golf courses and park land. Digging just beneath the surface reveals a friable material – in the main calcium carbonate and calcium hydroxide –the chemical remnants from reactions that took place many years ago. Its presence is indicated by the undulation of the road and land, and is a reminder of earlier industrial activity affecting areas where the Leblanc industry flourished.

## Cu @ Swansea: the reclamation and regeneration of the Lower Swansea Valley


*Professor Huw Bowen (Swansea University)*


Having briefly examined the natural environment of the Lower Swansea Valley, this talk traced the rapid emergence of the copper industry there during the early eighteenth century. It argued that when British supplies of copper ore were exhausted during the first decades of the nineteenth century, Swansea's smelter-entrepreneurs then created the first globally integrated heavy industry. This occurred from the 1820s onwards as new sources of ore were located in Europe, the Americas, and the Antipodes. A heavy price was paid, though, as extensive air pollution was caused by the voluminous sulphurous gases emitted from the thirteen copper works established by 1850. Huge copper slag heaps or tips were created by each of the works, and as the industry went into remorseless decline after 1890 the Lower Swansea Valley became Europe's largest post-industrial wasteland.

The talk then examined how the Lower Swansea Valley Project was established in 1961 by University College, Swansea, the Corporation of Swansea, and the Welsh Office. The project's methods and reports were described, especially the sections dealing with dereliction and pollution, and comment was made on the extent to which the project's recommendations were put in place. Particular attention was paid to the ways in which extensive community tree-planting schemes were implemented with great and lasting success. The talk ended with a discussion of a new heritage-led regeneration project – the Cu @ Swansea project – which is focused on the 12 ½ acre site of the former Hafod and Morfa copper works. This major new project, based upon a partnership between Swansea University and the City and County of Swansea, has just received significant grant funding from Cadw-Welsh government. First-phase interventions are now beginning on the site as part of a fifteen-year programme of regeneration activity intended to act as a catalyst for economic, social, and cultural regeneration across the valley. For further information on the various subjects covered in the talk, including links to films, go to www.welshcopper.org.uk

### Brownfield site or industrial heritage? Assessing the historic value of former explosives sites

*Wayne Cocroft (English Heritage).*

Despite the fundamental role that the chemical industry played in the industrial revolution and the history of this country, it has received comparatively little notice from industrial archaeologists. Its remains have neither the glamour of the steam engine nor the architectural splendour of many mills. One specialised area of the industry that has received more attention is the manufacture of gunpowder and later explosives. Initially, interest was focused on the remains of the water-powered gunpowder mills, but this soon extended to a more technical interest in the manufacture of its ingredients and the evolution of its production processes.

Many gunpowder works are protected as scheduled monuments and are publicly accessible. The largest, which also includes museum displays, is the former Royal Gunpowder Factory at Waltham Abbey, Essex; others such as works at Chilworth, Surrey, and Oare, Kent, combine industrial heritage and natural history. For obvious reasons, late nineteenth-century explosive factories were often located in remote coastal locations. This has aided their survival and the archaeological traces of many may be traced. The remains at Waltham Abbey also represent the largest protected late-nineteenth and early-twentieth-century chemical works, including the archaeological remains of sulphuric and nitric acid processing, nitro-glycerine manufacture, and guncotton drying.

These preserved sites are the exception and most former chemical sites will be remediated and put to new uses. These sites, nevertheless, are still important historical resources and have much to reveal about our chemical heritage. Desktop studies are routinely carried out during decontamination projects, and if combined with controlled excavation and sampling might reveal details of otherwise poorly documented works and their plant.

### Sites with Radioactivity

*Sean Amos (AWE, Aldermaston)*

This presentation provided the audience with a view of a comparatively new industry and some of the problems that face any reclamation activity. Although radioactivity has been present on earth since its formation, it is only in relatively recent history that man has discovered it and in even more recent history utilised it widely.

Radioactivity can be found in a number of industries; medical, minerals, power, engineering, military etc and some of those were/are quite secretive in their utilisation of it. That, along with a lack of understanding of the hazards posed by radioactive materials in the years/decades directly after its discovery, has led to cases where industrial contamination by radioactive materials has occurred.

The nature of radioactivity is complex and multi-faceted, with different types of radioactive decay aligned with details on half-life and energy making it difficult to compare one situation with another. This talk attempted to cover these facets along with providing an insight as to solutions that can be applied to materials impacted by radioactivity. The presentation also focussed on the issues facing the major nuclear industries with respect to waste management. It looked at what the industries are undertaking to ensure appropriate use of the Waste Hierarchy and to ensure that explicit control of the now much better understood hazards is both pragmatic and proportionate.

Peter Reed

## FORTHCOMING MEETINGS

## Royal Society of Chemistry Historical Group Meetings

**Autumn Meeting, Friday 28 September 2012**

This will be "Under the Influence – Famous Textbooks and their Authors", and has been organised by Peter Morris. It will be held from 10.30 – 17.15 in the Council Chamber of the RSC at Burlington House on Friday 28 September 2012. The meeting will explore the influence of some famous textbooks and the evolution of the chemistry textbook in physical, organic, inorganic and analytical chemistry in the mid-twentieth century, with a backwards glance at one of the most famous popularisations of chemistry, Jane Marcet's *Conversations on Chemistry.* Full details are given below: **please note that pre-registration is essential.**

*Under the Influence – Famous Textbooks and their Authors*

10.30 **Coffee**

Session 1. Chair: Peter Morris

11.00 Welcome

11.05 *A Golden Jubilee: Cotton and Wilkinson's Advanced Inorganic Chemistry*. Bill Griffith, Imperial College

11.40 *The continuing creation of physical chemistry*. Peter Atkins, University of Oxford.

12.30 **Lunch.** This is not provided but there are many cafés and bars close by.

(for RSCHG members only). AGM of the Historical Group, Council Chamber.

Session 2. Chair: Alan Dronsfield

14.00 *Arthur Israel Vogel (1905-1966): The man and his contributions to chemistry*. Duncan Thorburn Burns, Queen's University Belfast

14.40 *Origins and significance of Jane Marcet's Conversations on Chemistry*. Jeff Leigh, Sussex University

15.20 **Tea**

Session 3. Chair: Bill Griffith

1550 *The diffusion of mechanistic organic chemistry: the key textbooks.* Alan Dronsfield, University of Derby.

16.30 *Finar and the revolution in organic chemistry textbooks.* Peter Morris, Science Museum.

1710 **Close of Meeting**

### REGISTRATION

There is no charge for the meeting but **PRE-REGISTRATION IS ESSENTIAL** by e-mail to w.griffith@ic.ac.uk, before **Monday September 17.**

## Society for the History of Alchemy and Chemistry Meetings

**What's the Matter?: the Material Culture of Chemistry**

*Saturday 8 December 2012, Science Museum London*

This day of talks, discussions and guided tours will explore the material aspects of the history of alchemy and chemistry. It includes tours of the Science Museum exhibitions "Signs, Secrets, Symbols: An Illustrated Guide to Alchemy" and "James Watt and our World". SHAC's AGM will also be held at this meeting. Full details will appear on the SHAC website nearer the time: www.ambix.org

### American Chemical Society – Division of the History of Chemistry

**New Orleans, 7-11 April 2013**

Sessions on HIST Tutorial and General Papers, Legacy of Past ACS Presidents, and Graduate Education in Science History.

See the HIST website: http://www.scs.uiuc.edu/~mainzv/HIST/index.php

## Calls for Papers

**24th International Congress of History of Science, Technology and Medicine** *University of Manchester, 22-28 July 2013*

The theme of the Congress is "Knowledge at Work". The organisers construe the theme broadly to include studies of the creation, dissemination and deployment of knowledge and practice in science, technology and medicine across all periods, and to encompass a variety of methodological and historiographical approaches.

The general outline of the Congress programme, including the start and end times, proposed social receptions and dinner is now available:

http://www.ichstm2013.com/programme/

The call for individual papers is now open and the deadline for submissions is Friday 30 November 2012.

http://www.ichstm2013.com/call/index.html

For more information on the Congress see: http://www.ichstm2013.com

**Chemistry in Material Culture**

9th International Conference in the History of Chemistry (9ICHC) Uppsala University, 21-23 August, 2013

Conference webpage: http://www.9ichc.se

This interdisciplinary conference welcomes participants from a range of academic disciplines, including history of science and technology, economic history, cultural heritage research and the STS-field, as well as participants from chemistry, material science and related disciplines who have an interest in contributing to the writing of the history of their fields. Chemistry is the premier science dealing with the material world. From early modern times to the present, chemists have been involved in the analysis and synthesis of materials, in manufacture and industrial production. Engaging in diverse fields such as medicine, metallurgy, dyeing, agriculture, etcetera the science has had an important part in the shaping of the modern world, and was in turn shaped through its interactions with technology and industry. Simultaneously, the chemical laboratory is a site where our concepts of reality may be redefined. Historically, chemists have had an important role in defining the relationship of modern culture with the material world.

The conference will investigate all aspects of the history of alchemy and chemistry in its engagement with material culture, including the chemistry of materials and the philosophy of matter. Papers might address:

* Chemical sites, objects and practices as cultural heritage.

* The philosophical meaning of chemical 'materiality'.

* The chemical industry and the commodification of chemicals.

* The cultural and economic significance of elements and other chemical 'objects'.

* Museum collections of chemical instruments and other chemistry-related objects.

* Laboratories and experiments.

Session proposals and abstracts of a maximum of 300 words are invited on any of these, or related topics. Submissions should be posted to the conference administration at the Swedish Chemical Society, david@chemsoc.se at the latest by 31 March 2013. Please write 9ichc in the message field.

## FORTHCOMING CONFERENCES

### Sites of Chemistry in the 20th Century

The third conference in the series Sites of Chemistry, 1600-2000, a four year project to investigate the multitude of sites, spaces and places where chemistry has been practised will take place on 19-20 August 2013 at the Karolinska Institute in Stockholm, Sweden. This is immediately before the 9th International Conference in the History of Chemistry, to enable participants to attend both conferences if desired.

Further details and a call for papers will appear nearer the time on www.sitesofchemistry.org

For further information contact John Perkins at jperkins@brookes.ac.uk