RSC | Advancing the Chemical Sciences

# Historical Group

## NEWSLETTER and SUMMARY OF PAPERS


### No. 63 Winter 2013

**Registered Charity No. 207890**


## COMMITTEE


**Chairman:** **Prof A T Dronsfield**
4, Harpole Close, Swanwick, Derbyshire, DE55 1EW
[e-mail A.Dronsfield@derby.ac.uk]

**Secretary:** **Prof. J. W. Nicholson**
School of Sport, Health and Applied Science, St Mary's University College, Waldegrave Road, Twickenham, Middlesex, TW1 4SX
[e-mail: jwnicholson01@gmail.com]

**Membership Secretary:** **Prof W P Griffith**
Department of Chemistry, Imperial College, South Kensington, London, SW7 2AZ
[e-mail w.griffith@ic.ac.uk]

**Treasurer:** **Dr J A Hudson**
Graythwaite, Loweswater, Cockermouth, Cumbria, CA13 0SU
[e-mail johnhudson25@hotmail.com]

**Newsletter Editor** **Dr A Simmons**
Epsom Lodge, La Grande Route de St Jean, St John, Jersey, JE3 4FL
[e-mail a.simmons@ucl.ac.uk]

**Newsletter Production:** **Dr G P Moss**
School of Biological and Chemical Sciences, Queen Mary University of London, Mile End Road, London E1 4NS
[e-mail g.p.moss@qmul.ac.uk]

**Prof J Betteridge** (Twickenham, Middlesex)
**Dr N G Coley** (Open University)
**Dr C J Cooksey** (Watford, Hertfordshire)
**Prof E Homburg** (University of Maastricht)
**Prof F James** (Royal Institution)
**Dr D Leaback** (Biolink Technology)
**Dr P J T Morris** (Science Museum)
**Mr P N Reed** (Steensbridge, Herefordshire)
**Dr V Quirke** (Oxford Brookes University)
**Dr S Robinson** (Ham, Surrey)
**Prof. H. Rzepa** (Imperial College)
**Dr. A Sella** (University College)


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

# RSC Historical Group Newsletter No. 63 Winter 2013

**Contents**



## From the Editor

Welcome to the winter 2013 RSCHG Newsletter. If you have received the newsletter by post and wish to look at the electronic version it can be found at:

http://www.rsc.org/historical
or http://www.chem.qmul.ac.uk/rschg/

The 2013 calendar looks busy already with three meetings planned for the first half of the year. On Saturday 2 March *The History of the Chemical Industry in the Runcorn-Widnes Area* will take place at the Catalyst Science Discovery Centre in Widnes. On Thursday 21 March *The History and Chemistry of Fluorine* will take place at Burlington House and on Friday 17 May there will be an afternoon meeting at Burlington House entitled *Robert Woodward – Chemist Extraordinary*. Details of these meetings can be found in the online newsletter and as flyers inside the hard-copy version.

This issue contains a wide variety of news items, feedback from the summer 2012 issue, articles, book reviews, reports and conference announcements. There are two short essays: the first by Chris Cooksey entitled "The Great Stink" and the second by Derek Palgrave entitled "Conserving the Archives of a Technical Company" which is based on technical reports generated by technical staff employed by J.W. Chafer Ltd. There is a wide selection of book reviews: Robert G.W. Anderson and Jean Jones, eds, *The Correspondence of Joseph Black*; Raymond G. Anderson, *Brewers and Distillers by Profession: A History of the Institute of Brewing and Distilling;* John S. Rowlinson, *Sir James Dewar, 1842-1923: A Ruthless Chemist;* John C. Powers, *Inventing Chemistry: Herman Boerhaave and the Reform of the Chemical Arts*; Gilbert Thompson, ed, *Nobel Prizes that changed Medicine*; and R.G. Compton, A.S. Kabakov, M.T. Stawpert, G.G. Wildgoose, E.A. Zakharova, *A.G. Stromberg - First Class Scientis, Second Class Citizen*. These are followed by a short essay review of Istvan Hargittai's book, *Drive and Curiosity: What Fuels the Passion*. There are reports on the RSC Chemical Landmark Plaque for the Glucose Sensor, which was unveiled at the Inorganic Chemistry Laboratory, University of Oxford on Monday 16 July 2012 and also the plaque for Lord Porter of Luddenham unveiled at Imperial College on 21 November. An article also appears on the highly successful RSCHG meeting entitled "Under the Influence: Famous Textbooks and their Authors", which took place on 28 September 2012.

Finally I would like to thank everyone who has sent material for this newsletter, with particular thanks to the newsletter production team of Bill Griffith and Gerry Moss. If you would like to contribute items such as news, articles, book reviews and reports to the newsletter please do contact me. The guidelines for contributors can be found in the summer 2012 edition or online at:

http://www.chem.qmul.ac.uk/rschg/Guidelines.html

The deadline for the summer 2013 issue will be Friday 14 June 2013. 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

### Changes at the top

Observant readers of this Newsletter will have noted some changes to page one, which lists the Committee, including the Officers of the Group. Bill Griffith is no longer Secretary, having served us in this post for 10 years. Despite my entreaties, he has decided that it is time for someone else to take over this responsibility. I have worked with Bill for six enjoyable years and am personally sorry to see him retire. The Historical Group enjoys good relations with senior officers of the RSC and is perceived by them to be one of the more active, and certainly more helpful, of the subject groups. That this has come about has resulted, in part, from Bill's enthusiasm for historical chemistry and a good measure of political diplomacy!

Your Committee has invited Professor John Nicholson to serve as Secretary from September 2012. I am pleased to say that John has accepted and his succession was endorsed at our Annual General Meeting held on 28 September 2012.

Bill will remain on our Committee and has taken on the role of Membership Secretary, as this is closely involved with the distribution of the hard-copy version of the Newsletter.

Alan Dronsfield

### Congratulations…..

…..to our treasurer, John Hudson, and *Chemical and Information and Computer Applications Group* treasurer and *Historical Group* member Diana Leitch for securing the award of £10,000 to the Catalyst Science Discovery Centre in Widnes. This will be used to set up a permanent exhibition on the origins of the elements and to support weekend workshops for families at the Centre. Their proposal won first prize and was warmly commended by RSC President Lesley Yellowlees at the Chemical Congress on Saturday 10 November 2012.

The Catalyst Centre is, as far as I know, the only UK museum that concerns itself with the history of chemical industry and, *inter alia*, the history of chemistry itself. Well worth a visit!

Alan Dronsfield

### Do-it-yourself lunches at Burlington House

Most members will know that they can drop in for free tea and coffee in the reception area just outside our Library, though it is always sensible to telephone in advance as sometimes the space is 'booked' for conferences and thus would not be available.

I have always been uncertain as to whether we were allowed to bring in sandwiches and enjoy them with our coffees. I'm happy to report that the issue has been clarified. Helen Pain, Executive Director, Membership, Operations and Organisational Development, confirms "we are more than welcome to take sandwiches into the coffee area – it is always very rewarding to see members using the facilities".

As to nearby places to purchase sandwiches, there's *Boots the Chemists*, further along Piccadilly, close to Green Park tube station!

Alan Dronsfield

## The RSC Biographical Database

Over the past few years, the RSC Library has developed an online database of references to historical profiles of famous chemists and past RSC members. This project was initiated some 10 years ago, the genesis of which was to reference all the obituaries published in the RSC's precursor journals such as the Journal of the Chemical Society and the Journal of the Royal Institute of Chemistry.

Now the database contains references to obituaries and historical profiles of nearly 5,500 chemists from a wider range of publications, as well as links to the full-text accessible online where available and, in many cases, it also contains links to images of these people.

Historical Group members have free access to the RSC Journal Archive up to 1939; many of the later references will also be free to access. In circumstances where the reference requests payment (or the reference hasn't yet been digitised), members can contact the RSC Library to enquire what options are available in order to acquire the full-text.

The information referenced in the database has helped academics progress research into particular chemists as well as helping people conduct personal searches into their family's genealogy. Often, the information leads to further resources available within the library such as supplementary reference material and the information contained in the, as yet un-digitised, member's registers and certificates of election.

As well as providing assistance to enquirers, the RSC is also able to draw on the valuable information contained within this database to highlight achievements of little-known members. Last year, the Library discovered an obituary written for Mabel Elliott in *The Analyst* in 1944. In 1915, Ms Elliott, working for the War Ministry, uncovered hidden messages in some letters, this discovery directly led to a German spy being discovered and arrested.

If you wish to access this database you can do so by navigating to it from the RSC Library's homepage or directly by visiting: www.rsc.org/biographical. If you need any assistance, please contact the library: library@rsc.org.

David Allen
Library Collections Coordinator, RSC, Burlington House

### *A note on the above from Bill Griffith*

Following David's very useful www.rsc.org/biographical link takes you to the first page of the obituary (unless you are using an online library which subscribes to the RSC journals). Historical Group members will need to navigate to "*Login with your subscriber username and password*" to proceed to view the whole article in pdf format, assuming it was published before 1939 and has been digitised by the RSC (see Newsletter August 2008, pp. 3-6). Newer RSC Historical Group members might like to know that we have free access to all of the Society's online pre-1939 archives at no cost. Further details, including our username and password are available by e-mailing me at w.griffith@ic.ac.uk.

## Historical Group is joint winner of the RSC IYC Challenge Competition

During 2012 the RSC ran a competition (called the "IYC Challenge") open to all Groups and Local Sections, to carry out a project which would in some way promote public understanding and awareness of chemistry. The idea was to maintain the momentum established during 2011, the International Year of Chemistry, and each Group was provided with £1000 to run their project. Shortly before the competition was announced, Diana Leitch and I had attended the unveiling of an RSC landmark plaque at *Catalyst* in Widnes (see *Newsletter* No. 61, Winter 2012). Diana is both a member of the HG and also Treasurer of the Chemical Information and Computer Applications Group (CICAG). *Catalyst* is the only Science Discovery Centre in the country devoted to chemistry. Around 12,000 schoolchildren attend every year to learn about chemistry and perform hands-on experiments and activities, and 14,000 members of the general public visit as well. Diana and I toured *Catalyst* and met some of the staff. We were very impressed with the work they were doing.

When the IYC Challenge was announced, Diana and I decided that the two Groups should join forces so that together we could fund a more ambitious project. We wanted something that would not be just a one-off event but would enable an activity to be started which could continue on a permanent basis. We revisited *Catalyst* to discuss whether we could assist in the development of a new activity to add to their existing programme. The outcome is called Origins, and is aimed at children in the 5-13 age range, but can be modified for older students. It describes the birth of the chemical elements in stars, the structure of the atoms of which they are made, the chemical properties of some of the lighter elements, and how some elements can be used to generate huge amounts of energy without the release of carbon dioxide. It is delivered through two laboratory based workshops and a hands-on exhibit using new interactive computer simulations and video. Part of the funding is being used to offer Origins to families at weekends. By charging a modest entrance fee, it is hoped that weekend workshops will become self-sustaining. The project was launched on 29 September, and in the first nine weeks it was experienced by several hundred school children and by a large number of families at weekends.

Origins has a certain amount of historical content (e.g. uranium isotope separation), but it was never intended to educate on the history of chemistry. We were delighted when the RSC awarded our two Groups the first prize of £10,000, and together we are currently exploring how to use the new funding to enable the development of further new initiatives. A spin-off from the collaboration with *Catalyst* is that the HG is holding a one-day symposium there on 2 March 2013 entitled "The History of the Chemical Industry in the Runcorn-Widnes Area". Details are given in a separate announcement.

John Hudson

## RSCHG Meetings: 2011-2012

As in former *Winter RSCHG Newsletters* here is a brief summary of what we did in 2011 and 2012 and what is planned for 2013. 2012 was my last year as Secretary, but I'm sure that my replacement John Nicholson will continue this feature in subsequent years.

### 2011-2012 Meetings

There were four, all well-attended and well-received by their audiences.

*Environmental Chemistry - an Historical Perspective*. Joint meeting with the Environmental Chemistry group, Wednesday 26 October 2011, organised by Rupert Purchase and Peter Reed. A well-attended, successful meeting, reported in the *Winter 2012 Newsletter*, pp. 36-41.

*Dyes in History and Archaeology (DHA) 30*. A joint meeting of the DHA and RSCHG, Derby, 12-15 October 2011. This was a successful meeting, reported in the *Winter 2012 Newsletter*, pp. 15-16.

*Where there's muck there's brass! – the decontamination of chemical sites*. Burlington House, Friday 23 March 2012 organised by Peter Reed and David Leaback. Peter Reed reported that this had been a very successful and well-attended meeting. The meeting is reported in the *Summer 2012 Newsletter,* pp. 44-49.

*Under the Influence – famous textbooks and their authors,* organised by Peter Morris and Bill Griffith; Chemistry Centre, Friday 28 September 2012. There will be a report in the *Winter 2013 Newsletter*.

*RSC Landmark Plaques*. The Group was represented at both of these. John Hudson represented us at an award to commemorate James "Paraffin" Young at Bathgate on 27 April 2012 (Summer 2012 *Newsletter,* pp. 42-4); Bill Griffith represented us at the Glucose Sensor Plaque, Inorganic Chemistry Laboratory, Oxford, on Monday 16 July 2012 (a report will appear in the *Winter 2013 Newsletter*).

### 2013 Meetings

Four meetings are planned, and all will be reported in the *Newsletter*.

*The History of the Chemical Industry in the Runcorn-Widnes Area*. Saturday 2 March 2013 at the Catalyst Science Discovery Centre, Widnes. There will be a charge. Speakers will include John Hudson on the origins of the chemical industry in the area; Peter Reed on pollution problems and their solution; Diana Leitch on the people who worked there, plus others to be announced. Details in the *Winter 2013 Newsletter*.

*The History and Chemistry of Fluorine*. Thursday 21 March 2013 at 10.30 am, Council Chamber, Burlington House, organised by Alan Dronsfield and Bill Griffith. More details and a registration form appear in the *Winter 2013 Newsletter*.

*Robert Woodward – Chemist Extraordinary*. Friday 17 May 2013 at 1.30 pm, Council Chamber, Burlington House. An afternoon meeting with talks by Bill Brock, Henry Rzepa and Peter Morris; the latter will deliver the RSCHG Wheeler lecture entitled "Robert Woodward: Chemist Extraordinaire". More details and a registration form appear in the *Winter 2013 Newsletter*.

*Chemistry and Medicine*. Full-day meeting at the Chemistry Centre, Burlington House, on Wednesday 23 October 2013, to be organised by Alan Dronsfield: details will appear in our *Summer 2013 Newsletter*.

Plans are well afoot for other meetings in 2014 and 2015.

Bill Griffith

**Obituary: Harold Booth, 1926-2012**

Harold Booth was a long-standing member of the Historical Group. His entire teaching career was spent in the chemistry department at the University of Nottingham, for which he latterly served as departmental archivist. He was particularly interested in the work of F.S. Kipping and about eight years ago co-organised (with the Historical Group) a conference focusing on this pioneer of organo-silicon chemistry. Recently he was helping to write a biography of Col Brian ("Explosives") Shaw, and we anticipate publication during this next year or two.

Alan Dronsfield

## SUMMER 2012 NEWSLETTER FEEDBACK

Some comments by Nigel Jopson on "Historical Reminiscences of John Wilson"

On page 33 of the *Summer 2012 Newsletter* it was stated that N. Keith Bridge later headed the Printing and Allied Trades Research Association (PATRA). When I joined in 1979, the organisation was titled PIRA - the Paper, Printing and Packaging Research Association - with Dr Bridge at the helm. PIRA was formed in the mid-1960s by the fusion of PATRA with the British Paper and Board Industry RA on the Leatherhead site, the paper RA having been at Kenley. I am reliably informed that Dr Bridge is still in circulation. I knew him as a brisk Lancastrian, not a problem since my own parents emanated from that neck of the woods.

At that time, fundamental research was still very much in vogue supported by Government grants. I joined the Environmental Group, in the person of Leslie Webb to conduct research into the causes of 'sewage fungus' (*Sphaerotilus natans*), infestations of water courses receiving paper mill effluents. The cause was attributed to dilute concentrations of mono-, di- and oligosaccharides emanating from the degradation of starches and hemicelluloses in the mill water circuit. In simple, terms, the filamentous bacteria were better able to take advantage of this carbon source than competing organisms, probably due to the high surface area of the cells. The carbohydrates were identified by freeze-drying the soluble portions of the mill effluents, silating them and passing the volatile derivatives through a GLC column in comparison with derivatives of known sugars.

I went on to further work with Les on the removal of biological oxygen demand (BOD) in the physical treatment of mill effluents and then eventually specialised in product development matters. By the late 1980s, government support was dwindling to the extent that myself and colleagues went to North America to sell our services, riding the development of digital print and the demands that inkjet and electro-photographic imaging made on the paper surface. Meantime, PIRA underwent a management buyout, became part of CIBA Expert services, then BASF and are now part of the Smithers testing organisation, which also embraces the erstwhile RAPRA – Rubber and Plastics Research Association at Shawbury. We are still open for business in paper, printing and packaging technologies (the joke is we do anything beginning with 'P'), but have changed sites in Leatherhead.

In general terms, the loss of government support for the RAs and their successors has denuded the UK not only of capacity for effective research in the manufacturing sector, but also of an immensely valuable training ground for new post-graduates and post-docs who might otherwise have entered industry. The political class, it seems would rather waste money on Millennium Domes and foreign wars…..

Nigel Jopson

Postscript to "What Analytical Chemistry owes to *Silent Spring*"

From Derry W. Jones: Two small supplements to Anthony Travis's fine article on Mass Spectrometry and Gas Chromatography developments at institutions including the National Institute of Medical Research.

1. The career of James Lovelock is briefly summarized in an essay review [*Contemp. Phys.*, 2010, **51**(3) 273-276] of his biography by the Gribbins [1].

2. In 2001, the RSC Central Yorkshire Section held a considerable Chemical Landmark event at 'Torridon', the site of the Wool Industries Research Association (WIRA) laboratories, to celebrate the award in 1952 of the Nobel Prize to Archer John Porter Martin and Richard Synge, mentioned in Anthony Travis's article. The site in Headingley, Leeds, is now occupied by Bass Brewers plc, in whose reception area the plaque is positioned. WIRA became part of the British Textile Technology Group following the merger with the merged Shirley Institute (British Cotton Industry Research Association) and British Rayon Research Association; I had links with all three component institutions. With the aid of a video, Professors Keith Bartle and Peter Meyers described the inception of partition chromatography and later developments. As well as the RSC Past President, Tony Ledwith, and representatives of the RSC (including its Chief Executive, David Giarchi), the Society of Dyers and Colourists, and the Chromatographic Society, participants at the event included members of the families of both Martin and Synge and chemists who were employed at WIRA at the time of the award.

**Reference**

John and Mary Gribbin, *He knew he was right: the irrepressible life of James Lovelock and Gaia* (London: Allen Lane, 2009).

Derry W. Jones

## 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.

**Recent publications by Historical Group Committee Members**

Chris Cooksey, "Health concerns of heavy metals and metalloids", *Sci. Prog.*, 2012, **95 (1)**, 73-88, doi: 10.3184/003685012X13286247093244

This article is based on a talk given by the author at a joint meeting of the RSC Historical and Environmental Chemistry Groups at Burlington House on Wednesday 26 October 2011. The slides used at that meeting can be viewed at http://www.rsc.org/images/health-concerns-heavy-metals-and-metalloids_tcm18-210187.pdf. A slightly shorter version of this article has appeared in the Environmental Chemistry Group Bulletin in January 2012 and appears on their webpage: http://www.rsc.org/images/ECG-Bulletin-Jan-2012-destinations_tcm18-213482.pdf, pp. 23-28.

C.J. Cooksey, "An annotated bibliography of recent significant publications on indigo and related compounds", *Biotech. Histochem.*, 2012, Early Online: 1-25, http://dx.doi.org/10.3109/10520295.2012.698308

This 25 page bibliography contains 188 entries and 9 figures and is an update of an earlier version, C.J. Cooksey, "Indigo: an annotated bibliography", *Biotech. Histochem.*, 2007, **82 (2)**, 105-125, http://dx.doi.org/10.1080/00958970701267235

It contains mainly, but not exclusively, items published since 2007. The following trends can be identified:

- in the decade since 2000, the average number of articles about indigo increased by 24 each year
- in 2010, 258 articles were published, corresponding to one a day, assuming a 5-day week
- recent publications are nearly all available in digital form
- the time between submission and publication is now much reduced

• most recently published articles are in English; very few are in other European languages.

• an increasing number of articles are published in Chinese, Japanese and Korean

The author can supply a copy to colleagues, upon their specific request, provided that no fee is charged and the article is used for research, teaching and private study purposes. Any substantial or systematic reproduction, re-distribution, re-selling, loan or sub-licensing, systematic supply or distribution in any form to anyone is expressly forbidden.

Chris Cooksey

## NEWS AND UPDATES

### Society for the History of Alchemy and Chemistry

### John and Martha Morris Award for 2012: Professor Mary Jo Nye

Professor Mary Jo Nye (Oregon State University) has been awarded the 2012 John and Martha Morris Award for Outstanding Achievement in the History of Modern Chemistry and the Chemical Industry. The presentation of the award will take place at the 9th International Conference of the History of Chemistry in Uppsala in August 2013.

### SHAC Award Scheme 2013

The Society offers two types of award: support for research into the history of chemistry or history of alchemy by new scholars and support for subject development of either history of alchemy or history of chemistry. Applications are expected to open in March 2013 and close in May 2013. Further details can be found on the SHAC website: www.ambix.org

### The Partington Prize 2014

The Society for the History of Alchemy and Chemistry has established the Partington Prize in memory of Professor James Riddick Partington, the Society's first Chairman. It is awarded every three years for an original and unpublished essay on any aspect of the history of alchemy or chemistry. The prize consists of five hundred pounds (£500). The competition is open to anyone with a scholarly interest in the history of alchemy or chemistry who, by the closing date of 31 December 2013, has not reached 35 years of age, or if older has been awarded a doctoral thesis in the history of science within the previous three years. Scholars from any country may enter the competition, but entries must be submitted in English and must not have been previously submitted to another journal. The prize-winning essay will be published in the Society's journal, *Ambix*.

Entries should be submitted electronically as e-mail attachments. We prefer files to be Microsoft Word documents (Word 93–2013 or higher), although these may be accompanied by a PDF version if desired. Essays must be fully documented using the conventions used in the current issue of *Ambix*. Essays must not exceed 10,000 words in length, including references and footnotes. All entries must be submitted with a word count.

All entries should be sent to The Hon Secretary, Dr Anna Marie Roos, at anna.roos@history.ox.ac.uk, with the words "Partington Prize" in the subject heading. Two documents should be submitted: the first, a separate title page giving the author's name, institution, postal address, e-mail address and date of birth (and, if relevant, the date of the award of the PhD). The second should be the essay. The author's name and contact details must not appear on the pages of the essay as the identity of the author will not be made available to the judges. Essays (no more than one from each competitor) must be received no later than midnight GMT on 31 December 2013.

The decision of the judges appointed by the Council will be final. The Society reserves the right to divide the prize between two or more entries of equal merit, or not to award a prize should no essay be deemed of suitable standard. The name of the winner will be announced by 30 April 2014.

### Rumford Scholarship

The Chemical Heritage Foundation (CHF) and the Society for the History of Alchemy and Chemistry (SHAC) are pleased to invite applications for the 2013-2014 Rumford Scholarship. This annual award will enable the Rumford Scholar to travel to Europe in order to undertake original research in the history of chemistry or alchemy in libraries/archives/museum collections using their particular resources. The award may be held in any European country.

The value of the award is £2300. Applications are due 7 April 2013. For more information or to make an application, please go to:

http://www.chemheritage.org/research/fellowships-and-travel-grants/beckman-center-fellowships/index.aspx#FellowshipsandTravelGrants

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

The Chemical Heritage Foundation would like to encourage applications for long-term and short-term fellowships in residence at CHF for the academic year 2013-14. These fellowships are for scholars working in some area of the history of science, technology, medicine, or related industries in all periods and geographical areas. All fellowships should be in topics appropriate to the collections in the CHF library and museum. The deadline for applications, which are to be completed online, is 15 February 2013. There are 3 basic types of fellowships being offered: Postdoctoral, Dissertation, and Short-Term. The CHF are also currently offering two additional special fellowships: Société de Chimie Industrielle Fellowship (3 months in residence) and Ullyot Scholarship (2 months in residence). These fellowships are designed to stimulate public understanding of the importance of chemistry and the chemical industries. Applications are encouraged from writers, journalists, educators, and historians of science, technology, or business. For further information visit www.chemheritage.org

**Forum for the History of Chemical Sciences**

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 now has a website linked to that of the History of Science Society. You can reach it through http://www.hssonline.org/about/society_interest_groups.html the HSS interest groups web page.

FoHCS is also 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.

***A History of Platinum and its Allied Metals***

The definitive guide to the discovery and early uses of platinum group metals, *A History of Platinum and its Allied Metals* – first published by Johnson Matthey in 1982 – is now available in digital format for the first time. This publication describes the history of platinum and its associated metals, covering important discoveries and scientific work on the platinum group metals up to the early twentieth century. With twenty-four chapters, over 600 references and 235 illustrations (20 in colour) including 100 portraits, the book, by Donald McDonald (former director of Johnson Matthey) and Leslie B. Hunt (founder of *Platinum Metals Review*), is the foremost description of how science was able to progress by means of the unique properties of these metals. To access the book visit:

http://www.platinummetalsreview.com/resources/history-of-platinum-2/

## 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

**The European Association for Chemical and Molecular Sciences** (EuCheMS)

http://www.euchems.org/

**The Society for the History of Alchemy and Chemistry**

www.ambix.org

For details of how to join the Society, please see the on-line form (follow the links from the main page), or contact the Treasurer and Membership Secretary: John Perkins, 19 Nethercote Road, Tackley, Oxfordshire, OX5 3AW (shacperkins@googlemail.com).

**The Society for the Propagation of the Music of the Chemist-Composers**

This is an informal association that has been formed to publicize the music of chemist-composers.

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

**The Working Party on History of Chemistry (WP)**

Information on the activities of the WP can be found on its website:

http://www.euchems.org/Divisions/History/index.asp

**Walter Sneader's website 'Sources of information about drugs and medicine'**
http://historyofdrugs.net

**Website for the history of science and technology in Europe**

http://histsciences.univ-paris1.fr/

**Website of the Max Planck Institute for the History of Science (Berlin)**

http://www.mpiwg-berlin.mpg.de/en/index.html

**Selection of English-language papers relevant to the history of chemistry**

http://web.lemoyne.edu/~giunta/papers.html

**Website for the Nobel Prizes**

http://nobelprize.org/

## SHORT NOTICES

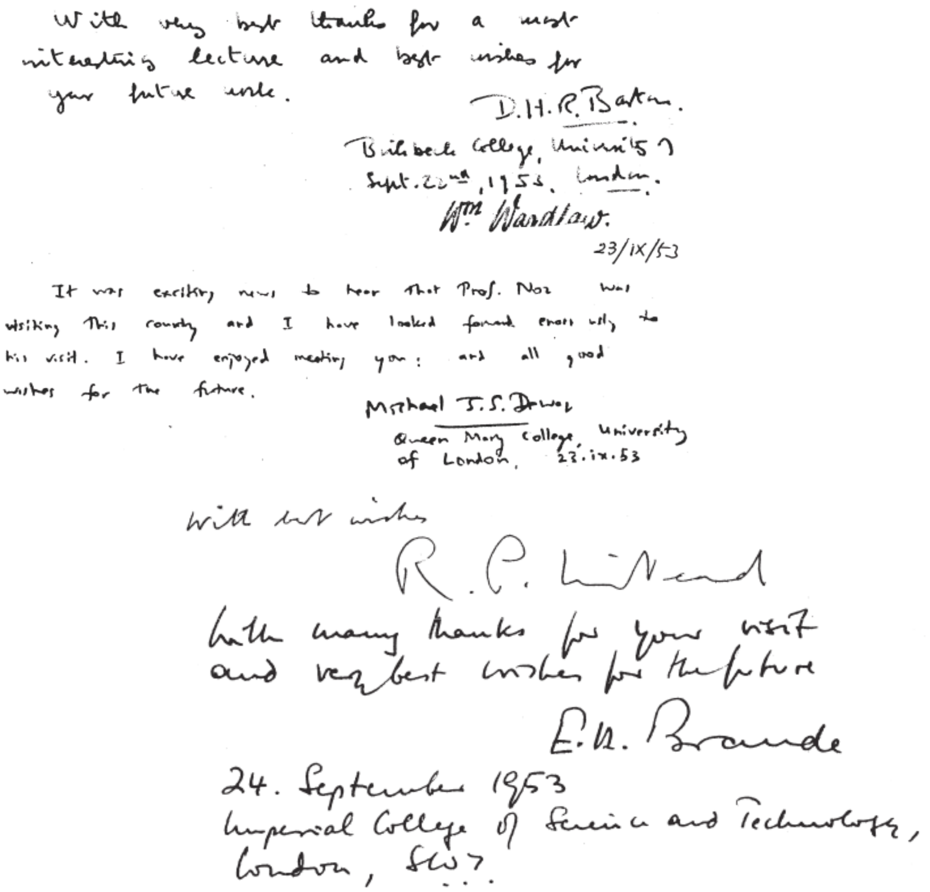
**Bonding Beyond Borders: The Tetsuo Nozoe Autograph Books**

In late September 1953, Derek Barton (then at Birkbeck College), Michael J.S. Dewar (Queen Mary College), and R.P. Linstead and E.A. Braude (Imperial College) signed page 18 of what was to become the first of nine autographs books of Tetsuo Nozoe. Nozoe carried these autograph books with him to meetings around the world for over 40 years, accumulating thousands and thousands of signatures, chemical structures, poems, cartoons and other writings. Almost 1200 pages in all! And these, together with indices and specially invited essays and perspectives, are being published in *The Chemical Record*, a Wiley-VCH journal published with the Chemical Society of Japan.

- You are invited to browse and enjoy!
- Now available open access
- Specially designed wiki-type website with user-supplied information and page overviews
- Sortable indices

- Edited by Jeffrey I. Seeman, University of Richmond, and Brian Johnson, Managing Editor

www.tcr.wiley-vch.de/nozoe


With very best thanks for a most interesting lecture and best wishes for your future work.

D.H.R. Barton.
Birkbeck College, University of London.
Sept. 22nd, 1953.

Wm Wardlaw.
23/IX/53

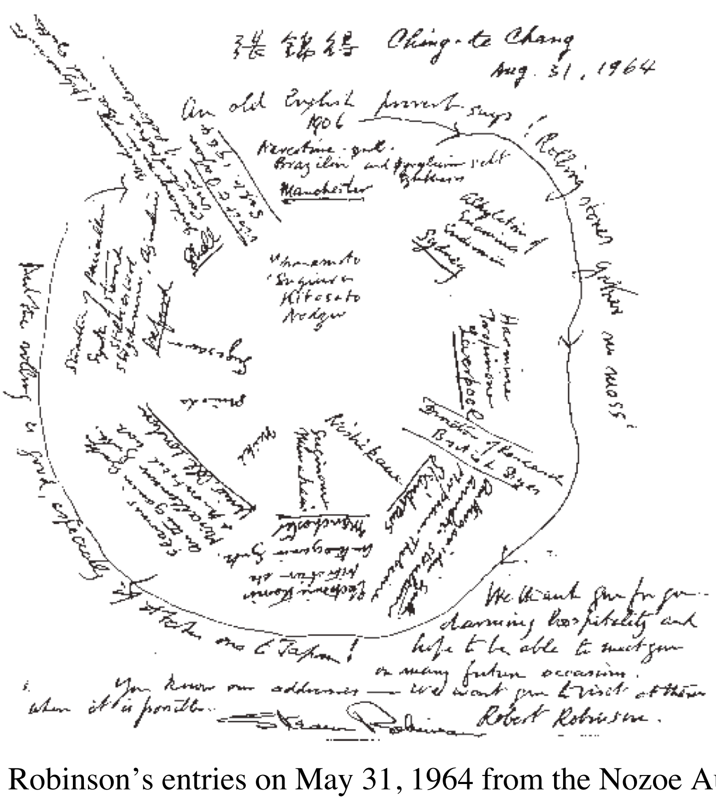
It was exciting news to hear that Prof. Nozoe was visiting this country and I have looked forward eagerly to his visit. I have enjoyed meeting you: and all good wishes for the future.

Michael J.S. Dewar
Queen Mary College, University of London, 23.ix.53

With best wishes
R.P. Linstead

With many thanks for your visit and very best wishes for the future
E.A. Braude
24. September 1953
Imperial College of Science and Technology, London, SW7.

Entries from page 18 of the Nozoe Autograph Books made on September 23 and 24, 1953 in London.




Sir Robert and Lady Robinson’s entries on May 31, 1964 from the Nozoe Autograph Books (page 161).

## SHORT ESSAYS

# The Great Stink

This is not about the parliamentary experience in the summer of 1858, but about some of the personal encounters that the author has had with historic stinks and some more recent ones, which have enlivened what might otherwise have been a dull day. *tert*-Butyl isocyanide is pretty stinky, usually described as indescribable, and not usually found outside the chemistry laboratory. The $^{13}C$ version is no different. Interestingly, it has a pretty NMR spectrum, showing coupling to $^{14}N$. Dimethylarsine is plain frightening, and the brain says run away, fast. But there are examples of smelly things outside the laboratory. The oldest example is probably Tyrian purple.

### Tyrian purple

The industry probably started in Crete about 2000 BC with the most famous manufacture at Tyre, hence the name. Its production continued throughout the Mediterranean on a large scale until the fall of Constantinople in 1453. The smell associated with the dye production was legendary and is due to dimethyl disulfide released from the 2-methylthio substituted indoxyl sulfates, in part by a photochemical reaction, of an intermediate (tyriverdin), and also to methanethiol from the Mediterranean species *Murex trunculus*. In 1685, William Cole [1] described the smell from a few molluscs, the Dog whelk, *Nucella lapillus*, which he encountered at Minehead:

> While the Cloth so writ upon, lyes in the Sun, it will yield a very strong fetid smell; (which divers who have smelt it could not endure,) as if Garlick and Assa-foetida were mixt together, which I proved but few days before I wrote this, although it had been at least twelve months, kept in a Book, and before it was laid in the Sun, had very little of that smell.

Both dimethyl disulfide and methanethiol are quite smelly with odor thresholds of 2.4 and 15.5 ppb respectively. Interestingly, to get some idea about the magnitude of a part per billion, think of it in terms of time: 1 ppb is one second in 31 years.

Sadly, at Minehead, improvements to the tourist facilities have discouraged *Nucella lapillus* and only a few could be found, but I had close encounters with the fragrance at Arisaig [2], Hastings [3] and at Rousillion in Provence [4]. In low concentration, the aroma is not that unpleasant or perhaps it is just a case of familiarity. Certainly after about half an hour, the brain gives up sending signals about the powerful stench which induce stomach churning, heart stopping fear and a wish to be on some other planet. After all, you are still alive, so it cannot be too harmful. It is the closely related dimethyl sulfide that is alleged to be the source of the ozone freshness aroma of the seaside [5].

### Woad

Making woad balls is a highly rated occupation on a scale of horribleness [6], but that is only the beginning. The next stage is to crush the dried woad balls and ferment the product to give couched woad. This process generates volumes of ammonia. So much so, that Queen Elizabeth I forbade this activity within five miles of any of the residences where she was likely to stay. Woad saves its best tricks to last. In order to be used as a dye, the indigo contained in the couched woad needs to be reduced to water soluble leuco-indigo in a woad vat. This generates, apart from $CO_2$ and $H_2$, some of the same sulfur compounds that are produced in Tyrian purple production, dimethyl sulfide (24%), dimethyl disulfide (24%) and methanethiol (18%) [7], and perhaps with a touch of butyric acid (personal observation). These odorous products are nothing to do with the pigment, but are more likely reduction products of antifeedants, etc. like isothiocyanates contained in the leaf of the plant. The late John Edmonds (formerly an RSCHG member) ably demonstrated a reconstruction of the medieval woad vat at the 2nd International Symposium "Woad, Indigo and other Natural Dyes: Past, Present and Future" in Toulouse at the *Forum des Cordeliers* in 1995 [8]. After three days, the characteristic aroma filled the entire building and the enthusiastic local press reported that, for the first time in six centuries, woad dyeing took place in Toulouse.

### Thioacetone

Derek Lowe, a regular contributor to *Chemistry World*, declared that he would never ever work with thioacetone. "It merely stinks. But it does so relentlessly and unbearably. It makes innocent downwind pedestrians stagger, clutch their stomachs, and flee in terror. It reeks to a degree that makes people suspect evil supernatural forces" [9]. Or perhaps not. Thioacetone readily trimerises to give 2,2,4,4,6,6-hexamethyl-1,3,5-trithiane and attempts to recover the monomer lead to other really smelly products, "but that's when people start diving out of windows and vomiting into wastebaskets" [9]. The identity of these products is not known for sure and researchers seem reluctant to investigate, but suggestions are propane-2,2-dithiol and 4-methyl-4-sulfenylpentan-2-one.

I was unaware of this notoriety when, many years ago, a young lecturer asked me to make some of the trithiane so that he could study the low-temperature NMR spectrum. The recipe seemed quite straightforward. Take some acetone, add a teaspoon of $ZnCl_2$, bubble in $H_2S$. It all seemed to go well. Meanwhile, in the outside world, the London Fire Brigade and Gas Board officials were searching for a massive gas leak extending from Tottenham Court Road to Euston station. The first I knew was when the LFB appeared at the laboratory door, equipped with axes, looking for the source of the smell. "Is this it?" I asked, offering them a sniff. They were not amused.

### 4-Methoxy-2-methylbutane-2-thiol

This highly fragrant compound is found in blackcurrant buds and in some Spanish olive oils, but only a µg or two per kg. It has a fruity blackcurrant aroma with a hint of cattiness, leading to the alternative name *urine de matou* [10]. It packs a punch, the odour being detectable from an aqueous solution containing $10^{-6}$ ppm. The synthesis, using Lawesson's reagent to replace the OH group by SH, went quite well, but required column chromatography purification. That was when luck ran out: the fume cupboard extraction failed, requiring immediate action. I transferred to a dedicated radiochemical laboratory which had super-efficient extraction which was still working. Within the hour, the entire building reeked of the stuff. The following morning when I approached my office, the cleaning ladies were waiting for me. They were not happy. They could not clean my office because of the ghastly stench inside. I had left an NMR tube containing a milligram of *urine de matou* in a solvent, sealed with a plastic cap, in a beaker on top of my filing cabinet. I apologised.

### References


1. William Cole, "Purple Fish", *Philos. T. R. Soc. Lond.*, 1685, **15**, 1278-1286.

2. G.W. Taylor, "The Arisaig Purple Expedition", *Dyes Hist. Archeol.*, 1995, 14.

3. C.J. Cooksey and R. Withnall, "Chemical Studies on *Nucella lapillus*", *Dyes Hist. Archeol.*, 2001, **16/17**, 91-96.

4. Inge Boesken Kanold, "The Purple Fermentation Vat: Dyeing or Painting Parchment with *Murex trunculus*", *Dyes Hist. Archeol.*, 2005, **20**, 150-154.

5.http://www.telegraph.co.uk/science/6044238/The-science-behind-that-fresh-seaside-smell.html

6. T. Robinson and D. Willcock, *The Worst Jobs in History: Two Thousand Years of Miserable Employment*. (London: Pan, 2005), 97–98.

7. A.N. Padden, V.M. Dillon, P. John, J. Edmonds, M.D. Collins and N. Alvarez, "*Clostridium* used in medieval dyeing", *Nature (London)*, 1998, **396**, 225.

8. J. Edmonds, "The Medieval Woad Vat", *Beiträge Waid,* 1998, 7, 77–79.

9.http://pipeline.corante.com/archives/2009/06/11/things_i_wont_work_with_thioacetone.php

10. J. Rigaud, P. Etievant, R. Henry and A. Latrasse, "Derivative of Butane Thiol found in the Fragrance of Black Currant Buds, Process for its Preparation and Use of this Derivative as a Fragrance", *European Patent* 0217719, 1987.


Chris Cooksey

## Conserving the Archives of a Technical Company

### Introduction

Industrial chemical laboratories may be involved in much routine testing but this does not preclude original research, a great deal of which is rarely made public unless it is either novel, and potentially patentable, or interesting, but not commercially sensitive. It is, of course, standard practice to prepare detailed reports for internal use so, over a long period of time, a very useful body of chemical knowledge can accumulate. There is a case for the permanent retention of such material so that, not only its intrinsic values but also its historical significance, illustrated here, can be appreciated. There are genuine opportunities for long term conservation which are demonstrated to be working very satisfactorily.

Hitherto, practical chemists have recorded their most significant experimental data in the time-honoured *Laboratory Notebook* although even this now seems destined for replacement by the more contemporary ELN. Such raw data is, quite often, processed and presented with other relevant matter as a *Technical Report*. Such reported information is normally reviewed on a regular basis to determine whether any future action is appropriate.

The outcome of such a Report is often a recommendation for further experimental work to refine earlier conclusions, thereby opening up the possibility of modifying an existing process or even seeking patent cover for a new process or product. On the other hand it may have given rise to a useful, but not necessarily confidential, summary of data which may be worthy of publication in the technical literature.

It is recognised that a great deal of the data derived from experimental activity may not proceed any further than the Technical Report stage. Nevertheless it is still relevant and is likely to be consulted from time to time in response to queries from other parts of the organisation requiring technical support. For this reason it is important that arrangements are in place to archive Technical Reports so they remain accessible even when their creators have moved on.

The following account is based largely on practical data, first presented in the form of Technical Reports, generated by technical staff employed by J.W. Chafer Ltd of Doncaster, and now deposited in the Local Authority Archives Department at Doncaster.

**Company Background**

Just as the Green Revolution was beginning in the 1960s, the relatively long-established Chafer Company, specialising in the supply and application of crop protection products and mineral amendments, embarked on the additional task of supplying and applying aqueous solutions of fertilizer. This was a significant departure from their previous practice because it was no longer just the provision of concentrates in drums, for dilution at farm level, but involved delivering substantial volumes of liquid fertilizer into local storage tanks. Customers taking advantage of the new opportunity were also offered a comprehensive Soil Analysis Service [1]. For Chafer, an early priority was the recruitment of chemical analysts to ensure that these soil samples were analysed and the results promptly communicated to the customer.

Initially Liquid Fertilizer was purchased from local suppliers, but it soon became clear that the distances between production points and the ultimate customers were too long. Although buffer storage had been installed at local depots, this proved to be inadequate. The situation was eventually resolved by Chafer recruiting chemists and engineers to design and build plants in the major consuming areas and by encouraging all customers to install sufficient tanks on their farms. Concomitant to these developments was the provision of a research and development laboratory at Doncaster operating in conjunction with the extant soil and fertilizer analysis service [2].

The availability of this new resource had a marked impact on all of the company’s activities including the production and development of field application equipment which had always been an integral feature of its operations. In the early 1960s the traditional materials of construction for sprayers were found to be inadequate so the comprehensive corrosion testing programme [3, 4] already in place for plant, pipework, vehicles and storage tanks was extended to include applicators and ancillary equipment. This major project was not only the subject of important internal reports but also featured in the scientific press.

Chafer’s original crop protection concept also included dusting operations [5] as in areas where water supplies were sparse this was often considered preferable to spraying. As new crop protection compounds were introduced it was important to find appropriate media for developing a suitable dust formulation. A wide range of carriers were screened and checked for compatibility and potential performance in simulated field conditions. In the late 1960s laboratory staff devised a number of novel tests [6] to assess the physical properties of several dust products: they also achieved a fair measure of success by introducing flow conditioners [7] to improve their flow properties.

Bulk liquid fertilizers were new to the majority of farmers in Britain although aqueous ammonia derived from gas works operations had been applied, somewhat intermittently, to grassland since the early nineteenth century. Aqueous solutions containing soluble nitrogen, phosphorus and potassium compounds had been utilised horticulturally as early as the 1930s, but their more general use in agriculture only became practicable approximately thirty years later.

**Large Scale Fertilizer Solution Manufacture in Britain**

The raw materials required were ammonia, urea, ammonium nitrate, phosphoric acid and potassium chloride. Although all of these were available within the fertilizer industry in the 1960s, not all were suitable for direct use in aqueous fertilizer solutions. Wet process phosphoric acid contained high proportions of dissolved metals which, on neutralisation with ammonia, precipitated as insoluble base phosphates, unacceptable components in fertilizer solutions.

Whilst such insoluble base phosphates could be removed by filtration, this not only introduced extra stages into the production sequence, but also gave rise to a somewhat intractable by-product which was difficult to handle and store. The filtered liquor could be converted directly into a range of solution grades or, after concentration, allowed to crystallise as an ammonium phosphate. This proved to be a valid intermediate for subsequent conversion to fertiliser solutions and, for a number of years, was traded as a convenient phosphate source.

For a number of years, when thermal grade phosphoric acid was available, neutralisation did not give rise to troublesome precipitates. However the cost of this very pure grade, derived from elemental phosphorus, normally precluded its general use in liquid fertilizers. Nevertheless, within a few years, wet process phosphoric acid manufacturers introduced solvent extraction technology to enable the production of a much purer grade of acid [8] free from dissolved bases. Chafer screened a number of samples of phosphoric acid produced by this method and demonstrated their suitability for liquid fertiliser manufacture within the company's operations.

An alternative way of avoiding the precipitation of base phosphates was to introduce sequestering agents which reacted with the bases in such a way as to convert them to soluble complexes. Polyphosphates [9, 10] have long been known as effective sequestrants and by concentrating phosphoric acid, more and more polyphosphates are produced. For instance when phosphoric acid contains 76% $P_2O_5$, over forty per cent is in the pyrophosphate form, five per cent as the triphosphate and half a per cent as tetraphosphate. Polyphosphoric acids, which have been concentrated, often by submerged combustion techniques, to this level and beyond have been dubbed superphosphoric acids.

Careful neutralisation of the latter with ammonia produces a solution containing a range of polyphosphates more than capable of sequestering all the bases in the original wet process acid. The typical composition of suchan ammonium polyphosphate solution is designated 11-37-0, describing its composition as 11% N and 37% $P_2O_5$. This has become a very important intermediate in many parts of the world and was imported for use in Chafer plants during the late 1960s. It is worth noting that the phosphate polymerisation which takes place during concentration comes about by the removal of the elements of water from phosphate chains in such a way as to encourage chain extension. There was some evidence that this also occurred during the neutralisation of concentrated orthophosphoric acid, a process piloted at Chedburgh, in Suffolk.

In the early 1970s, Chafer began importing phosphoric acid which had been manufactured in Israel and purified by solvent extraction. Tanks were leased at Ipswich and the acid delivered to plants which had been established in Suffolk, Hampshire and Lincolnshire. Consequently by the 1980s, liquid fertilizers were claiming a significant proportion of the United Kingdom fertilizer market so there were powerful constraints on the continued use of solvent-extracted phosphoric acid. The possibility of utilising wet process phosphoric acid per se was reinvestigated.

At Chedburgh it had been common practice to react phosphoric acid with aqueous ammonia to create a stock liquor, prior to adding urea and potassium chloride to produce a range of products with differing plant nutrient ratios. When wet process phosphoric acid was introduced, ammoniation gave rise to a stock liquor contaminated with base phosphate precipitates. The latter was allowed to settle so the clear liquor above could be drawn off for further processing. The settled precipitates were accumulated in a suitably lined lagoon and, after chemical analysis, applied to land on a contract basis as a relatively low grade slurry but, nevertheless, with a declared composition based on analytical data.

In the United States [11] where contract operations were the norm, slurry [12] and suspension grades had made considerable headway. It had been noted that a major drawback to suspension grades was the risk of crystal growth, rendering the products immobile and un-sprayable. Chafer teams investigated the effect of crystal growth inhibitors and were able to demonstrate that very stable high analysis grades [13] could be produced and stored for extended periods.

**Nitrogen Solutions**

There was always a specific requirement in the growing season to apply mainly nitrogenous grades as opposed to compounds which were normally applied before or at planting. In general, the nitrogen was supplied in the form of urea and ammonium nitrate neither of which were sufficiently soluble on their own to justify a solution grade. However, it had been found that with similar proportions of each nitrogenous component present, there was a convenient eutectic composition containing 32% nitrogen, stable at zero degrees Centigrade. This opened the way to manufacturing what became known as *UAN solutions* formulated at a range of concentrations depending on the ambient temperatures likely to be encountered.

Although urea was available on a worldwide basis enabling large quantities to be imported, ammonium nitrate was more problematical. However it was possible to transport hot ammonium nitrate liquor by road tanker and this became the norm at several of the Chafer plants. An alternative was the local production [14] of ammonium nitrate liquor which was introduced at Chedburgh in the late 1960s. This involved reconstructing a nitric acid plant together with an ammonium nitrate neutraliser both acquired from the Ministry of Defence.

The nitric acid pressure oxidation process generated a great deal of heat, which it was possible to conserve as hot water, suitable for assisting in the dissolution of urea and potassium chloride in water during the manufacture of compound grades. Nitric acid was continuously converted to ammonium nitrate which was itself incorporated into UAN solution. Bearing in mind that UAN solution was normally applied only in the spring, arrangements had to be made to accommodate the very substantial tonnage produced throughout the rest of the year.

Specialist lagoons were established by constructing large enclosures of walls of concrete modules, bolted together and supported by external earth banks, lined either with butyl rubber or high density polyethylene. UAN solution was formulated at 32% N so even if diluted by rainfall it was unlikely to fall below the 26% N level declared at the time of sale. In fact the very high density of the more concentrated solution was such that the layer diluted with rainwater on the surface tended not to mix in. In practice, the final dilution stage was accomplished by carefully blending the more concentrated liquor from the base of the lagoon with the diluted liquor scavenged from the surface.

The simplicity of the above process management system was such that it was developed at a number of company sites in more remote locations where there was a significant demand for UAN Solutions. On three such sites open topped shallow cylindrical mixing vessels were installed just below ground level so that truck-loads of urea, arriving by road, could be discharged directly into them. Each vessel was provided with a pump, piped up to it in such a way as to allow the option of recirculating its contents or transferring them into a large open lagoon. Tankers of hot ammonium nitrate liquor could be coupled up to a delivery pipe leading into the mixing vessel.

As far as possible, deliveries of urea and hot ammonium nitrate liquor were arranged to coincide and their contents transferred into the vessel together with a premeasured volume of water. The pump was activated and the valves set to ensure recirculation until the urea had dissolved. The product was sampled so temperature, density and electrical conductivity could be determined. By using a chart, relating these parameters to chemical composition, devised by the Control Laboratory in Doncaster, its analysis could be ascertained. Adjustments to concentration by adding water could be undertaken, if necessary, before transferring the batch to the lagoon.

The ratio of the two forms of nitrogen were rarely in an exact balance so it was important to keep a record of the cumulative quantities of urea and hot ammonium nitrate liquor delivered over a period of time. When the imbalance was equivalent to a load of one or other of the two components, a single load could be ordered to rectify the situation. At this stage some recirculation of the contents of the lagoon was important prior to adjusting to its final composition by blending with more water as outlined earlier.

**Compatibility Issues**

In addition to the quite extraordinary growth of the liquid fertilizer operation, Chafer also remained heavily committed to the supply and distribution of a very wide range of agrochemicals and also the development and manufacture of its own application equipment which was on lease to an increasing number of farmers.

The company had a field research and development unit [15] carrying out comprehensive trials with various new and improved agrochemical formulations. There was also a technical service commitment to answer queries about joint application of different agrochemical products or, more often, the latter in conjunction with liquid fertilizers. Members of the laboratory staff were frequently called upon to check on the physical and chemical compatibility of several components in mixtures of sprays.

Where sprays were combined [16, 17, 18] because their times of application coincided, it was essential that their properties were compatible. Often crop protection sprays incorporated wetting agents to ensure good distribution on plant surfaces. This might result in excessive volumes of nitrogenous liquid fertilizer remaining on a plant surface thereby causing scorch.

Much of the standard spray equipment on agrochemical duty in the early 1960s was largely incompatible with fertilizer solutions. Aluminium and copper based items were seriously corroded by fertilizer solutions and this led to a reappraisal of all the materials of construction hitherto in regular use. The interior surfaces of some applicator tanks were coated with epoxy-resins, but eventually the company decided to construct their tanks of stainless steel. This gave rise to a new generation of dual-purpose applicators.

Nozzles, previously manufactured in brass, were redesigned in plastic and colour-coded to indicate aperture size so it was clear when a complete set was in place on a boom. Special attachments were introduced to generate a very coarse droplet pattern and reduce the incidence of crop scorch.

Working with very dilute fertilizer solutions automatically removed the risk of scorch, but in specific situations where foliar uptake of nutrients was required this was very effective. Late applications of dilute urea solution were shown to enhance the protein content in winter wheat so a new product line based on urea was introduced in the 1980s.

Quite apart from spraying, entirely new application techniques also became possible so that, during a drilling operation, liquid fertilizer could be injected into the soil close by but not in direct contact with the seeds.

**Operational and Environmental Issues**

When the decision was taken to import phosphoric acid through the port of Ipswich, staff at the terminal and the cargo superintendents, employed during offloading, had no special knowledge of the properties of phosphoric acid. Consequently it was incumbent on the company to provide a detailed account of this product and measures required to handle it safely and to undertake basic tests of quality to a sufficient standard to authorise transfer into the tanks on lease. The necessary data was summarised in a Technical Report [19] compiled in 1972.

From time to time manufacturing problems occurred for which it was necessary to carry out detailed technical investigations. In 1972 during nitric acid manufacture at Chedburgh, a sudden fluctuation in the temperature of the platinum/rhodium catalyst, where ammonia gas was being converted to oxides of nitrogen, caused partial melting of the catalyst.

A detailed study [20] of the damaged catalyst was undertaken, but a careful analysis of the precious metals and their debris, both in the vicinity and downstream of the converter, showed no significant loss. It was concluded that a small amount of dust or particulate matter may have been released upstream. It was recommended that an upstream filter be installed to prevent a reoccurrence.

At Upton in Lincolnshire there was a serious incident caused by leakage of UAN solution due to a damaged flexible rubber lining within a large storage lagoon [21]. This was a particularly sensitive issue as the site was immediately adjacent to a local river.

Urgent remedial action was taken with the rapid excavation of a series of ditches between the site of the lagoon and the river. Temporary pumps were then installed to pump material accumulating in the ditch and transfer it to an empty metal tank. This process was continued for several days during which the nitrogen levels both in the ditch and in the nearby river were monitored. After three months the level of contamination in the ditch had dropped by a factor of 100 but within one week the nitrogen level in the river had fallen to its typical ambient value.

The Chafer Company had customers in most of the major arable areas of Britain. Those who used liquid fertilizers on a regular basis installed their own farm storage tanks. Most were sited near hand standings and accessible roads to facilitate delivery by road-tanker. Occasionally the tanks were somewhat exposed or even in frost pockets so there was a possible risk of fertilizer compounds crystallising out.

The probability of prolonged low temperatures during the application seasons had been shown to be very low indeed and in the case of a very full tank the rate of cooling was so slow that crystallisation was very unlikely indeed. Nevertheless some instances had been recorded, but on investigation the problem was, more often than not, caused by mixing compound grades with UAN solution. The presence of ammonium nitrate from the latter, and potassium, from the former, led to formation of the less soluble potassium nitrate which rapidly crystallised at normal ambient temperatures. Dilution of the mixture with additional water and agitation by prolonged recirculation normally resolved the situation.

**New opportunities**

Solutions based on chemical compounds, normally used in agricultural fertilizers, have found application in other contexts. For this reason Chafer, with its ICI connections, became involved in the production of garden and household fertilizers [22] in 1977 and a year or so later in the formulation of the animal feed supplement, "Granstock", plus a new forestry product to control disease in tree stumps. Both of the latter products were based on urea solutions. Technical support for these new ventures was readily provided "in house".

**References**


1. Basic Soil Analysis (CTR3868).
2. Chemical Analysis at the Doncaster Laboratory (CTR9980).
3. The Corrosion of Mild Steel by Liquid Fertilizers (CTR0165).
4. Physical Compatibility in Pesticide Mixtures (CTR0266).
5. Factors affecting the Potential of Dry Sprays (CTR3469).
6. Factors affecting Dust Formulations (CTR0766).
7. Flow Conditioning of Dustox Products (CTR1167).
8. The Potential of "Cleaned-up" Phosphoric Acids (CTR6170).
9. The use of Condensed Phosphates in Liquid Fertilizers (CTR1467).
10. Polyphosphates in Fertilizer Practice (CTR2067).
11. Liquid Fertilizer Developments in the USA (CTR6071).
12. Nitrophosphate Slurry Fertilizers (CTR3369).
13. Improved Suspension Fertilizers (CTR9478).
14. The Chemistry of Ammonium Nitrate Production at Chedburgh (CTR2667).
15. Field Research and Development Unit (CTR4268).
16. Combined Applications of Avadex and LF for wild oat control (CTR2367).
17. Combined Applications of SWK and LF (CTR2467).
18. Combining LF and Pesticides in One Application (CTR2567).
19. Handling Concentrated Phosphoric Acid (CTR7272).
20. P.O.P. Catalyst Damage at Chedburgh (CTR6872).
21. Nitrogen Loss at Upton (CTR9678).
22. Nutrient Solution Plant at Doncaster (CTR9177).


**The Chafer Archive**

Like many companies, J.W. Chafer Ltd had an area, in the basement of its offices, devoted to storing its old documents and files. Priority tended to be given to commercial items although some technical material was included, as it was occasionally exhibited at special promotional functions. Unfortunately, basements are notoriously susceptible to flooding and, after some very prolonged rainfall, there was an incident when several important documents were severely damaged. The upshot was a management decision to set up an archive room on the first floor to house the company's most important documents including its technical archives. Bound copies of Technical Reports for the period 1965-1986 were included in this collection. The approximate breakdown by topic was as follows:

| | |
|---|---|
| *Process and product development* | *24%* |
| *Technical Support* | *18%* |
| *Quality Control and Routine Testing* | *18%* |
| *Corrosion and Compatibility Tests* | *15%* |
| *Evaluation of potential Raw Materials* | *13%* |
| *Field Trials* | *12%* |

By 1979, J.W. Chafer Ltd had become an ICI subsidiary which not only provided access to enhanced technical and commercial resources, but also allowed it to retain a very substantial measure of autonomy over a period of several years. However in 1988 it became part of an ICI Conglomerate trading as BritAg Industries. The laboratory was re-sited at Chedburgh and all facilities in Doncaster closed. The Technical Archives together with a representative selection of the Company's General Archive were also transferred to Chedburgh. In the early 1990s these Archives were placed on temporary deposit at the Bury St Edmund's Branch of the Suffolk Record Office.

Later on, many of the former Chafer assets were acquired by Norsk Hydro and liquid fertilizer has continued to be produced and distributed under the name Hydro Chafer now Yara Chafer.

The former applicator design and manufacturing department, staffed by some of the original Chafer employees from Doncaster, continues to operate within what is now a wholly independent company, Chafer Machinery Ltd, at Upton by Gainsborough.

Because J.W. Chafer Ltd was founded in Doncaster in 1901 and conducted its business in the town for almost a century, it seemed singularly appropriate to arrange for the company archives to be finally deposited in the Doncaster Archives Repository at Balby. In 2006, arrangements were made for the permanent transfer of the collection from Bury St Edmunds to Doncaster.

All the items have been catalogued and it is possible for them to be consulted at the Repository in King Edward Road, Balby, Doncaster, DN4 0NA.

http://library.doncaster.gov.uk/web/arena/archives

There is also an entry in the National Register of Archives which may be consulted online where there is a link to the Doncaster Archives. Some other Chafer material is held by the *Museum of English Rural Life* at Reading University, details of which are also available online.

Derek Palgrave
Former Chief Chemist and Technical Director of
J.W. Chafer Ltd of Doncaster

## BOOK REVIEWS

Robert G.W. Anderson and Jean Jones, eds, *The Correspondence of Joseph Black* (Farnham: Ashgate, 2012), £300.00 (or £270 for website orders). ISBN: 978-0-7546-0131-9, Pp 1564.

First, some statistics: the two massive volumes weigh in at 1.9 kg (803 pp) and 1.8 kg (729 pp) respectively. The editors have transcribed and printed a total of 835 letters and documents, comprising 355 from Black himself, and 408 from his correspondents who include important contemporaries such as William Cullen, Lorenz Crell, Thomas Beddoes and James Watt. Oddly, there are no letters to or from Priestley, though Black was kept well informed of Priestley's activities by Watt. There are a further 72 reports, notes and accounts that have a connection to Black. A statistical analysis of the letters' frequency implies that only some 25 per cent of Black's letters have survived or been identified to date. Those included in the edition can be classified into scientific-medical, medical diagnoses (diagnosis by mail was an eighteenth-century practice), letters to and from landowners and industrialists, family letters, and finally letters of a purely domestic and social character. The family letters are quite significant since Black's father, uncle and six brothers were engaged in commerce, bleaching and glass-making in France, London, Belfast, Trinidad and the Isle of Man. As the theologian John Henry Newman once said: such a collection of letters enables us to get "inside of things".

Four introductory essays by the editors (pp. 1-73) provide the historical context for the exchanges; a brief life of Black; an account of the dissipation and present location of the documents and analysis of the historical significance of the collection; and a statement of the editorial principles used in transcription. A series of 14 appendices (170 pp) in the second volume provides readers with additional information on those of Black's correspondents with three or more surviving letters; biographies of 21 members of the Black family (many of whom were what, today, would be called industrial chemists); Black's genealogy; autobiographical fragments prepared by Black between 1793 and 1798; a sequence of undated chemical notes on bleaching and on gold; transcriptions from Black's surviving income and household account books which among other things underline the expense of postage before the days of "the penny post"; a list of his silver plate; a valuation of his property made by Black in 1799 when he was preparing his final long and complicated Will; the list of Black's possessions made by his executors in December 1799; the ornate inscription on his memorial stone in Greyfriars Churchyard in Edinburgh; and, finally, a note on Black's library and his borrowings from the University Library in Edinburgh. The edition is crowned by a bibliography of sources and a comprehensive index which is essential for navigating the huge number of people and topics embedded in the letters and documents.

The principal events of Black's career are well known. He was born in April 1728 in Bordeaux, where his Ulster-born father ran a business as a ships' victualler and wine merchant. At the age of twelve Black was sent to school in Belfast and four years later he matriculated at the University of Glasgow. He never returned to France, rarely corresponded in French, and rarely travelled outside Scotland (his home for 55 years). Historians, therefore, rightly identify him as a Scottish, not French, chemist. Following his Arts degree, Black trained to be a physician, thereby becoming the favourite pupil of William Cullen, the physician-chemist who developed Boerhaave's programme that chemistry was far more than an adjunct to medicine, but a discipline whose philosophical underpinnings were the key to the improvement of agriculture and industry. It was Cullen who suggested that Black complete his education at Edinburgh, which was then the Mecca for medical training. There Black wrote his famous dissertation, dedicated to Cullen, on the distinction between mild and caustic alkalis. Completed in 1754, this elegant qualitative and quantitative demonstration of the existence of a fixed air different from ordinary air ($CO_3$), laid the foundations of the pneumatic chemistry that was to, literally, transform chemistry.

When Cullen moved to Edinburgh in 1756 he arranged that Black was elected to the chair of anatomy and botany at Glasgow, together with a lectureship in chemistry. In 1766, when Cullen moved to the chair of the Institutes of Medicine, Black replaced him in the chair of chemistry.

Although Black (as far as is known) never lectured on anatomy or botany, an important conclusion from this edition is that Black had a considerable medical practice in Glasgow and, later, at Edinburgh. Although latterly this practice was confined to written advice to his family overseas, or to caring for personal friends such as David Hume and James Hutton, the correspondence shows that medicine was a significant element in his career as late as 1793. Indeed, Black was First Physician to the King in Scotland – not that George III ever visited Edinburgh. It was at Glasgow that Black produced his other major work on specific and latent heats and where he began his lifelong friendship with James Watt. The Watt-Black correspondence was previously published by Eric Robinson and Douglas McKie in 1970, but is rightly republished here, where it gains additional context and relevance in relation to other letters [1]. The editors' annotations to this exchange are more informative and up to date.

When coupled with the hundreds of letters from less familiar figures the edition provides an enormously rich portrait and illumination of what Robinson and Mckie termed the "take-off" period of the Industrial Revolution and what the pioneering duo of Archie and Nan Clow deliberately called "*The* Chemical Revolution", namely a revolution that embraced chemical technology that was coterminous with, and which benefited from, the fundamental theoretical and experimental work of Black, Priestley and Lavoisier [2]. Just consider the range of subjects covered: instruments, pharmaceutical preparations, mineralogy, agricultural fertilisers, alkali production, bleaching, metal refining, sugar production, dyeing, brewing, corrosion, salt extraction, glass-making, vinegar production, and water supplies. There is even correspondence about James Price's abortive alchemical claims. We can watch, patiently, as Black is gradually weaned to Lavoisier's new system of chemistry. We also find Black providing references for his students, advising parents about their sons' careers, and lending money to many, including John Roebuck. He died a wealthy man worth £20,000 (more or less a million pounds in today's terms). His private dung heap realised thirty shillings!

It seems curious to us today that Black never published his work on heat; instead it was publicised through his university lectures by his many pupils. However, this non-publication of what we term "research" was a long-standing convention among university academics that was slowly changing during Black's lifetime. Despite being continually urged to publish, it was only in 1794 that he promised Watt that he was arranging his lectures containing his views on heat for publication. The supreme procrastinator, he broke this promise and when John Robison eventually arranged for their posthumous publication in 1803, he expressed dismay at their chaotic condition. But why should Black have bothered? He conscientiously fulfilled his duties as a professor in lecturing daily (128 lectures a year), prepared fresh demonstrations daily, acted as a chemical consultant to all and sundry, and enjoyed a rich social life in the intellectual capital of Scotland. Meanwhile, his hundreds of pupils broadcast his work and his fame all over the world. A genial, well-tempered man, he was never disturbed by the plagiarism of others because his pupils always fiercely guarded his reputation and priority. In fact, besides the work on magnesia alba in 1754 (Latin) and 1756 (English), Black's only other deliberated publication was in 1775 when he forwarded an account to the Royal Society in London of how boiled water froze faster than water previously at room temperature. Ironically, this was a solution to the puzzling effect whose explanation was set as a competition by the Royal Society of Chemistry in 2012!

Black's health was never robust and he suffered terribly during the harsh Scottish winters. Black resigned his chair in favour of his pupil Thomas Charles Hope in August 1795 and died on 5 December 1799.

The editors use a light touch in the notes. It is amusing to learn of Crell's obsession to become an honorary member of as many learned societies as possible; or to learn that a former pupil, the surgeon Richard Crossfield was accused of conspiring to assassinate the King in 1794.

Apart from a few obvious typographical slips (mainly over dates) and some unexpected omissions of relevant secondary sources (e.g. the work of Henry Guerlac and Roger French), the volumes are superbly edited, printed and illustrated. Some may wonder why a complex edition like this was not put on the internet. I am glad it was not, for nothing can beat the convenience of having the notes instantly to hand, easy cross-referencing and a very accessible comprehensive index. Although well beyond an affordable price for individual purchasers, the edition will be an essential purchase for academic libraries where its rich contents will be of the greatest interest to historians of science and medicine, economic historians and historians of eighteenth-century Scotland and Ireland, and of the Enlightenment. The letters demonstrate the international character of the eighteenth-century scientific-medical-technological network and that there was then no barrier between pure and applied chemistry. Sadly, the co-editor Jean Jones (1935-2009), a multi-talented expert on Black's friend Joseph Hutton and eighteenth-century culture generally, has not lived to see this magnificent edition through to publication [3]. Robert Anderson and his publisher, Ashgate, are to be warmly congratulated for producing this major work of scholarship and important academic resource for historians of chemistry.

**References**


1. E. Robinson and D. McKie, *Partners in Science. Letters of James Watt and Joseph Black* (London: Constable, 1970). This book remains of value for containing the exchange of letters between Watt and Robison, as well as for a transcription of Watt's notebook.

2. A. and N. L. Clow, *The Chemical Revolution. A Contribution to Social Technology* (London: Batchworth, 1952).

3. See obituary, *The Guardian*, 13 August 2009.



W. H. Brock
University of Leicester


Raymond G. Anderson, *Brewers and Distillers by Profession: A History of the Institute of Brewing and Distilling*. [The Institute of Brewing and Distilling, 2012, Pp 374, £11.99 (PB), £21.99 (HB), plus postage in both cases. Available from the printers, Lulu Publishing http://www.lulu.com/shop/]

Most readers of this Newsletter will remember Magnus Pyke, an eccentric TV presenter with flailing arms, who was associated with several popular programmes in the 1970s. He was, however, a distinguished writer on scientific subjects, a Fellow of the Royal Society of Edinburgh and an expert on nutritional chemistry. Ray Anderson, the writer of this history of the organisations that represented the people associated with the brewing and distilling industries, quotes Pyke on the relationship between the brewers and the brewery chemists: "Brewers employed a chemist in an obscure laboratory as a sort of scientific chaplain in an otherwise unscientific industry". Before the nineteenth century, brewing was both an art and a trade uncontaminated by any input from us chemists. However, to refute claims that surfaced in 1852 that some brewers were adding strychnine to enhance the bitterness of their products, they had to produce evidence in the form of chemical analyses that no such adulteration was being practised. These were initially performed on a "one-off" basis by freelance consultant chemists. As the nineteenth century progressed, chemical input to the brewing industry increased and more and more firms found it economical to set up their own laboratories, supervised by a full-time works chemist. Ray, a long-time member of our Historical Group, writes informatively on the early chemical history of the brewing industry, such as the great arsenic scandal of 1900. Suddenly, over consumption of beer became associated with a strange new "disease". Its symptoms were paralysis, muscle wasting and a skin rash resembling shingles. A perceptive medical officer made the diagnosis of arsenic poisoning, and yes, beer samples showed enough of the element to account for the toxic effects. But why was it a recent occurrence? Sulfuric acid is used to hydrolyse various starches to form saccharides. These account for the sweetness of the beer and, ultimately, the alcohol content. Most sulphuric acid comes from iron pyrites, an ore also rich in arsenic compounds. Usually, when the $H_2SO_4$ was used in food and drink processes, care was taken to reduce the arsenic content to insignificant levels. However a firm in Leeds, Nicholson & Son, suddenly began to supply the trade with arsenic-rich acid. This was used by Bostock & Co of Liverpool to manufacture their "brewing sugar" which in turn afforded beers with high arsenic content. Some 6,000 drinkers suffered poisoning and about 70 actually died as a result. The scandal ruined the careers of two chemists associated with Bostock's factory.

It would be wrong to say that the bulk of this book is about historical chemistry, though. Most of it is a detailed account of the two major organizations set up in the nineteenth century to further the interests of those associated with the brewing industry and Anderson draws several parallels between these and the Chemical Society and the (Royal) Institute of Chemistry. Indeed, when the two brewing organisations decided in 1989 that merger was the most sensible way ahead, the 1980 merger between the Chemical Society and the RIC (forming the Royal Society of Chemistry) was the model that was followed.

In paperback form this book is remarkably good value for the insight it gives, at least in its early chapters, for the connection between chemistry and the brewing industry. Recommended, especially to beer enthusiasts!

Alan Dronsfield
University of Derby

John S. Rowlinson, *Sir James Dewar, 1842-1923: A Ruthless Chemist* (Farnham: Ashgate, 2012) £65.00 or £54.00 for the e-book edition from Amazon). ISBN 9781409406136, Pp 236.

Most of James Dewar's talented contemporaries in UK chemistry have received the attention of biographers, notably Crookes, Ramsay and Perkin. But until Historical Group member Sir John Rowlinson took up his pen, Dewar's life was documented only in the shortish obituaries written soon after his death. Rowlinson suggests there are two reasons for this. Firstly, although there is no dearth of Dewar's correspondence, his handwriting is so appalling that potential biographers soon give up trying to decipher it and move on to other "victims". The second reason, he suggests, is that biographers find it difficult to warm to this man who was irascible, argumentative, a bearer of grudges and demanding to the point of unpleasantness to those over whom he had authority.

Dewar's early life was spent in Scotland. He was a product of Edinburgh University, and whilst here proposed the structure for benzene (with the elongated central "1,4" bond) that still bears his name. Later in the same year (1867) he studied with Kekulé at Ghent. His early researches showed no particular theme, but certain traits of character soon became evident: in 1869 he was appointed lecturer in chemistry at a veterinary college in Edinburgh. It appears his decision to spend £44 on laboratory improvements was challenged by the Trustees. He responded: "It seems ridiculous for anyone possessed of average knowledge to imagine that getting a table along with gas and water could have anything to do with analysis or investigation". Rowlinson comments that "At the age of 27, the new professor had started his independent career in the way he would continue"….

In 1875 he was elected as the Jacksonian professor of natural philosophy at the University of Cambridge and set to with his duties which today would be seen to be remarkably light. Just two years later he became Fullerian Professor of Chemistry at the Royal Institution. Though he continued in his Cambridge post alongside the RI one, thus benefiting from the two salaries (and also, incidentally, fees from various consultancies), he came to regard the RI as his main base, and certainly it is the one most associated with his researches. These Rowlinson treats thematically in his book. Thus, rather than have a strictly chronological account of Dewar's life and discoveries, we get chapters devoted to his work on spectroscopy, on cryogenics and on argon and helium. This thematic treatment helps the reader to remain focussed and John is to be commended for this approach. Probably Dewar is most famous today for his low-temperature work and his attempts to liquefy the so-called "permanent" gases. He devised the double-walled silvered vessel that still bears his name (at least, in research laboratories). In the wider world we know it as the *Thermos* flask, which paradoxically, is now more used for keeping hot things hot, rather than cold things cold. You had to have several qualities to work in Dewar's laboratories. Certainly, you had to do as you were told, or face the professor's wrath, and you had to have a good deal of bravery: part of the work to liquefy oxygen involved the use of liquid ethylene as a coolant. Rowlinson writes that "in 1896 he suffered the inevitable whilst convincing a visiting lady that he had made liquid oxygen… After the explosion de la Rue was the only man present who could go for a surgeon". Two assistants, John Heath and Robert Lennox each lost an eye in explosions and at Cambridge, Jacksonian demonstrator William Spivey died in 1901 from burns sustained whilst extracting narcotic chemicals from hemp with carbon disulfide.

In 1871 Dewar married Helen Rose Banks who survived some twelve years after his death. We learn little of their relationship in this biography, which deals mainly with her husband's life in science. One wonders whether she attempted to have a moderating effect with respect to Dewar's irascible nature, or indeed whether she might have sided with him and encouraged it.

John Rowlinson's book meets an important need and I recommend it to readers who, like me, are fascinated by the lives of the great scientists who contributed so much to our subject at the dawn of the twentieth century.

Alan Dronsfield

John C. Powers, *Inventing Chemistry: Herman Boerhaave and the Reform of the Chemical Arts*, (Chicago: The University of Chicago Press, 2012), £26 hardback. ISBN13: 9780226677606, Pp 260.

Herman Boerhaave was born near Leiden on 31 December 1668 and died there on 23 September 1738. His father, a preacher in the Dutch Reformed Church, wanted his son to follow the same profession. Accordingly, he took a degree in philosophy at the University of Leiden in 1689 and then graduated in medicine in 1693 at the University of Harderwijk, about sixty miles north of Leiden, because it was half the price of the course at Leiden and took less time. After his return to Leiden, he was forced to abandon his plans to enter the ministry, but the University was keen to retain the enthusiastic and dedicated Boerhaave. He progressed to lecturer in the institute of medicine (1701), professor of botany and medicine (1708), was appointed rector of the university (1714) and then awarded a chair in chemistry (1718).

The author is collateral assistant professor in the Department of History and assistant director of the Science, Technology, and Society Program at Virginia Commonwealth University. Drawing on manuscript sources at the Military-Medicine Academy (VMA) in St. Petersburg, the British Library and the Universiteitsbibliotheek Leiden, the author has charted the development of Boerhaave's career at the University of Leiden in seven densely referenced chapters and in addition, presents an introduction and a conclusion.

Boerhaave considered the Hippocratic principles sound, but over the centuries had been degraded. He asserted that *medicine degenerated from painstaking observations to the assertions of philosophers, from precepts of nature to garrulity, from the utterances of Hippocrates to wanton fantasies*. To remedy this defect, he introduced observation and experiment followed by logical analysis, using mathematical techniques, into his medical teaching. Mathematics, especially geometry, helped the student *to distinguish the clear from the obscure, true from false, and to equip his mind with prudence*.

Soon after taking his medical degree, Boerhaave began to study chemistry in his spare time, prompted by the need to understand the processes which occur in the human body. He found that the existing chemical texts were not adequate and applied the same techniques that he had used in his medical studies, leading to a new view of chemistry which he expounded in lectures and textbooks. He raised the status of chemistry by concentrating on the need to know how to investigate problems rather than on how to follow existing recipes. His experimental work showed that the alchemical concept of metals as a combination of mercury and sulfur was false, thus moving away from alchemy towards chemistry.

With over 700 references and a 20-page bibliography, and for the impatient reader a conclusion which summarises each chapter, as the cover suggests, *Inventing* Chemistry is essential reading for historians of chemistry, medicine, and academic life. But the index is inadequate.

Historical Group members will remember with pleasure (Newsletter, August 2004) a meeting at the Boerhaave Museum in Leiden. Recommended.

Chris Cooksey

Gilbert Thompson, ed, *Nobel Prizes that Changed Medicine,* (Imperial College Press: London, 2012) £32 paperback. ISBN13 978-1-84816-826-8, Pp 354.

This book comprises fourteen essays on Nobel Prizes in Physiology or Medicine and their winners of the twentieth and early twenty-first centuries and one on chemistry but highly related to medicine, written not by the laureates but by distinguished specialists in the appropriate fields. Gilbert Thompson has edited the book well (also writing two of the essays) so that his authors follow roughly the same pattern: outlining the background of the problem, giving brief biographies of the prize winners, their subsequent research and developments on the topic in general.

The topics covered are the discovery of insulin (1923); discovery of the cure for pernicious anaemia, Vitamin B12 (1934); discovery of penicillin (1945); cardiac catheterisation (1956); the structure of DNA (1962); interpretation of the genetic code (1968); discovery of neuropeptides and radioimmunoassay of peptide hormones (1977); computer-assisted tomography (1979); discovery of prostaglandins (1982); the antibody problem and generation of monoclonal antibodies (1984); the LDL receptor and its role in cholesterol metabolism (1985); the polymerase chain reaction and site-directed mutagenesis (1993 – actually a chemistry prize); the pathophysiological role of nitric oxide in blood vessels (1995); discovery of *Helicobacter Pylori* (2005); discovery of RNA interference – gene silencing by double-stranded RNA (2006). An appendix lists the first 100 Nobel prizes in physiology or medicine - the first prize of 1901, when the Nobel awards were inaugurated, was on diphtheria.

The book is attractively produced with a number of monochrome colour photographs and is well indexed. There is much of human interest as well as of scientific information here, and the contributors have not hesitated to point out that the cases for some of their laureates is not as strong as it might be. The celebrated Crick-Watson-Wilkins story is particularly well retold. There are a few questionable statements, e.g. the suggestion (p. 114) that Lavoisier was responsible for the scientific revolution in biology – we chemists might argue otherwise. I find this to be an attractive and very readable book: chemists will find much of interest here.

Bill Griffith
Imperial College

R.G. Compton, A.S. Kabakov, M.T. Stawpert, G.G. Wildgoose, E.A. Zakharova, *A.G. Stromberg - First Class Scientist, Second Class Citizen* (London: Imperial College Press, 2011) £88. ISBN 13-978-1-84816-675-2, Pp 363.

Subtitled Letters from the GULAG and a History of Electroanalysis in the USSR, this book gives an account of the life and times of the Russian electrochemist Armin Stromberg (1910-2004). It appropriately called a ‘semi-biography’, giving the complete text of the 74 surviving letters to his family during his Gulag internment, and a fairly brief account of his scientific career before and after the internment. He was of Germano-Russian-Estonian origin, born in Breslau (then in Germany) but brought up in St Petersburg. He studied in Sverdlovsk (now Ekaterinburg), graduating at the Urals Industrial Institute where he carried out research on magnesium production by electrolysis of fused salts. In 1930 he moved to the Urals Physical Chemistry Institute in Sverdlovsk, and in 1937 he married Lydia Poponiva (‘Lidusya’) a physicist from Leningrad; they had a daughter Elza.

The Great Terror (*Ezhovschina*) started in the mid-thirties, with many summary executions. Mass deportation of Russo-Germans started, and in 1942 Stromberg was conscripted into the Workers’ and Peasants’ Red Army, essentially a slave labour organisation. He was sent to a Gulag in the closed city of Nizhny Tagil in Siberia. From March 1942 to September 1943 he sent 74 letters, translated in the book, to his wife and his daughter, detailing the dreadful conditions in the camps. In 1943 he was released and he returned to the Laboratory of Electrochemistry of Fused Salts, but was then seconded to the closed city of Chelyabinsk-65 (now Ozyonsk), where weapon-grade plutonium was made. After dismissal in 1950 as a ‘politically undesirable element’ he got a job at the Urals State University at Sverdlovsk, resuming research on polarography and stripping voltammetry. He became a full professor in 1951, moving to the Tomsk Polytechnic University, where he developed a strong team of electrochemists, and he retired in 1985. After Gorbachev’s *perestroika* he re-visited Nizhny Tagil in 1990.

Stromberg is not a well-known name in this country, but this unusual biography does make us realise under what appalling conditions many scientists in the former USSR worked. This book is a worthy memorial to him, and will be of interest to students of Soviet government and to electrochemists (though it contains minimal chemical detail). It would have been more useful had there been an index.

Bill Griffith

## Publications You May Have Missed

Note: The intention of this occasional series is to draw the attention of historians of chemistry to publications of interest that have escaped review in publications that are normally scrutinised by historians of science.

Laurie Dahlberg, *Victor Regnault and the Advance of Photography. The Art of Avoiding Errors* (Princeton University Press: Princeton & Oxford, 2005). 208pp with 100 illustrations.

Although not a biography of the French chemist and physicist Victor Regnault (1810-78), and only incidentally concerned with his very precise experimental work, Dahlberg’s original study reveals Regnault's hitherto unknown interest in photography as a tool for scientific, technical and industrial use. She draws attention, for example, to the precise and exemplary "drawings" of experimental apparatus in Regnault's *Cours élementaire de chemie* (1847; 2nd ed. 1853) that were evidently engraved from photographs Regnault had taken in his laboratory. Regnault also wanted to use photography in documenting the manufacture of ceramics after he was appointed Director of the national porcelain works at Sèvres in 1852. Tragically, he lost all his unpublished research and photographs when the Prussians destroyed his laboratory at Sèvres in 1870. The book contains most of his surviving photographs (mainly salt prints), including a striking image of Thomas Graham, the founder of the Chemical Society, as well as some fascinating self-portraits.

## SHORT ESSAY REVIEW

### Perception, Passion and Perseverance

Istvan Hargittai, *Drive and Curiosity: What Fuels the Passion* (Amherst, New York: Prometheus Books, 2011) £22.95 (hardcover). ISBN 978-1-61614-468-5, Pp338.

There have been a number of attempts to encapsulate the crucial factors that enable a scientist to make a significantly creative rather than a merely incremental discovery. The greater predominance of financial rewards may have led to more emphasis on research aimed at gradual improvements and there is some perception that creativity has decreased by comparison with the mid-twentieth century. Reflecting on later twentieth century physics, Nobel Prize winner W.A. Anderson regrets both the increased tendency towards quantity over quality in publications and also the reduction in support by government and industry of intellectually exciting research. Istvan Hargittai, a respected scientist brought up in Hungary but with wide international experience, has made serious research contributions in symmetry, crystallography and molecular structure. In the past decade or so he has carried out informed relaxed interviews with over 200 Nobel-level scientists and has written short and longer informal biographies. These have led to fourteen books (some jointly with Magdolna Hargittai), including six volumes of the *Candid Science* series.

In *Drive and Curiosity*, Hargittai has drawn on this experience to select 15 distinguished scientists, mainly chemists or physicists, each of whom represents a character trait that, coupled with drive and curiosity, has led to genuine creativity and discovery in the field of that chapter. Most are well-known and the majority are Nobel prizewinners. One, Dan Shechtman representing *Stubbornness*, was even awarded the 2011 Chemistry Nobel (for a discovery in 1982) during publication. Although many achieved success in the USA and a few in Britain, a good proportion were of German or Eastern European extraction, with the scientist or parents leaving because of anti-Jewish discrimination; three were brought up in Hungary. The least familiar is the Romanian/Hungarian combinatorial chemist Arpad Furka (born in 1931). Coming from a humble farm-worker background in troubled political times, Furka had (like many of the examples) much to overcome; but his technique for peptide synthesis is chosen to illustrate the stimulus of *Saving Time and Labour*.

In the 1940s and 1950s, women in research had an extra handicap to overcome, not least in the USA, in addition to any personal tragedy. Chemist Gertrude Elion (1918-1999) and physicist Rosalyn Yallow (1921-2011), who epitomise the themes of *Personal Tragedy* and *Proving Oneself* as incentives, each had to surmount poor immigrant backgrounds before encountering academic prejudice. Yallow, who later coped with partial paralysis, began physics research as the only woman in a large engineering faculty. Each woman had a long scientific partnership with a better known male collaborator. Although Solomon Bersohn was nominated before his death in 1972, he could not share the Nobel with Yallow when it was actually awarded in 1977. Elion shared the Nobel in 1988 for drug development and treatment with George Hitchings, previously her senior in a pharmaceutical laboratory from 1944. Rosalind Franklin (1920-1958), considered in Hargittai's Watson chapter, had an unfriendly relationship with her colleague Wilkins and died before the Nobel was awarded to Crick, Watson and Wilkins in 1962. Georgina Ferry has recently outlined the ideal family, location, and education from school to post-doc (in a developing interdisciplinary field) for young women to achieve scientific distinction in the UK; parental support, single-mindedness and stamina are *sine qua non* [1].

Despite the above, Hargittai chooses the magnetic resonance imaging (MRI) pioneers Peter Mansfield (born 1933) and Paul Lauterbur (1929-2007) to illustrate the *Overcoming of Handicaps* in scientific education. Mansfield trained first as a compositor, began his degree at 23 and, through immense drive, graduated Ph D at age 29 while Lauterbur was 33. Military service was a delaying experience for some, but Lauterbur was able to specialize in NMR spectroscopy at a US Army Chemical Center. Active-service experience in Vietnam transformed the aspiration of Craig Venter (not described here) towards medically related research. Lauterbur had great difficulty in getting his ideas for zeugmatography, the reconstruction of two-dimensional images, recognized, funded, published or patented, while Mansfield even had to contend with Raymond Andrew's group competing in the same department. The first hint that NMR could be applied medically came from Raymond Damadian, who did not receive a share of the MRI prize. As one supported in cancer research, I recall being intrigued around 1971 by reprints of his pioneering NMR relaxation-time tumour-detection papers. Damadian took whole-page newspaper advertisements in Britain and the USA protesting that he should share in the Nobel (although he received other awards).

In the double-helix chapter, James Watson (born in 1928 into a supportive family) is presented as the 'ignorant' genius, in that his lack of awareness of the limitations of structural chemistry caused him to aim further. His partner, Francis Crick (1916-2004), who spent seven years at the British Admiralty on R and D in magnetism, acoustics and electronics before moving towards biophysics is, I feel, an exemplar of collaboration. At successive stages in his career, Crick engaged in fruitful partnerships and so extended his creativity into old age. The right co-worker can fulfill one of Watson's criteria for success: ensure that ideas are exposed to informed criticism. Another example of this is the 2000 Chemistry Nobel for conducting polymers awarded to Alan Macdiarmid (1927-2007) together with his younger partners, the entrepreneurial physicist Alan Heeger and the polymer chemist Hideki Shirakawa. Hargittai uses their achievement to highlight the *Risk to Reputation* that Macdiarmid took in moving mid-career from inorganic to unfamiliar organic polymer chemistry.

Sherwood Rowland (1927-2012) has a chapter headed *Reluctant Environmentalist* because his first environment-related research exonerated industry by finding that mercury in ocean-going fish was not a consequence of industrial pollution. After realizing with Mario Molina that ozone was being removed from the atmosphere he suffered many years as a research outcast, despite being confident of meticulous measurements. They shared the Chemistry Nobel with Paul Crutzen in 1995 but Rowland (then aged 68) remained a fairly restrained environmentalist. He had been prompted to investigate chlorofluorocarbons in the atmosphere when he became aware of the measurements of James Lovelock who had in the 1950s developed GC detectors (See A.S. Travis, *RSC Historical Group Newsletter*, 2012, 62, 18-25).

Hargittai's final theme *The Joy of Understanding* concerns the unorthodox genius George Gamow, keen on jokes from his early days in Ukraine and Russia. Despite outstanding contributions to nuclear fusion and astro-physics, including the famous Alpher, Bethe (a contrived non-contributing author) and Gamow paper on the Big Bang, Gamow received few prestigious prizes. Best known for his fine semi-popular books, Gamow did the science that entertained him. Incidentally, Fred Hoyle, the steady-state enthusiast who coined the derisive expression Big Bang for what was presumably the ultimate creative event, intended to read Chemistry at Leeds until a scholarship visit lured him to Mathematics at Cambridge.

Hargittai does not pretend that there is a common way for such diverse personalities to achieve outstanding science although most Nobel Prize-winners seem to cross conventional disciplinary boundaries. (Lauterbur thought all good research was interdisciplinary.) Obviously, scientific achievers do not all fall into one or other of the 15 chapter types, which include competition (Linus Pauling) and beating Nature (Neil Bartlett) but not seeking fame. The quiet biochemist Frederick Sanger (born 1918) said that possession of two Nobel Prizes gave him a secure job! Those who have read any of Hargittai's collections of miniature biographies will doubtless select different representatives and, indeed, make different classifications of motivation. Unusually, the printed pages of this book begin with recommendations from six Nobel Laureates and three other distinguished scientists (with six more on the jacket) and the Forward, Preface and Introduction by equally eminent scientists are all favourable. In the light of this praise, one can add only that Hargittai's biographical collections generally contain thoughtful insights into the genesis of discoveries that are worth reading; this is no exception.

Reference

1. G. Ferry, "The Exception and the Rule: Women and the Royal Society, 1945-2010", *The Royal Society and Science in the 20th Century*, ed Peter Collins, *Notes Rec. R. Soc.*, 2010, 64, 163-172.

Derry W. Jones
University of Bradford

# RSC NATIONAL HISTORICAL CHEMICAL LANDMARKS

**Chemical Landmark Plaque for the Glucose Sensor,** Inorganic Chemistry Laboratory, Department of Chemistry, University of Oxford, Monday 16 July 2012

This plaque commemorates the development, starting in the early 1980s, of an enzyme electrode for detecting glucose. The original paper described a ferrocene-mediated electrode for the analysis of glucose which was usable in whole undiluted blood, and had obvious potential for the sensing of sugar levels in diabetic patients. This original work was extended (principally by Hill, Cass and Davis) and later patented, and the resulting electrode system has saved the lives of many diabetic patients by the simple, reliable detection of sugar levels in the blood. Currently less than 1 $\mu$l of blood is needed in a painless straightforward procedure which allows patients to monitor their own blood sugar levels.

The unveiling ceremony began with a welcome and introduction by Professor Peter Edwards FRS, the head of inorganic chemistry at Oxford. Allen Hill FRS then reminisced about early work on the electrode leading to the first paper on it. Tony Cass spoke on "sensors today": blood sensors are still of prime importance for glucose measurement but now also give an instant blood profile, e.g. for pregnancy and other conditions. Professor Fraser Armstrong spoke on "Looking to the future"; Dr Robert Parker, the Chief Executive of the RSC, spoke on the RSC Chemical Landmarks scheme, and the plaque was then unveiled by the three principal investigators of the original work, Allen Hill, Tony Cass and Graham Davis. Final comments were made by Pete Edwards and a reception for the large audience followed.

The plaque reads:

Glucose Sensor
In this laboratory on 20 July 1982,
Allen Hill, Tony Cass and Graham Davis
made the crucial discovery which led to
the development of a unique electronic
blood glucose sensor now used by
millions of diabetics worldwide.
16 July 2012

1. A.E.G. Cass, G. Davis, G.D. Francis, H.A.O. Hill, W.J. Aston, I.J. Higgins, E.V. Plotkin, L.D.L. Scott & A.P. Turner, "Ferrocene-Mediated Enzyme Electrode for Amperometric Determination of Glucose", *Analyt. Chem.* 1984, 56, 667-671.

Bill Griffith

**Chemical Landmark Plaque for Lord Porter of Luddenham, OM PRS**, at Imperial College

Presentation of this plaque formed the climax of an RSC Faraday Symposium held in the Pippard lecture theatre, Imperial College, on Wednesday 21 November 2012. It was preceded by the presentation of four RSC Medals: the Harrison-Meldola Prize to Dr Tuomas Knowles and to Dr Marina Kuimova; the Liversidge Award to Prof Anthony Legon, and the Tilden Prize to Prof James Durrant, all of whom lectured before the presentation. Meldola, Liversidge and Tilden were all at the Royal College of Chemistry, the forerunner to Imperial College. The Group was represented at the meeting by Alan Dronsfield and Bill Griffith.

The Head of Department, Professor Tom Welton welcomed guests at the conclusion of the Symposium and Prof David Phillips, OBE, immediate past President of the RSC, then presented the plaque. He spoke affectionately of George Porter (1920–2002), who was awarded the Nobel Prize for chemistry in 1967 (with Manfred Eigen and R.G.W. Norrish) "for his studies on extremely fast chemical reactions, effected by disturbing the equilibrium by means of very short pulses of energy". Essentially, his work at that time involved the use of the generation of visible and/or ultraviolet radiation by the discharge of a large bank of capacitors; the energy of such flashes would be commensurate with the lifetimes of chemical intermediates (milliseconds or less) of gaseous intermediates. George Porter had been at Cambridge (1949-1954), Sheffield (1955-1963), the Royal Institution (as Director and Fullerian Professor (1963-1985) and finally at Imperial College.
David spoke of George's passion for science, his ability to communicate his own ideas and those of others (he was an extremely able speaker at the Royal Institution) and his ability to press the cause of science to politicians – he got on well, for example, with Margaret Thatcher during her time as Prime Minister. His was an affable and engaging personality, and his charisma was put to good use in his contacts with the Press, the broadcasting media, and of

course the public from his time at the Royal Institution. He did much for science and its reputation with government and the public. He was a cultured person with many interests – he was, for example, a skilled yachtsman.

The plaque was unveiled by Lady Stella Porter, and the inscription reads:

Professor The Lord Porter
of Luddenham OM PRS
(1920 – 2002)
1985 – 2002 Chairman, Centre for
Photomolecular Sciences and
Visiting Professor, Imperial College
1967 Nobel Laureate for the study of
fast reactions by flash photolysis
21 November 2012

After the ceremony a reception was held in the Chemistry department. More information on George Porter and the award, including some photographs, may be seen at

http://www3.imperial.ac.uk/newsandeventspggrp/imperialcollege/newssummary/news_22-11-2012-17-18-41

Bill Griffith

## MEETING AND CONFERENCE REPORTS

### Under the Influence: Famous Textbooks and their Authors

This meeting was so well attended that it had to be moved from the Council Chamber to the more appropriate surroundings of the Chemistry Centre (the former library) where the RSC Library put on a display of chemistry textbooks. Bill Griffith went back as far as the Royal College of Science in the late-nineteenth century in his search for the roots of Cotton and Wilkinson and also showed how Cotton & Wilkinson evolved over the years. Peter Atkins gave a delightful talk on how his textbook of physical chemistry had come about and how a single book in 1978 has been transformed into a flotilla of several interconnected volumes now available electronically - all of which have to be regularly updated. Duncan Thorburn Burns gave an affectionate account of Vogel as a chemist and his various textbooks, drawn partly from personal recollections. The meeting was attended by several members of Vogel's family. Jeff Leigh discussed how *Conversations on Chemistry* arose out of the social milieu in which the Marcets moved in London, including free tickets to his lectures from Jane's admirer Michael Faraday. Alan Dronsfield looked at the British and American predecessors of Peter Sykes' famous *Guidebook to Mechanism in Organic Chemistry* and mused that Elliot Alexander's *Principles of Ionic Organic Reactions* might have become the standard textbook but for Alexander's death in a plane crash in 1951. Finally, Peter Morris spoke about Ivor Finar and his textbook on organic chemistry, putting it in the context of its predecessors and its mostly American competitors and successors.

### Golden Jubilee: Cotton and Wilkinson's *Advanced Inorganic Chemistry*

*Bill Griffith, Imperial College*

This book contributed much to the renaissance of inorganic chemistry and was important in teaching, being written by two outstanding authorities in the field who continued to work in the area until their respective deaths. The six editions (1962, 1966, 1972, 1980, 1988 and 1999) were published by Wiley-Interscience. Biographical details were given of Geoffrey Wilkinson – his humble beginnings in Todmorden, education at Imperial College and selection for the *Tube Alloys* (atomic bomb) project in 1943 at Chalk River, Ontario. In 1945 he joined Glen Seaborg in Berkeley, and made there 89 new radioisotopes, thereby gaining a profound knowledge of inorganic chemistry. He moved to MIT and then to Harvard in 1951, where he worked on ferrocene (with R.J. Woodward) and on other organometallic and coordination complexes. He moved to Imperial College in 1956 to the then only established chair of inorganic chemistry in the country, aged 34. His Nobel Prize, jointly with E.O. Fischer, was awarded in 1973. F. Albert Cotton, who also had a very distinguished career, was his student from 1951-4.

The possible influence of the excellent *Inorganic Chemistry,* by E. Frankland & F.R. Japp (Churchill: London, 1884) was mentioned; main influences for the book were *Modern*

*Aspects of Inorganic Chemistry* (H.J. Emeléus and J.S. Anderson, Routledge: London, 1952) and *Chemical Elements and their Compounds* (N.V. Sidgwick, 2 vols., Oxford: OUP, 1950). The evolution of the six editions of Cotton & Wilkinson was discussed: editions after the first cited recent references; the third edition was perhaps the best. New textbooks are obviously more up-to-date and have better graphics and information on physical methods, but Cotton and Wilkinson has stood the test of time and contributed much to inorganic chemistry.

### The Continuing Creation of Physical Chemistry

*Peter Atkins, University of Oxford*

I began my review of the nearly four-decade history of my Physical Chemistry textbook by pointing out that it is not just a single volume, and not even nine (soon to be ten) editions of a single volume, but a whole complex of core and peripheral books that have emerged over the years, including shortened versions, parallel volumes, and support volumes, not to mention the electronic versions that are of increasing importance. I reviewed the sequence of editions, the unique role of the collaboration between my UK and US publishers (OUP and W.H. Freeman), and the origin of that collaboration. I had retained notes of the development of a single page right back in the 1970s, and showed how that page had evolved from sketch to final page in the first edition. The process of production has changed out of all recognition over the decades, and I reviewed how I now go about the production of a new edition and all the software now involved in producing the artwork and text. I glanced at the future, with the increasing role of electronic versions and acknowledgement of the changing interests and preparation of the student users.

### Arthur Israel Vogel (1905-1966): The Man and his Contributions to Chemistry

*D. Thorburn Burns (The Queen's University of Belfast)*

The life and times of Dr Vogel were outlined on the basis of the sole obituary, that given by Dr H. Jeffery [1], which is devoid of any personal details such as his place of birth, probably out of respect. Although many knew about Dr Vogel's researches and his textbooks, relatively few people knew him personally. He was a very private man and in my experience rather shy, who compartmentalised his family and working life. Few photographs of him exist, at least in college records and none in other sources such as the RSC archives. In 1932 he was appointed Lecturer-in-Charge of the Chemistry Department at Woolwich Polytechnic. Two years later he was made Head of Department; for the remainder of his life 'The Department' was his prime concern.

Dr Vogel's output of research publications is remarkable not only for their quantity and quality, but also for the breadth of interests. His first researches were in inorganic sulfur chemistry then into the synthesis of cyclic organic compounds, carried out during his tenure of a Beit Research Fellowship, and the topic of his DSc thesis submitted at the remarkable early age of 24. His major work was the study of the physical properties of organic compounds and the effects of variation in structure. He produced over 150 papers including three series, namely, (i) Synthesis of cyclic compounds (in 11 parts), (ii) The dissociation constants of organic acids (in 20 parts) and (iii) Physical properties and chemical constitution (in 52 parts).

Dr Vogel is, without doubt, best known as an author of text books on practical chemistry; books which are still known and used in laboratories throughout the world. His first book was *Elementary Practical Chemistry* (1937) for matriculation students, followed by texts at degree level namely, *Qualitative Inorganic Chemistry* (1937), *Quantitative Chemical Analysis* (1939), *Practical Organic Chemistry* (1948) and *Elementary Practical Organic Chemistry* (1957-8). Over the years all, except the first text, were kept up to date by revisions and new editions as appropriate during his life time and since.

A number of personal remembrances of Dr Vogel were related, mostly concerned with Vogel's defence of his department, support of his staff and the provision of the best possible facilities for teaching and research. My moving from Medway College of Technology, Chatham to Woolwich Polytechnic was a jump up, two academic divisions in one go, and thus I was delighted but quite nervous in joining a department with such a distinguished and able head, and with a research-orientated staff. I was told, soon after arrival, that Dr Vogel had mellowed considerably and was at a lull in book production. After recovering from being asked after one month, "what had I published since arrival", I concluded, that as Dr Vogel led by example, he was a worthy model to try to copy. The outcome, after three years, was one text book, *Introductory Practical Physical Chemistry* (1966), and 22 papers. In recent times I have come to fully appreciate Dr Vogel's influence, the confidence he showed in me and for the research encouragement and support I received whilst in his Department. His untimely death was a great loss to his chemical family at Woolwich.

In conclusion, the lecturer stated that he regards Arthur Israel Vogel as a world class chemist, who ran a research-orientated department, at the time superior to many University departments of similar size. Furthermore he did not receive the national recognition his merits deserved, no Chair, no awards from the bodies prior to the RSC and no FRS.

**Reference**

1. G. H. Jeffrey, "Arthur Israel Vogel 1905-1966", *Chem. Brit.*, 1966, **2**, 548.

## The Origins and Significance of Jane Marcet's Conversations on Chemistry

*Jeff Leigh, Sussex University*

Published in 1806 in the first of sixteen British editions, this book was revised and re-published until 1856. The first edition was written "by a lady", and Jane Marcet's name did not appear on the cover until the thirteenth edition of 1837. Adopting a then current conversational form, of dialogues between a tutor and two students (Mrs. B, and Emily and Caroline), it was ground-breaking for being directed at women, for its attempt to convey in a popular English text the new chemistry first publicised widely in Lavoisier's *Traité Élémentaire de Chimie*, of 1789, and for its informal and lively style. Though intended for self-study, nevertheless it was also used with amendments and additions as a textbook in some schools in the United States for more than sixty years.

The production was originally a collaborative effort between Jane and her husband Alexander. Both were of Swiss extraction and spoke fluent French, and both moved in circles in London when new ideas in science were being enthusiastically adopted, and especially in chemistry, by such as Smithson Tennant, Wollaston, Yelloly, and Roget (the medic and chemist of Thesaurus fame) and including Davy and Faraday. Alexander died in 1822, but Jane continued to revise and add to the text whilst consulting various authorities, especially Faraday, until she died in 1858.

## The Dissemination of Organic Reaction Mechanisms through Textbooks

*Alan Dronsfield, University of Derby*

It might be thought that Christopher Ingold started it all off with his magisterial textbook of 1953, *Structure and Mechanism in Organic Chemistry,* but this view is incorrect. There had been at least three books which covered the topic in earlier years, though none with Ingold's thoroughness. The first was published in 1934 by Robert Hunter. His *The Electronic Theory of Chemistry* appeared only a few years after the acceptance of the Lewis/Langmuir theory of the two-electron bond. This same year saw the publication of Ingold's classic fifty page *Chemical Reviews* paper in which he laid down all the fundamentals and nomenclature that underpin today's studies of mechanisms. Possibly he published his *Structure and Mechanism* 1953 text to defend his corner against the book written in 1949 by Michael Dewar, protégé of his arch-rival Robert Robinson. Dewar's *The Electronic Theory of Organic Chemistry* naturally gave a "Robinsonian" view of the subject that was even by that time seen as outdated. Firmly in the Ingold camp was the young Illinois professor, Elliott Alexander, who published his 1950 book *Principles of Ionic Organic Reactions*. This text is remarkably readable and could serve even today's students well. Sadly, Alexander died in an air-crash aged only 30. Had he survived and produced subsequent editions of his book, then there might have been no need for the appearance at the turn of the next decade of the two student-oriented classic texts on mechanisms: Peter Sykes' *A Guidebook to Mechanism in Organic Chemistry* (1961) and Edwin Gould's *Mechanism and Structure in Organic Chemistry* (1959). This period saw the integration of mechanistic theory in the comprehensive texts of organic chemistry, exemplified by the epoch-making *Organic Chemistry* (1960) by Donald Cram and George Hammond, but this must remain another story.

## Finar and the Disappearance of the British Organic Chemistry Textbook

*Peter Morris, Science Museum*

Ivor Lionel Finar was born in the East End of London in 1912 as Itzic Finar. He took his BSc at Queen Mary College (QMUL) under J.R. Partington and a PhD in biochemistry at London under Jack Drummond at UCL in 1937. He was a Principal Lecturer at the Northern Polytechnic (now part of London Metropolitan University), Holloway, between 1947 and 1977. He died in 1984. His *Organic Chemistry* was one of the most popular in Britain from its first appearance in 1951 until the end of the 1970s and it remains popular in India. The second volume on stereochemistry and natural products first appeared in 1956. While its organisation by types of compounds looks old-fashioned, in many respects, Finar was a progressive author. Even in the first edition of 1951 he used curly arrows and reaction mechanisms. But in a period of rapid change in both organic chemistry and educational methods, he was perhaps too modest in the updating of his books. The key problem was the printing of the book which was constrained by traditional typography. American publishers produced books that were more modern in their layout and illustrations of (e.g.) molecular orbitals. Both volumes of 'Finar' were last published in Britain in the mid-1970s. Lord Tedder's *Basic Organic Chemistry* was last published in 1987 and not widely used. There was not another organic chemistry textbook by British authors until 2001, when OUP brought out *Organic Chemistry* by Jonathan Clayden, Nick Greeves, Stuart Warren and Peter Wothers. For two decades, the British market was dominated by American textbooks by authors such as Jerry March and John McMurry. They followed in the footsteps of Louis and Mary Fieser, and Donald Cram and George Hammond which had been used alongside Finar.

Peter Morris
Science Museum

## FORTHCOMING MEETINGS

**Royal Society of Chemistry Historical Group Meetings**

**Meeting at *Catalyst* Museum and Science Discovery Centre, Widnes, Cheshire, Saturday 2 March 2013**

The Historical Group traditionally holds its meetings in London, but if we are to explore the development of the chemical industry in one of its major strongholds in the nineteenth century, i.e. the North-West of England, then it is appropriate that we should hold the meeting where it all happened. *Catalyst* is located in a former ICI laboratory, and it contains an interesting museum of the chemical industry. There **will be a charge** for attending this meeting and **pre-registration is essential**. Full details of the programme and a registration form will be found in the flyer enclosed with the hard-copy version of the *Newsletter* and in the online version.

**Some Historical Aspects of the Chemistry of Fluorine, Thursday 21 March 2013**

This meeting will be held at the Royal Society of Chemistry, Burlington House, Piccadilly, London, W1J 0BA, beginning at 10.30 am. Various aspects of the history of fluorine will be examined with papers on the isolation of fluorine; personal reminiscences of fluorine research; the history of fluorinated anaesthetics; the work of Davy and Faraday on fluorine at the Royal Institution; fluorine and the ICI connection; and Thomas Midgley and the chlorofluorocarbons. The meeting will end at 5.10 pm.

There will be no charge for the meeting *but*, as always, **pre-registration is essential** by e-mail to the Historical Group Secretary, John Nicholson john.nicholson@smuc.ac.uk before **Monday 11 March**. Full details are given in this edition of the *Newsletter* (printed flyer enclosed with the hard-copy version) and in the online version.

**Robert Woodward – Chemist Extraordinary, Friday 17 May 2013**

This afternoon meeting at The Royal Society of Chemistry, Burlington House, Piccadilly, London, W1J 0BA will examine the career of Robert Woodward. It will end with the presentation of the Wheeler Award to Peter Morris, Keeper of Research Projects at the Science Museum. It will begin at 1.30 pm with the first paper given by Bill Brock on Hofmann and the beginnings of organic synthesis. Then Henry Rzepa will speak on Woodward and the Woodward-Hoffmann Rules. During the tea interval we hope to show short films of Robert Woodward in action. The meeting will conclude with the Wheeler Lecture given by Peter Morris, entitled "Robert Woodward: Chemist Extraordinaire". The meeting will end at 5.00 pm. Full details of the programme and a registration form will be found in the flyer enclosed with the hard-copy version of the *Newsletter* and in the online version.

There is no charge for the meeting, but **pre-registration is essential**. If possible please register by e-mail to Historical Group Secretary, John Nicholson john.nicholson@smuc.ac.uk before **Monday 13 May**.

**Society for the History of Alchemy and Chemistry Meetings**

**300th Anniversary of the First Professor of Chemistry at Edinburgh University**

The meeting will take place at the Royal Society of Edinburgh on 24 October 2013. The theme of the meeting, which celebrates the 300th anniversary of the appointment of the first professor of chemistry at the University of Edinburgh, James Crawford (1682-1731), is on Chemistry during the Edinburgh Enlightenment. There will be a private view of a special exhibition in Edinburgh University Library on the evening of 23 October, and the meeting will close with the first performance of a small, specially composed opera, on a theme concerning Edinburgh chemists! This meeting is being organised by the Chemistry Department of the University of Edinburgh and the Royal Society of Edinburgh, with the support of SHAC and the Royal Society of Chemistry Historical Group. Further details will appear in the *Summer 2013 Newsletter*.

**Books in Chemistry,** 9 November 2013

A joint meeting between SHAC and the CHF Bolton Society to be held in London. Further details in the *Summer 2013 Newsletter*.

**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

**Sites of Chemistry in the 20th Century,** 19-21 August 2013, Karolinska Institutet, Stockholm

This is the third conference of the project **Sites of Chemistry, 1600-2000** which investigates the multitude of sites, spaces and places where chemistry has been practised since the beginning of the seventeenth century. It is part of a series of four annual conferences each devoted to a particular century. A final conference will be held in 2015 to explore themes and developments over the whole period and on a broader comparative scale.

The focus of this third conference is on the variety of physical sites where chemistry was practised in the twentieth century. Its main purpose is to analyze, first, who was practising chemistry in a particular site, where, how, to what ends, and the physical, social, cultural and economic organization of these sites; and second the wider social, economic, political and cultural contexts for the practice of chemistry through detailed examination of chemists' interactions, in and around these sites, with other actors. Further details about the range of 'Topics and Themes' under study can be found at: www.sitesofchemistry.org

During the nineteenth century, first the university research and teaching laboratory, and then the industrial laboratory came to be the most important sites for the practice of chemistry. While this remained the case during the twentieth century we intend that the conference will look more widely at the variety of sites where chemistry was practised, from the hospital to the battlefield, from the farm to the spa, from the government bureau to the mineralogical expedition.

The two previous conferences, on the Sites of Chemistry in the eighteenth and nineteenth centuries, focussed on chemistry in Europe. During the twentieth century chemistry became a global science. It is therefore important that this conference expands the geographical coverage of chemical sites and explores the processes through which chemical sites and practices were created and re-created, adopted and adapted as chemistry became globalised. We therefore welcome proposals reflecting the wide range of chemical sites and their geographical distribution during the twentieth century.

**Conference format:** There will be five non-parallel sessions over the two days of the conference with three or four papers in each session. Each session will consist of a 15-minute presentation of each paper, followed by a 15-minute report on all of the papers by a commentator and then a general discussion. Commentators will be asked to summarize key points of the papers and will offer a few critical/constructive thoughts on them as the focus for discussion.

**Full versions of papers are due to be submitted for pre-circulation by 15 July 2013**. Papers should be no more than 6,000 words in length. They will be made available only to registered participants in the conference via a restricted section of the project's website three weeks before the conference. The conference will open with registration and a reception at the

Karolinska Institutet on the evening of Monday 19 August and there will be a conference dinner on Tuesday 20 August.

Proposals in the form of a 300 word summary should be sent to the organisers Antonio Garcia Belmar, belmar@ua.es and John Perkins, jperkins@brookes.ac.uk

**Deadline for proposals: 31 January 2013**.

**Decisions will be announced by 28 February 2013.**

We particularly welcome proposals from doctoral students and post-doctoral researchers.

**Funding:** There will be no registration fee for the conference. The accommodation costs (for the nights of 19 and 20 August) of those giving papers will be paid by the project. The project will be able to subsidise the travel costs of those giving papers up to a maximum of £200, or €250. It may be possible to increase this amount especially for doctoral students and those who do not have access to research funds.

The conference on Sites of Chemistry in the 20th Century has been organised to coincide with the 9th ICHC conference to be held in Uppsala on 21-24 August 2013 (see below). Transport from Stockholm to Uppsala will be provided for those who wish to participate in both conferences.

**Chemistry in Material Culture**

**9th International Conference in the History of Chemistry (9ICHC)**

*Uppsala University, 21-24 August, 2013*

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

**Keynote speakers:**

Mary Jo Nye, Oregon State University, USA

Marta Lourenço, University of Lisbon, Portugal

Lawrence Principe, Johns Hopkins University, USA

Please visit the website http://www.9ichc.se to register online and to obtain information about the preliminary scientific programme, special exhibitions, social programme and venue.

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, etc., 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.

All submissions should be posted through the form on the conference website: http://www.9ichc.se

The deadline for abstract submissions is **31 March 2013**. Announcement of the acceptance of abstracts is **24 April 2013**. The deadline for 'early bird' registration is 15 May 2013.

## FORTHCOMING CONFERENCES

**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 registration fee for the 24th International Congress of History of Science, Technology and Medicine, to be held in Manchester, UK on 22-28 July 2013, has now been confirmed as follows:

**Until Sunday 14 April 2013: £205, after 14 April 2013: £280**

The registration fee includes access to all symposia and other speaker sessions throughout the Congress; the Congress documentation pack; tea and coffee during session breaks; and admission to the opening evening receptions. It does not include lunches, dinners or accommodation. Pricing is fixed in British pounds, payable on registration. Registration will open in February 2013. Please see the Congress website for further information: http://ichstm2013.com/registration/

For indications of accommodation costs, see also: http://ichstm2013.com/hotels/ which lists the special rates we have negotiated on hotels and University halls of residence across the city. Reservations will be handled as part of the main Congress registration process, and will likewise open in February.

We regret that day rates for partial attendance will not be available. We hope to be in a position to offer bursaries to assist with attendance in appropriate cases: further information will appear on the Congress website when it is available. If you have any queries, please contact us at: enquiries@ichstm2013.com

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

## PROGRAMMES FOR FUTURE MEETINGS

### The History of the Chemical Industry in the Runcorn – Widnes Area

**Saturday March 2, 2013**

**Catalyst Museum and Science Discovery Centre, Mersey Road, Widnes, Cheshire, WA8 0DF**

Programme

10.15 Coffee and tea

10.45 Welcome

10.50 Dr John Beacham, CBE, DSc: *Runcorn's Chemical Foundation, or Location, Location, Location*

11.30 Dr John Hudson, FRSC: *Leblanc Widnes*

12.10 LUNCH

13.25 Peter Reed, Independent Researcher: *"Widnes: Where's there's muck, there's brass!"*

14.00 Launch of book by Gerald Hayes, MRSC: *The Catalyst Triangle - Mathieson, McKechnie and Wigg.*

14.10 Dr Diana Leitch, FRSC: *Runcorn and Widnes in the first half of the 20$^{th}$ century*

14.55 Dr Vincent Attwood, MInstP: *Nuclear Bomb Work at Runcorn during WW2*

15.15 TEA

15.35 Prof. Colin Suckling, OBE, DSc, FRSE: *The Latter Days of the Widnes Research Laboratory.*

16.05 Dr Jenny Clucas, MRSC: *Runcorn and Widnes – the future*

16.45 Closing remarks and Close of Meeting

There is ample free parking at Catalyst. For directions go to www.catalyst.org.uk Nearest station is Runcorn; walk over the bridge or take a taxi. A convenient train departs Euston 0807, arrives 0955.

**REGISTRATION FORM**

***Advance registration and pre-payment is essential.*** I wish to attend the RSCHG- Meeting *The History of the Chemical industry in the Runcorn – Widnes Area* and enclose a cheque for £15, payable to the RSC Historical Group. This charge includes a sandwich lunch morning and afternoon tea or coffee.

Name……………………………………….. **e-mail**……………………………………........

Address (please print)……………………………………………………………………
……………………………………………………………………….
(postcode)………………………

To register, please **return the above form with a cheque for £15**, payable to '**RSC Historical Group' to Dr. John Hudson, Graythwaite, Loweswater, Cockermouth, Cumbria CA13 0SU.** Receipt of cheques will be acknowledged to applicants who give their e-mail address. For any problems or queries please contact John at johnhudson25@hotmail.com.

## Some Historical Aspects of the Chemistry of Fluorine

**Thursday 21st March 2013**

*The Royal Society of Chemistry, Burlington House, Piccadilly, London W1J 0BA*

10.30 Reception and Coffee

**Session 1. Chair: Alan Dronsfield**

11.00 Welcome

11.05 "The Isolation of Fluorine". Richard Toon, formerly of Keele University

11.50 "Personal Reminiscences of Fluorine Research". John Holloway, Leicester University

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

**Session 2. Chair: Chris Cooksey**

14.00 "To Sleep, Perchance to Dream: the history of the fluorinated anaesthetics". Alan Dronsfield, University of Derby

14.40 "Davy, Faraday and the Royal Institution". Frank James, The Royal Institution

15.20 Tea

**Session 3. Chair: Bill Griffith**

15.45 "Fluorine and the ICI Connection". Richard Powell, formerly of ICI Ltd

16.30 "Thomas Midgley and the Chlorofluorocarbons". Chris Cooksey, formerly of University College London.

17.10 Close of Meeting

**REGISTRATION**

There is no charge for the meeting, but registering in advance **is essential**. If possible please register by e-mail to Historical Group Secretary, John Nicholson (john.nicholson@smuc.ac.uk), before Monday **11th March**

## Robert Woodward – Chemist Extraordinary

**Friday 17th May 2013**

The Royal Society of Chemistry, Burlington House, Piccadilly, London W1J 0BA

1330 Introduction, Alan Dronsfield, Chair of Historical Group

1340- Bill Brock, University of Leicester, *Hofmann and the beginnings of organic synthesis*

1425 Henry Rzepa, Imperial College, *Woodward and the Woodward-Hoffmann Rules*

1510- Tea: We hope to show short films of Robert Woodward in action during this time.

1545 Alan Dronsfield, Chair, Historical Group, to present the Wheeler Award to Peter Morris.

1600 Peter Morris, Keeper of Research Projects, Science Museum. *The Wheeler Lecture: Robert Woodward, chemist extraordinaire*

17.00 Close of Meeting

**REGISTRATION**

There is no charge for the meeting, but registering in advance **is essential**. If possible please register by e-mail to Historical Group Secretary, John Nicholson (john.nicholson@smuc.ac.uk), before **Monday 13th May**.