Historical Group

NEWSLETTER
and
SUMMARY OF PAPERS

No. 72 Summer 2017 (issue no. corrected here May 2021)

Registered Charity No. 207890

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RSC Historical Group Newsletter No. 72 Summer 2017

(issue no. corrected May 2021)

Contents

From the Editor

Welcome to the summer 2017 RSCHG Newsletter. The autumn RSCHG meeting is entitled *Chemistry and Anaesthesia: Some Historical Perspectives* and will be held on Wednesday 18 October 2017 at Burlington House. Full details on how to register for the meeting can be found in the flyer enclosed with the hard copy newsletter and also in the online version.

This issue contains a wide variety of news items, articles, book reviews and reports, in addition to details of the RSCHG's AGM, which will take place during the group's autumn meeting. I'm particularly pleased to be able to highlight in this issue Alice White and Jess Wade's work aimed at updating the image of women in Chemistry through the innovative Hidden Figures Wikithons. These Wikithons encourage school girls to build a previously untold picture of the women behind fascinating discoveries by researching, creating and populating their biographies on Wikipedia. Three short articles also appear in this issue. Brian Vincent explores the life and career of William Herapath (1796-1868), the first professor of chemistry in Bristol; Michael Jewess explores how "Davy hits the headlines (again)" and Debbie Radcliffe looks at Alphonse Normandy's Testimony to the Adulteration of Food, Drink and Drugs Parliamentary Select Committee in 1855 in "The Historic Practice of Deliberate Poisoning".

Following an essay review by Anthony S. Travis of Paul David Blanc, *Fake Silk: The Lethal History of Viscose Rayon*, there are five book reviews of the following titles: Hannah Gay and William P. Griffith, *The Department of Chemistry at Imperial College London: A History, 1845-2000*; Balazs Hargittai and Istvan Hargittai, *Wisdom of the Martians of Science - History in their own Words with Commentaries;* Trevor Levere, Larry Stewart and Hugh Torrens, with Joseph Wachelder, *The Enlightenment of Thomas Beddoes: Science, Medicine and Reform;* Marelene Rayner-Canham and Geoff Rayner-Canham, *A Chemical Passion: The Forgotten Story of Chemistry at British Independent Girls' Schools, 1820s-1930s;* and Melvyn C. Usselman, *Pure Intelligence: The Life of William Hyde Wollaston.* A report also appears of the RSCHG meeting held in May 2017 entitled *The Centenary of Robert Burns Woodward (1917-1979).* The meeting *Rutherford's Chemists*, organised by the IOP History of Physics Group in conjunction with the Royal Society of Chemistry Historical Group took place in Glasgow on 15-16 July 2017 and a report will appear in the winter 2018 newsletter.

Finally, I would like to thank everyone who has sent material for this newsletter. I also want to particularly thank the newsletter production team of Bill Griffith and Gerry Moss and John Nicholson, who liaises with the RSC regarding its online publication. 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 online at: http://www.sbcs.qmul.ac.uk/rschg/Guidelines.html

The deadline for the winter 2017 issue will be **Friday 8 December 2017**. Please send your contributions to a.simmons@ucl.ac.uk as an attachment in Word. All contributions must be in electronic form. 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.sbcs.qmul.ac.uk/rschg/

Anna Simmons
UCL

ROYAL SOCIETY OF CHEMISTRY HISTORICAL GROUP MEETINGS

CHEMISTRY AND ANAESTHESIA – SOME HISTORICAL PERSPECTIVES

Burlington House, Piccadilly, London, Wednesday 18 October 2017

10.30 – 11.20: Registration, tea or coffee

11.00 – 11.20: AGM, Historical Group

Session Chairman: John Hudson**

11.20: David Wilkinson* *Anaesthesia ignored; why doesn't chemistry give us the answers?*

11.45: Frank James** *Davy, nitrous oxide and Bristol*

12.15: John Pring* *Nitrous oxide in anaesthetic practice: some reflections*

12.45 – 14.10: Lunch. This is not provided but there are several pubs and eating places nearby

Session Chairman: John Nicholson**

14.10: Ann Ferguson* *Surgical relaxation: Crum Brown to the present day*

14.45: Alan Dronsfield[#] *Cocaine: a chemical, medical and social history*

15.25: Tony Wildsmith* *Local anaesthetics after cocaine: an early structure-activity relationship*

16.00 – 16.20: Tea

Session Chairman: John Hudson**

16.20: Adrian Padfield* *Carbon dioxide: the original anaesthetic gas*

16.55: David Wilkinson* *Post Manhattan: time for a new chemistry*?

17.l5 – 17.25: John Hudson** *Concluding remarks*

* History of Anaesthesia Society; retired consultant anaesthetist

** Royal Society of Chemistry Historical Group

History of Anaesthesia Society and RSC Historical Group

REGISTRATION FORM

There is no charge for this meeting, but prior registration is essential. Please use the form below or the flyer included with the hard copy version of the newsletter and send it to Professor John Nicholson, 52 Buckingham Road, Hampton, Middlesex, TW12 3JG, jwnicholson01@gmail.com. **This is expected to be a popular meeting. If having registered, you are unable to attend, please notify Professor Nicholson.**

I wish to attend the HG meeting on 18 October 2017 at the Royal Society of Chemistry, Burlington House, London on "Chemistry and anaesthesia: some historical perspectives".

Name……

Address…….....

Email…….Acknowledgement required: Yes/No

ROYAL SOCIETY OF CHEMISTRY HISTORICAL GROUP AGM

The forty-second Annual General Meeting of the Group will be held at the Royal Society of Chemistry, Burlington House, at 11 am on Wednesday 18 October 2017.

Agenda

1. Apologies for Absence.

2. Minutes of AGM at Burlington House, 19 October 2016.

3. Matters arising from the Minutes.

4. Reports:

Chairman's Report.

Secretary's Report.

Treasurer's Report.

5. Future Meetings.

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

7. Any Other Business.

8. Date, time and place of next meeting.

Minutes of the Forty-First Annual General Meeting of the Royal Society of Chemistry Historical Group

Held at Burlington House, London, at 12.20 pm on Wednesday 19 October 2016.

1. Apologies for absence: Received from Professor Jack Betteridge, Dr Gerry Moss and Professor Bill Brock.

2. Minutes of AGM at the Royal Institution, Tuesday 13 October 2015. Having been published in the Newsletter, these were accepted as a true record without amendment.

3. Matters arising from the minutes: None.

4. Reports:

a) *Chairman's report (Dr John Hudson)*: Dr Hudson reported on another year of commendable activity by the Group, which included two Newsletters and two 1-day symposia. He gave particular thanks to Dr Anna Simmons for her work in producing the Newsletter, which is a substantial document as well as an interesting one. He also noted that last October (2015), Professor Frank James of the Royal Institution had delivered his Wheeler Lecture, and that this would be the subject of an occasional paper to be published later this year.

Dr Hudson went on to report that there had been problems with funding, following the introduction by the RSC of a revised method of determining allocations to subject groups. The initial allocation had given us only 43% of last year's allocation, an amount that would make it impossible for the Group to continue with its current level of activity. However, however, discussions with senior staff at the RSC had resolved the situation, and the shortfall had been more or less made up in a revised allocation. It was noted that one reason for this that the Group's work in outreach is particularly valued, and in connection with this, Dr Hudson asked that if any members of the Group gave lectures or carried out any other activity that could be considered outreach, they let the Secretary know by email (at jwnicholson01@gmail.com), and he would collate an annual report of such activities for the year.

The Group was involved in two Chemical Landmark events, one to Sir Edward Frankland in Lancaster at which Dr Hudson spoke, and one to Sir John Cornforth at Sittingbourne at which Professor Hanson spoke.

Dr Hudson noted that there were currently 672 members of the Group. He thanked the committee for their work over the past year, and singled out Peter Reed for particular thanks for his many years of service on the committee, noting that he was standing down at this AGM as he was shortly relocating to America.

b) *Secretary's report (Professor John Nicholson):* Professor Nicholson had nothing to add concerning the past year, but noted that two meetings were planned for next year. One was scheduled for the spring, on the Life and Work of Robert Burns Woodward (date to be confirmed), and one was scheduled for the autumn, on the History of Anaesthesia (18th October 2017).

c) Treasurer's report (Dr Peter Morris): Dr Morris reported that our accounts were as follows: Current account: £6136-59; Deposit account (Wheeler Bequest): £4716-25. The financial situation was therefore healthy, though care would be needed in future, following the change in the method used by the RSC for allocating funds to subject groups. It was also noted that we had received extra financial support from the RSC for some of our recent meetings, and that the balances were also somewhat inflated because of the delay by the printer in submitting invoices.

5. Election of Officers and Committee: The Chairman, Secretary and Treasurer, plus the current committee (with the exception of Peter Reed) were proposed for re-election (Proposer: Peter Reed, Seconder: Julian Perfect).

6. Any Other Business: There was none.

7. Date of next AGM: 18 October 2017, as part of our one-day symposium at Burlington House

Accounts for RSC Historical Group for 2016

Receipts	£	£
RSC Deposit Account	35.76	
Annual Grant	3 745.00	
Donations	500.00	
Meetings and Conferences	180.00	
Total Income	4460.76	
Payments		
Meetings and Conferences		3 987.75
Committee Meetings		628.95
Committee Travel Expenses		169.50
Stationery and Postage		599.06
Committee Teas and Coffee		43.20
Bank Charges		2.67
Total Expenditure		5 431.13
Surplus (Deficit) for the year		(970.37)
Summary		
Balance at 31st December 2015		12 023.75
Surplus (Deficit) for 2016		(970.37)
Balance at 31st December 2016		11 053.38
Cash at Bank		
Current (Bankline)		1 997.33
Current (other)		4 304.03
RSC deposit		4 752.02
Balance as at 31st December 2016		11 053.38

RSC NEWS

Symposium Commemorating the 150th Anniversary of the Gesellschaft Deutscher Chemiker

25 October 2017, Royal Society of Chemistry, Burlington House, London

The Gesellschaft Deutscher Chemiker (GDCh, German Chemical Society) is celebrating its 150th anniversary in 2017. To mark this milestone, it is joining with the Royal Society of Chemistry, which marked its 175th anniversary in 2016, to hold a one-day meeting on Wednesday 25 October 2017 in the Royal Society of Chemistry's Burlington House headquarters.

Led by the Presidents of the GDCh and RSC, the meeting will commemorate the creation and shared history of the two societies, marked in particular by the contribution of August Wilhelm von Hofmann, President of the Chemical Society of London from 1861 to 1863 and, after his return to Berlin, Founding President of the Deutsche Chemische Gesellschaft (DChG) in 1867. The all-day program of activities will revolve around the theme of past, present and future activities and collaboration: this will include a historical exhibition celebrating the contribution of eminent chemists from Germany and the UK over the last 150 years together with talks on the shared history, a scientific program with plenary talks from leading German and UK chemists, the presentation of the Alexander Todd – Hans Krebs Lectureship in Chemical Sciences to Professor Thomas Carrell from Ludwig Maximilians Universität München, and a panel discussion led by the Presidents of both Societies on the future of the chemical sciences.

For further details and to register please visit http://www.rsc.org/events/detail/27201/symposium-commemorating-the-150th-anniversary-of-the-gesellschaft-deutscher-chemiker

Accessing and Using the RSC's Digital Archive

The digitised material in the collection, which is of value to many chemists in addition to those with an interest in the history of chemistry, can be accessed and saved by RSC members free of charge. You will need your member username, which is your six digit membership number (on your membership card), and your password, which is your date of birth expressed numerically in the format YYYYMMDD.

To Access the Historical Collection

Go to http://pubs.rsc.org/historical-collection

On this page there is a panel where you can click to obtain general information on the historical collection and guidance on how to access.

Books and Papers in the Historical Collection

The RSC holds an extensive range of classic works, with titles by Lemery, Lavoisier, Priestley, Davy and others.

Having reached the Historical Collection page (link above), click on *Historical Books and Papers*.

Sign in with your member username and password.

Either enter a search term, which will search the entire collection, or click on one of the four currently digitised components of the Historical Collection (Main Collection, The Roscoe Collection, Davy Bookcase, or The Nathan Collection), which will bring up a searchable list of the books in that part of the Historical Collection.

An item in the collection can be downloaded and saved as a PDF file. Not surprisingly, the file sizes for books are large.

Society Publications and Minutes in the Historical Collection

This collection contains material produced by the Royal Society of Chemistry, the Chemical Society and the Royal Institute of Chemistry, including minutes of the Chemical Society from 1841 and the (Royal) Institute of Chemistry from 1877, magazines (e.g. *Chemistry in Britain* and *Education in Chemistry*), annual reviews, monographs, and lists of Fellows.

From the Historical Collection page (link above), click on *Society Publications and Minutes*.

Enter a search term (e.g. the title of an article in *Chemistry in Britain*), or click on one of the components of the collection (e.g. *Chemical Society Council Minute*s or *Chemistry in Britain*, and then select year and volume).

Note: for *Chemistry in Britain* and *Education in Chemistry*, when you have selected an issue, only the main articles appear in the contents list. The entire issue can be viewed by clicking the box *Download full PDF*.

Papers in RSC Journals

Also of great value is the archive of all journals published by the RSC and its predecessor societies from 1841 (with the exception of issues less than ten years old). This archive is published on a different platform from the Historical Collection, and a different login procedure is required.

Go to http://pubs.rsc.org/en/journals

Click *Log In* (top left of screen).

Here you are offered three login options. Click *Log in with your member or subscriber username and password* (NOTE this is not the option offered automatically – it is No. 3 on the list).

Enter your username and password.

Click *Journals*.

In the "Browse by" list, select *All Journals* (this will list both current and discontinued journals), then enter details in "Find an issue" or "Find an article".

If you don't have enough details or if you don't have a specific article in mind, try clicking *Advanced* at top of page, click on *Journals*, and insert author name and any other available details (e.g. date range).

Select paper to be viewed by clicking on *PDF*.

Download paper.

Philosophical Transactions of the Royal Society

This is not available from the RSC, but go to

http://rstl.royalsocietypublishing.org/content/by/year

This gives access to all papers 1665-1886. For papers from 1887 onwards, choose Series A or Series B.

Select volume and then paper by clicking on *PDF*.

Proposed Webinars

In collaboration with the Historical Group and the RSC Library, the Chemical Information and Computer applications Group (CICAG) is intending to run some webinars which will be open to all RSC members, during which users of the Digital Archive will be able to learn more about the collection, and compare their experiences. More information will be made available once details have been finalised. Contact Helen Cooke, Chair of CICAG (helen.cooke100@gmail.com).

John Hudson

Many thanks to Helen Cooke and David Allen for help in preparing these guidance notes.

New RSCHG Wheeler Lecture Published Online

Since 1997 the Royal Society of Chemistry Historical Group have published Occasional Papers, which are the texts of lectures given by notable historians of chemistry to the Group. In April 2017, Peter J.T. Morris' Wheeler Lecture *Robert Burns Woodward in His Own Words*, was published in hard copy and online to mark the centenary of the birth of Robert Burns Woodward. An abstract of the paper follows:

Peter Morris' Wheeler Lecture explores Robert Burns Woodward's distinctive writing style. This was very different from the style of his colleagues even in the days when chemists wrote papers in a less robotic manner than now. The lecture shows how Woodward was interested in the history of chemistry, it demonstrates the importance of theory and instrumentation in his lifetime, and explores his views on the purpose and planning of syntheses. A belief in the sensuousness of chemistry, considering nature as a source of material and the way that creativity was constrained by the laws of nature were all important for Woodward. Morris argues that Woodward's understanding of nature and the role played by wonder indicates that there is more than a trace of the Scottish Enlightenment, especially the work of Adam Smith, in his thinking. The lecture is published alongside a biography of Robert Burns Woodward written specially for the one hundredth anniversary of his birth in 1917. This biography sheds new light on Woodward's family background.

In addition to Peter Morris' paper, Anthony S. Travis - *Nitrogen, Novel High-Pressure Chemistry, and the German War Effort (1900-1918),* (April 2015) and Frank A.J.L. James - *'the first example … of an extensive scheme of pure scientific medical investigation': Thomas Beddoes and the Medical Pneumatic Institution in Bristol, 1794 to 1799,* (November 2016) have been published as PDFs, and copies can be downloaded from the following websites:

http://www.rsc.org/Membership/Networking/InterestGroups/Historical/occasional-papers.asp

http://www.sbcs.qmul.ac.uk/rschg/

The first six Occasional Papers by Mary Archer, Robert G.W. Anderson, Seymour H. Mauskopf, David Knight, William H. Brock, David Knight and Colin A. Russell are currently only available in hard copy and can be found in the Royal Society of Chemistry Library, the British Library and the Whipple Library. It is hoped they will all be available online in due course. Jeffrey Seeman's Wheeler Lecture *R.B. Woodward: His Unpublished Letters and His Lighter Side,* given at the RSCHG meeting held on 10 May 2017, will be the next in the series to be published.

OBITUARY

Professor Eric Banks

Long-standing member Eric Banks died in February 2017 aged eighty-four. Most of his academic life was spent in the Chemistry Department, UMIST, working on organo-fluorine compounds. His book "*Fluorocarbons and their derivatives*" (Oldbourne Press, 1964) contained a significant amount of background historical material, but perhaps his greatest historical contribution was to edit the 660 page text *"Fluorine Chemistry at the Millennium*" (Elsevier, 2000) with its chapters on the growth of the discipline in both industry and academia. Second-hand copies of this book are extremely expensive, but portions are freely accessible on-line, courtesy of Google Books, and are well worth exploring. Eric's prompting led us to host a whole day highly-successful conference in March 2013 on *Some Historical Aspects of the Chemistry of Fluorine*. Our condolences go to his family, especially his wife, Linda.

Alan Dronsfield

MEMBERS' PUBLICATIONS

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

C.J. Cooksey, "Quirks of dye nomenclature. 7. Gentian violet and other violets", *Biotech. Histochem.,* 2017. http://dx.doi.org/10.1080/10520295.2017.1286038

The name gentian appeared about 1880 and is thought to have been introduced by the German pharmacist Georg Grübler. Immediately following its discovery in 1861, by Charles Gustave Lauth (1836–1913), this violet dye was known as *Violet de Paris* or as methyl violet. Initially used as a textile dye, it was soon used to colour virtually anything. The names and identity of the components, the varying modes of manufacture, analytical methods and the dye's significant contribution to biological staining are discussed here. Finally, the author discusses the dye's declining medical use following the revelation of its toxic nature.

K. Ramig, A. Islamova, J. Scalise, S. Karimi, O. Lavinda, C. Cooksey, A. Vasileiadou, I. Karapanagiotis, "The effect of light and dye composition on the color of dyeings with indigo, 6-bromoindigo, and 6,6'-dibromoindigo, components of Tyrian purple", *Struct. Chem.*, 2017. http://dx.doi.org/10.1007/s11224-017-0932-0

Chris Cooksey provided the historical introduction to this paper in which quantitative HPLC and colorimetry are used to study colour variations in dyeings with indigo, 6-bromoindigo, and 6,6'-dibromoindigo, the main components of the historic dye Tyrian purple.

Chris Cooksey, "Recent advances in the understanding of the chemistry of Tyrian purple production from Mediterranean molluscs". A presentation at a meeting in Lecce in May 2013 published in Hedvig Landenius Enegren and Francesco Meo (eds.), *Ancient Textiles,* Series 30*, Treasures from the Sea*: *Sea Silk and Shellfish Purple Dye in Antiquity*, pp. 73–78. £38.00. (Oxford and Philadelphia: Oxbow Books, 2017). A review with about twenty references including much historical detail.

For more information contact: chriscooksey8@gmail.com

Fritz Haber's Method and Where It Led

Two new studies related to the high-pressure synthesis of ammonia have recently appeared, one on Haber's collaborator, Robert Le Rossignol, the other on the international expansion of the ammonia industry after 1918:

Derri Sheppard, "Robert Le Rossignol, 1884-1976: Engineer of the 'Haber' Process", *Notes & Records Roy. Soc.,* 2017. DOI: 10.1098/rsnr.2016.0019.

Anthony S. Travis, "Globalising Synthetic Nitrogen: The Interwar Inauguration of a New Industry", *Ambix*, February 2017, 1-28.

http://www.tandfonline.com/eprint/wbPi887mCUIDiQKU7piE/full

PUBLICATIONS OF INTEREST

Contents of *Ambix*

November 2016, volume 63, issue 4

Dorothea Heitsch, "Descartes, Cardiac Heat and Alchemy", 285-303.

José Vieira Leitão, "Alchemy, Prophecy, and Politics in Eighteenth-Century Iberia: Anselmo Castelo Branco's Critique of Benito Feijoo", 304-325.

Marcin Krasnodebsik, "From Distillation to Standardization: A French Perspective on the Shaping of Turpentine Spirit (1909–1976)", 326-346.

February 2017, volume 64, issue 1

Anthony S. Travis, "Globalising Synthetic Nitrogen: The Interwar Inauguration of a New Industry", 1-28.

Fabrizio Bigotti, "A Previously Unknown Path to Corpuscularism in the Seventeenth Century: Santorio's Marginalia to the *Commentaria in Primam Fen Primi Libri Canonis Avicennae* (1625)", 29-42.

William H. Brock, "British School Chemistry Laboratories, 1830-1920", 43-65.

Leon Gortler and Stephen J. Weininger, "Private Philanthropy and Basic Research in Mid-Twentieth Century America: The Hickrill Chemical Research Foundation", 66-94.

Contents of the *Bulletin for the History of Chemistry*, 2016, vol. 41, Nos. 1 and 2

Alexander Kraft, "Addendum to 'On the Discovery and History of Prussian Blue'", 1-2.

David E. Lewis, "Klaus at Kazan: The Discovery of Ruthenium", 3-11.

David W. Moreland and Paul R. Jones, "Emil Fischer's Sample Collection", 12-18.

William B. Jensen and Peter J. T. Morris, "From Chemical Theory to Industrial Chemistry: The Eclectic Career of Geoffrey Martin", 19-37.

Jessica L. Epstein, "The Legacy of Tetraethyllead", 38-43.

Tom Scheiding, "More Than Meets the Eye: Chemical Foundation Investments in the Journal of Chemical Education", 44-55.

Jeffrey Kovac, "Ethics of Chemical Weapons Research", 56-63.

Seth C. Rasmussen, "On the Origin of 'Synthetic Metals': Herbert McCoy, Alfred Ubbelohde, and the Development of Metals from Nonmetallic Elements", 64-73.

Comment and Response: Rediscovering Pyrotartaric Acid, 74.

Contents of the *Bulletin for the History of Chemistry*, 2017, vol. 42, No. 1

Ursula Klein, "Chemists for the Common Good", 1-6.

G.J. Leigh, "The Changing Content of *Conversations on Chemistry* as a Snapshot of the Development of Chemical Science", 7-28.

Frederick G. Page, "Carbon Dioxide in Self-Rising Flour and Baking Powder: A Study in Apparatus, Scheibler to Chittick", 29-45.

Vladislav Sunstov and David E. Lewis, "After the Revolution: Nikolai Mateevich Kizhner (1867-1935) in Soviet Moscow", 46-56.

Nenad Raos, "Carbide Chemistry and Oparin's Theory on the Origin of Life", 57-62.

Seth C. Rasumussen, "Cuprene: A Historical Curiosity Along the Path to Polyacetylene", 63-78.

Jeffrey I. Seeman, "Moving Past a Seminal Generation in the History of Chemistry: A Moment to Reflect", 79-80.

From Bench to Brand and Back: The Co-Shaping of Materials and Chemists in the Twentieth Century

Edited by Pierre Teissier, Cyrus C.M. Mody, Brigitte Van Tiggelen, Série III, n°2, 2017.

Through eight case studies including paint, plastics, fertilisers and carbon nanomaterials, this volume sketches the mutual shaping of chemists and materials in the long twentieth century. The circulation among interconnected fields and activities from bench research to engineering processes to brand consumers to human cultures and the natural environment highlights two features of modern technosciences: scaling up and down and the transgressive, boundary-blurring ways in which people, things, and words affect (or trans-operate on) each other.

It can be downloaded for free at: http://www.cfv.univ-nantes.fr/cahiers-francois-viete-presentation-1231373.kjsp?RH=1405598162629&RF=1405598162629

NEWS AND UPDATES

Hidden Figures: Updating the Image of Women in Chemistry

Within this newsletter you will find John Nicholson's review of *A Chemical Passion*, a fascinating book exploring the teaching of chemistry in girls' schools from as early as the 1820s. Earlier this year, "Hidden Figures", a biographical account of three brilliant African-American women at NASA became a box office smash-hit; to date it has made more than $230 million dollars. Amongst young people there is evidently an interest in the narrative that leads to science and engineering discoveries, an enthusiasm for chemistry education and a need for more context surrounding careers in chemistry. Young people spend more than eight hours a day online, and whilst women making up 50% of A-Level classes and undergraduate courses, they are not well represented at senior levels. Systematic bias within Wikipedia has means that women in science are woefully underrepresented there too: only 16.98% of biography articles are about women. The RSC Diversity group generously agreed to support our mission: to increase the number of women in chemistry on Wikipedia by getting school girls to research, create and populate their biographies.

The Hidden Figures Wikithons are one-day events that run in schools and universities. The day begins with speakers sharing stories of their personal chemistry heroes from history: so far, we have welcomed speakers from Imperial College and the Diamond Lightsource, as well as the RSC Historical Group's John Nicholson. Then, after being taught about reliable, non-biased sources by experienced Wikipedia editors, the students begin their own research adventure. To get started, they use various books from the Wellcome Library as inspiration, including *Chemistry Was Their Life: Pioneering British Women Chemists, 1880-1949*, *Women in Chemistry*, *Notable Women Scientists* and volumes of *Candid Science*, and also conduct their own research to find sources online. Through university archives and academic papers the girls start to build a previously untold picture of the women behind fascinating discoveries.

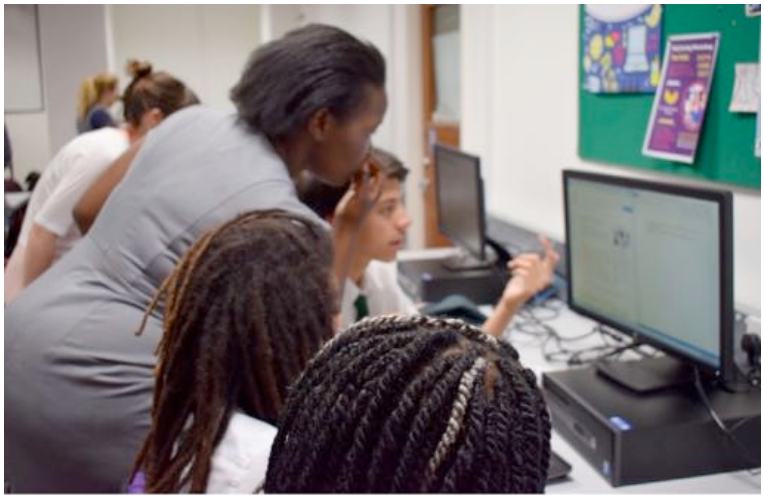

Figure 1: Students and their teacher crafting a Wikipedia article

The project is exciting for teachers, students and researchers alike, who are fascinated by their research and shocked by the gender gap. To date, two hundred students aged twelve to fifteen have learned how to edit and made meaningful improvements to the online encyclopaedia in just the few hours allotted to the sessions. They have created over twenty biographies for women in chemistry on Wikipedia and improved even more. Pages either in the pipeline or already created and improved include: Frances Micklethwait, who was awarded an MBE for her research during the First World War; magnetochemist Cecilie Mary French; May Sybil Leslie (pictured), whose research on dyes led to her RSC Fellowship; and Reiko Kuroda, known for her research on chirality. As with any pages on Wikipedia, these are works in progress – if you'd like to contribute more information on these or other women scientists to Wikipedia, dive in!

Figure 2: May Sybil Leslie

These Hidden Figures Wikithons are just the beginning for the students involved. Their teachers are already talking about having lunchtime editing sessions and running more women in science wikithons for British Science Week 2018, and who knows what exciting careers in science the students may be inspired to pursue with their new role models in mind…

This project is the collaboration between a Historian of Science, Dr Alice White, Wikimedian in Residence at the Wellcome Library, and Dr Jess Wade, a postdoctoral researcher in the Centre for Plastic Electronics at Imperial College London. Alice has worked with several learned societies (such as the Institution of Engineering and Technology) and big organisations (such as the BBC) to get women's stories online, and Jess orchestrates lots of different events to promote Women in STEM, including sitting on the WISE young women's board – she recently won the Jocelyn Bell Burnell award. To find out more and start your Wiki-adventure, please contact jessica.wade@imperial.ac.uk or a.white@wellcome.ac.uk. You can find more information on:

https://en.wikipedia.org/wiki/Wikipedia:WikiProject_Women_scientists as well.

Alice White and Jess Wade

Johnson Matthey Celebrations Continue

2017 sees the 200th birthday of Johnson Matthey which was founded in London in 1817 as a gold assaying business by Percival Norton Johnson. Various articles on the celebrations have appeared online.

https://www.chemistryworld.com/news/how-do-chemical-firms-last-hundreds-of-years/3007065.article

http://www.matthey.com/media_and_news/news/2017/johnson-matthey-celebrates-200-years-of-inspiring-science-and-sustained-innovation

SOCIETY NEWS

British Society for the History of Pharmacy

The BSHP celebrated their fiftieth anniversary at their annual conference held in London on 1-2 April 2017. This year a number of changes are taking place at the BSHP. In collaboration with the International Society for the History of Pharmacy, the BSHP's quarterly journal *Pharmaceutical Historian* is now available as an open access online publication, starting with the March 2017 issue.

http://www.ingentaconnect.com/content/bshp/ph/2017/00000047/00000001

The Society is also now publishing a *Gazette* (distributed by email) to keep members up to date with news and activities. For more information, including details on future events and membership, please visit http://www.bshp.org/bshpwebsite/index.htm

History Division of the American Chemical Society

The History Division of the American Chemical Society is delighted to announce that Professor Jeffrey I. Seeman, University of Richmond, Richmond, Virginia, USA, has been awarded the HIST Award for 2017. This award is the successor to the Dexter Award (1956-2001) and the Sydney M. Edelstein Award (2002-2009), also administered by the Division of the History of Chemistry. The HIST Award will be presented to Prof. Seeman at the fall national meeting of the American Chemical Society in Washington DC, on 20-24 August 2017.

Society for the History of Alchemy and Chemistry

Partington Prize for 2017

The Society for the History of Alchemy and Chemistry is delighted to announce that the 2017 Partington Prize has been awarded to Stephen T. Irish (Cambridge University) for his article "The Corundum Stone and Crystallographic Chemistry". The essay will be published in the Society's Journal, *Ambix*, and a presentation made to Stephen Irish at SHAC's autumn meeting on 30 September 2017 at the Maison Française, Oxford. The Partington Prize was established in memory of Professor James Riddick Partington, the Society's first Chairman. It is awarded every three years for an unpublished essay on any aspect of the history of alchemy and chemistry. The prize consists of £500.

2018 Morris Award: Call for Nominations

The Society for the History of Alchemy and Chemistry solicits nominations for the 2018 John and Martha Morris Award for Outstanding Achievement in the History of Modern Chemistry or the History of the Chemical Industry. This award honours the memory of John and Martha Morris, the late parents of Peter Morris, the former editor of *Ambix*, who has contributed the endowment for this award. The recipient chosen to receive the Morris Award will be expected to deliver a lecture at a meeting of SHAC, where the awardee will be presented with an appropriate framed photograph, picture or document and the sum of £300. The award is international in scope, and nominations are invited from anywhere in the world. For more details visit www.ambix.org .

A complete nomination consists of

• a complete curriculum vitae for the nominee, including biographical data, educational background, awards, honours, list of publications, and other service to the profession;

• a letter of nomination summarising the nominee's achievements in the field of history of modern chemistry and/or the history of the chemical industry and citing unique contributions that merit this award; and

• two or more seconding letters.

Only complete nominations will be considered for the award and the nomination documents must be submitted in electronic form. All nomination materials should be submitted by e-mail to Peter Morris at doctor@peterjtmorris.plus.com and a separate email which indicates that the material has been submitted should be sent to the same address (a precaution in case of incomplete transmission of documents) for arrival no later than 1 May 2018.

SHORT ESSAYS

William Herapath (1796-1868) – the first professor of chemistry in Bristol

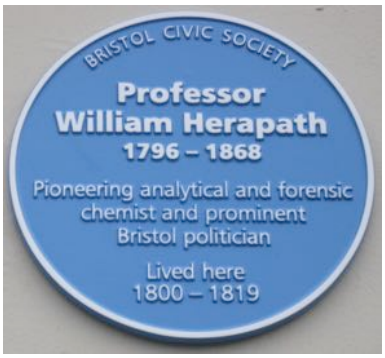

Fig. 1, The Herapath Plaque in Bristol

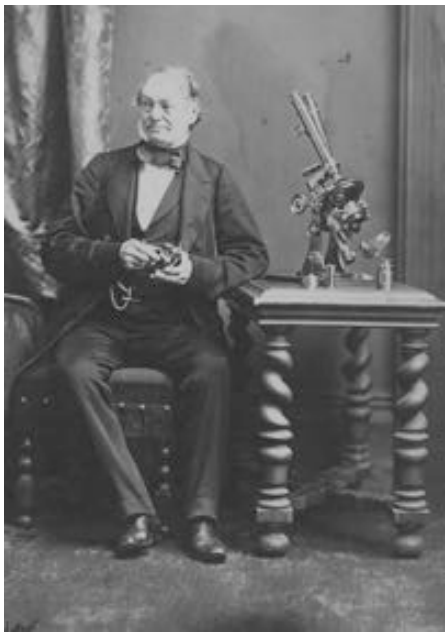

Fig. 2. William Herapath

On 20 February 2017 a Bristol Civic Society blue plaque [Fig.1] commemorating Professor William Herapath [1] [Fig.2] was unveiled on the outside wall of the *Packhorse* public house in Lawrence Hill, Bristol. In 1833 Herapath was appointed to the staff of the newly opened Bristol Medical School, initially as lecturer, but subsequently promoted to professor, in chemistry and toxicology. He was a self-taught, analytical chemist who gained public fame as an expert witness on the use of poisons in many murder trials and also as the first person in Bristol to use anaesthetics in both hospital surgery and dental extractions. He was very active in local politics and became a well-known public lecturer in Bristol. Moreover, he was the first of five generations of Herapaths who practiced as medics or scientists in and around Bristol. Furthermore, his first cousin, John Herapath, was a mathematician – also self-taught.

William Herapath was born in Queen Street, near the Castle Green area of Bristol, where his father ran the former *Jolly Meter* pub. In 1800 his father took over the *Packhorse* pub and brewery in Lawrence Hill, where William grew up, and which he inherited when his father died in 1816. However, the brewer and publican's life was not for him, although he retained ownership of the *Packhorse* at least until the 1840s. Instead, his attention turned to the newly emerging science of chemistry. It could well be that his initial interest in the subject arose from his close observation of the brewing process. On the other hand, it could have been his somewhat eccentric schoolmaster, Mr George Pocock, who stimulated his interest. Pocock was an amateur inventor, who liked to involve his pupils in his experiments. After leaving school at sixteen, Herapath worked in a local bank, but continued his chemical experiments at home.

In 1819 William married Sophia Bird and the couple set up home at 56, Old Market, where their six children (three boys and three girls) were born. In 1823 he published his first scientific paper [2], in collaboration with a local zinc-smelting company (P. George & Co.), which describes an analytical method for determining the amount of cadmium impurity in commercial zinc dust.

In 1826, a local surgeon, Mr Henry Clark, opened a "theatre of anatomy" in Kings Square, Bristol, to which a lecture theatre was added the following year. In 1828, William Herapath, whose reputation as an analytical chemist in Bristol was by now firmly established, was appointed to teach chemistry at the Kings Square institute, which took the name: "The Bristol Medical and Surgical School". However, "rival" anatomy and surgery courses were also being given at the Bristol Infirmary on nearby Marlborough Street. In 1832, the Bristol General Hospital opened in Guinea Street, and that year agreement was reached to bring together all the various training courses for surgeons, physicians and apothecaries in Bristol, within a single institute, to be called the "Bristol Medical School" [3]. This was initially located at the Kings Square site, but in 1834 it moved into new premises behind Lunsford House on Park Row.

The Herapath family moved house to 2, Old Park. This was very close to the Medical School, where William taught chemistry and toxicology until his retirement in 1867. Although the students found his lectures interesting and stimulating, he gained the reputation of having a quick temper and a rather brusque manner. After one particular lecture, one snowy morning, someone threw a snowball at him, which knocked his hat off. He was not pleased and threatened to thrash the culprit if he caught him!

In 1879 the Bristol Medical School was incorporated (as the new medical faculty) within the then University College of Bristol (founded 1876), and moved into a new building on University Road in 1880. The former medical building was incorporated into the industrial school for boys (located since 1859 in Lunsford House). In 1922 the school closed and the old Medical School building itself was acquired by the University of Bristol (founded 1909) as a store house until it was finally destroyed during a bombing raid on Bristol in the Second World War. In the early 1960s the site was cleared, and construction of the University's new School of Chemistry commenced. Herapath would no doubt have been very pleased!

Alongside his teaching duties at the Medical School, Herapath was very busy in many other spheres, including research. The portfolio of analytical chemistry challenges he was presented with was very broad-based, ranging from determining the presence of lithium salts in the excreta of silkworms to analysing the colouring matter in the wrappings of an Egyptian mummy. In 1844 he published an analysis of the Hotwells Spa waters, comparing his results with an earlier analysis of the Bath Spa waters. He later incorporated his results for the Hotwells waters in a guidebook he edited: *Handbook for Visitors to the Bristol and Clifton Hotwells* [4]. In this guidebook Herapath lists the ailments that it was thought the waters could cure, including "weakness /irritation of the lungs, chronic diarrhoea, and sterility - in either sex"!

It was as a toxicologist that Herapath became best known to the wider public. To quote one source [5]: "During his lifetime the courts sought his assistance in many of the *causes célèbres* of the day, his opinions were quoted in the leading texts on toxicology". Perhaps his most famous court case in Bristol was the trial in 1835 of Mary Ann Burdock, who was accused of murdering, by arsenic poisoning, Mrs Clara Ann Smith, a 60-year-old widow, who was a lodger in her house [6]. Clara died in October 1833. A verdict of death by natural causes was returned by the coroner at the time. It was some time after that some of her relatives became suspicious that Mary Burdock appeared to have become considerably wealthier. Eventually, the police were called-in and the coroner ordered the exhumation of Clara Smith's corpse in December 1834. The internal organs were sufficiently preserved, even after 14 months in the grave, for samples to be sent for analysis to William Herapath at the Medical School. He was able to show that the stomach contained sufficient arsenic to have caused death. Mary Burdock was arrested and tried at the 1835 Bristol Spring Assizes; she was found guilty of murder and hanged. Herapath's method of determining arsenic in Clara Smith's corpse was original but involved. It pre-dated the method, devised in 1836, that became widely used subsequently by forensic analysts, namely the "Marsh test" [7].

Herapath was also a pioneer in the use of anaesthetics in Bristol. Although ether and chloroform had been used previously in London, Herapath was the first person in Bristol, in December 1846, to administer ether as a general anaesthetic during an operation. He assisted the surgeon during a leg amputation on a young man at the Bristol General Hospital. The *Bristol Mirror* reported: "The patient was thrown into a state of utter insensibility, by means of the bladder by which Mr Herapath introduced the ether and caused the patient to inhale the vapour" [8]. Herapath would have been very familiar with the research, a few decades earlier in Bristol, of Thomas Beddoes and Humphry Davy at the Pneumatic Institution in Dowry Square, on the possible medical uses of nitrous oxide [9]. Although Beddoes and Davy had discovered the strong psychedelic and hallucinogenic effects of inhaling nitrous oxide (which became known subsequently as "laughing gas"), and were even aware that it numbed pain, they never tried it as an anaesthetic. A few days after Herapath had used ether during surgery, he used nitrous oxide during a dental extraction. The *Bristol Mirror* this time records that a young lady from Stoke Bishop, who had been suffering from a toothache, went to Mr Gordon's dental practice on Park Street and "being rendered insensible to pain by Mr Herapath, the extraction was successfully performed without the least pain to the lady" [10].

Herapath was greatly concerned by the major outbreaks of cholera that occurred in Bristol in 1832 and again in 1849. He held the conventional view at the time that cholera resulted from the inhalation of putrid gases emanating from decaying animal flesh. In 1848 he published, with others, a pamphlet, entitled *Hints on Domestic Sanitation*, with the intention of reducing the extent of cholera [11]. A group of other doctors in Bristol, led by William Budd (a physician at the Infirmary) subsequently came to realize that cholera was not carried in the air, but in contaminated drinking water [12].

Herapath had a great enthusiasm for lecturing, not only to medical students, but also to the wider public. He had particular concern for the broader education of working people, both men and women. Beginning in October 1836, he presented a series of four, weekly lectures at the Mechanics' Institution (1825-1845) in Broadmead. The first lecture was on the properties of air and fire; the second was on the properties of water; the third was concerned with baking, brewing and similar common chemical processes. However, it was the topic of the fourth lecture which attracted the largest audiences, so much so that many people had to be turned away. The topic was nitrous oxide and during the lecture Herapath demonstrated its peculiar properties. One contemporary report noted: "In the majority of those who took the gas it occasioned a pugnacious tendency….it was a matter of congratulation that a magistrate was present to prevent a breach of the peace. The scene was as truly comic as can be conceived" [13].

Herapath was not only very active in science and education, he was also very much involved in local politics in Bristol. Around 1830 a number of provincial English cities formed political unions, modelled on the highly successful one that had been set up in Birmingham. Their primary aim was the reform of Parliamentary representation and local government. The membership of the political unions was mainly drawn from the various

professions. Bristol's Political Union was set up in 1831 (in Bristol in 1831 only around six percent of the population of around 100,000 had the vote). William Herapath was a founder-member, and was elected Vice-President. He gave frequent open-air speeches protesting against the poverty resulting from unemployment and the high price of basic goods. He was also concerned about problems of public hygiene and campaigned for public baths and washhouses in Bristol, but his message was largely ignored by the Bristol Corporation. The Bristol Political Union was suspicious that the Corporation was not making proper use of public funds and that some chartable funds were being diverted for party-political purposes. When the House of Lords rejected the first reform bill of 1831, which had been passed by the House of Commons, Herapath was outraged.

The Bristol Recorder, Sir Charles Wetherell, had voted against the reform bill in the Commons (he was also an MP, representing Boroughbridge in Yorkshire, which had two MPs – the same as Bristol - but an electorate of only forty-eight men). So when Wetherell came to Bristol to open the half-yearly Assizes on Saturday 29 October 1831, he was not well received. So much so that the protests that accompanied his arrival became out of control, culminating in the infamous Bristol Riots [14], in which many prominent buildings were destroyed in the City, particularly in Queen's Square, where Wetherell was due to stay in the Mansion House. Another of the buildings attacked by the mob was the new Bristol Gaol on Cumberland Road. In his capacity as the Vice-President of the Political Union, Herapath went to the gaol to try to dissuade the mob. Although he was listened to with respect, he could do nothing to stop the attack. Herapath then went to the Council House to suggest that the swing bridges that led to the gaol (essentially located on an island between the Floating Harbour and the New Cut) be closed to maroon the rioters, but he was not listened to. However, the Corporation did appoint 200 special constables, one of whom was William Herapath (another was Isambard Kingdom Brunel), in an attempt to keep order, but these were ineffective and after three days troops, who up till then had been kept on stand-by, were deployed to quell the riot. The Parliamentary Reform Bill was finally passed in 1832. Bristol Corporation was also reformed and William Herapath was elected as a Liberal Councillor from 1835 to 1840, and then again from 1842 to 1863, representing the St James ward. He also served as a senior magistrate and as a trustee of *Bristol Charities* (which took over many of the charities formerly administered by the Corporation), from its inception in 1836 until he died in 1868.

William's first cousin, John Herapath (1790-1868) [15] was born in Bristol but moved to London in 1820. He became a renowned applied mathematician, who made significant early contributions to the kinetic theory of gases [16], prior to the seminal work of Maxwell and Boltzmann. Two of William's three sons followed in their father's footsteps. His youngest son, Thornton John Herapath (1830-1858) worked closely with his father at the Bristol Medical School until he took an appointment in Chile, as chief chemist with the South American Smelting Company. Sadly he was drowned at sea, aged twenty-eight, during a return voyage home. William's eldest son, William Bird Herapath (1820-1868), who returned to Bristol after qualifying as a doctor in London, was appointed to St Peter's Hospital. He went on to be elected a Fellow of the Royal Society, primarily for his discovery of quinine iodosulphate (later named "Herapathite"), a crystalline solid which is strongly light-polarizing and was subsequently used in such products as "Polaroid" sheet [17]. William Bird Herapath's son, grandson and great-grandson all went on to be medical doctors in or around Bristol. His great-grandson, Geoffrey Herapath, who was a general practitioner in Saltford, died in 2009, bringing to a close the Herapath dynasty, comprising five generations of doctors and scientists.

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Davy hits the headlines (again)

The following is an account of how a historical perspective has influenced both the course of some recent research and also its reception.

On 11 February 2016, the Society for the History of Alchemy and Chemistry's (SHAC) spring meeting was entitled *High pressure in the interwar period*. Topics naturally included the Haber process for the high pressure conversion of nitrogen and hydrogen gases to ammonia. Haber received the Nobel Prize for chemistry of 1918 for his work, which solved the problem for mankind posed by the "worldwide economic necessity of supplying bound nitrogen to the soil", now that natural mechanisms were inadequate on account of population growth and demographics, globalisation (in modern parlance), and industrial demand for nitrogen [1]. At the time, his solution, by "fixing" *atmospheric* nitrogen, appeared sustainable (again in modern parlance), unlike continued use of sodium nitrate from Chilean saltpetre, found in "the high-mountain deserts of Chile". Today, Haber-produced ammonia is key to world agricultural production.

Alan Dronsfield, a member of both the Historical Group and SHAC, spoke at the meeting about Haber's work and its antecedents, noting for instance that Davy had in 1807 reported the electrochemical fixation of atmospheric nitrogen.

Also a member of both the Historical Group and SHAC, I was in the audience – and was very struck by Alan's reference to Davy. Alan pointed me towards the key reference [2] and to later endeavours to fix nitrogen electrochemically by Swiss workers in 1922 [3].

Davy had reported the production of ammonia and nitric acid when water containing dissolved air was electrolysed between gold electrodes with a potential of *ca* 100 V. The Swiss workers electrolysed dilute sulfuric acid between a platinum black cathode and a platinum wire anode using lower potentials but under 200 atmospheres of nitrogen and obtained ammonia. Yields were low, though higher yields were obtained from 1998 to 2014 with nickel, palladium, and platinum electrodes.

The fact that nitrogen can be fixed electrochemically is not surprising from a thermodynamic point of view. Consider the following potentially useful overall reaction (occurring in the presence of excess water) –

$$N_2 + 2.25\ H_2O \rightarrow 0.75\ NH_4NO_3 + 0.5\ NH_3 \qquad \text{(R1)}$$

– in which 2 mol N in the 0 oxidation state disproportionate into 0.75 mol N in the +5 state and 1.25 mol N in the -3 state. First, one can reasonably imagine an electrochemical cell in which overall reaction (R1) is achieved:

reaction at the anode: $N_2 + 6\ e^- + 6\ H^+ \rightarrow 2\ NH_3$; (R2)

reaction at the cathode:

$$1.5\ NH_3 + 2.25\ H_2O \rightarrow 0.75\ NH_4NO_3 + 6\ e^- + 6\ H^+. \qquad \text{(R3)}$$

((R1) is of course the sum of (R2) and (R3).) Secondly, the potential required to drive this reaction, if it could be performed reversibly, can be estimated from tabulated thermodynamic data as *less than 1 V*.

But without the right catalysis, the kinetics of the half-cell reactions (R2) and (R3) are unfavourable.

For almost a century, then, atmospheric nitrogen has been fixed primarily by manufacturing nitrogen gas and hydrogen gas and combining these to form ammonia by use of the Haber process. The Ostwald process is used for oxidising the ammonia into nitric acid, so that, in turn, ammonium nitrate can be produced, including for direct use as a fertiliser. But the energy demand is high, and has been said to account for 3 % of world carbon dioxide emissions contributing to man-made climate change.

In May 2016, I was visited by my friend from Oxford days, Professor Robert Crabtree of Yale Chemistry Department [4]. The eventual result was a joint "perspectives" paper [5] in which key possibilities discussed were (i) the solar-powered electrolytic production of aqueous ammonium nitrate solution on farms where it could be directly applied to fields, and (ii) the use of *molecular electrocatalysts* rather than catalytic *electrodes* such as platinum.

Davy was cited in the paper, and this excited journalistic interest beyond our expectation. Robert was given the prominent "Opinion/comment" page in the RSC monthly magazine *Chemistry World* [6], which gave him an opportunity to promote our perspectives paper. The editorial staff clearly liked the Davy angle: the headline was "Deriving Mr Davy" and Gilray's "bathroom humour" satire of Davy demonstrating at a Royal Institution lecture [7] was reproduced. The story was then picked up by a journalist for *Chemical & Engineering News* [8], the

American Chemical Society's weekly magazine. The headline was "Nabbing nitrogen from the air to make fertilizer on the farm", but the very first sentence began "British chemist Humphry Davy ...".

Davy made the newspapers such as *The Observer* in his own time [9], and to this day is "good copy".

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http://www.nobelprize.org/nobel_prizes/chemistry/laureates/1918/haber-lecture.pdf See especially pages 327-328. This award was unpopular in former Allied countries. Haber had personally supervised the first use of poison gas (chlorine) on the Western Front in the First World War. Nitric acid made from ammonia is used also for manufacture of explosives.

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The Historic Practice of Deliberate Poisoning: With Reference to Dr Alphonse Normandy's Testimony to the Parliamentary Select Committee in 1855

As reported in the winter 2017 *RSCHG Newsletter* in September 2016 a blue plaque was unveiled at 91 Judd Street, Bloomsbury, London to commemorate the achievements of Dr Alphonse Normandy (1809-1864), especially as a pioneer in desalination processes [1]. He was also a highly respected analytical chemist and at the forefront of exposing the falsification of food and drink. In 1855 Normandy was among the "most eminent chemists and medical men of the day" who gave testimony to a Parliamentary Select Committee, chaired by the MP for Birmingham William Scholefield [2]. The committee was appointed to inquire into the Adulteration of Food, Drink and Drugs, an issue of growing concern at the time. Including Normandy there were seventeen witnesses: Arthur Hill Hassall, M.D., Robert Warrington (chemist), John Simon (Medical Officer of Health for the City of London), Sir John Gordon (Mayor of Cork), John Mitchell (chemist), Robert Dundas Thompson (Professor of Chemistry at St Thomas Hospital), Thomas Blackwell (wholesale pickle and sauce manufacturer – Crosse & Blackwell), Theophilus Redwood (Professor of Chemistry and Pharmacy, at the Pharmaceutical Society), Thomas Herring (wholesale chemist and druggist), Peter L. Simmonds (author and editor of *The Journal of Commerce*), John Postgate (Birmingham surgeon), Charles H. Burton (Treasury), George Phillips (Inland Revenue), Richard Archer Wallington (solicitor and Chairman of the Leamington Board of Health), Henry Letheby MD (analytical chemist) and Maurice Scanlan (apothecary, Dublin).

The published work of Alphonse Normandy

Normandy's name first appeared in print in 1848, as translator from German to English of Heinrich Rose's *Practical Treatise of Chemical Analysis* [3]. He was familiar with both languages, albeit a native French speaker, having been born into the Le Mire family of Rouen [4]. Normandy was an adopted surname, perhaps a useful reference to his birthplace's significance that would resonate with British clients. Normandy's next work was *A Practical Introduction to H. Rose's Treatise of Chemical Analysis* [5] and in the same year (1849) he wrote *A Guide to the Alkalimetrical Chest* [6]. In addition to providing analytical services, Normandy designed a "do it yourself kit" containing necessary glassware and reagents, all in a custom-made wooden chest, so that some of his clients could carry out a few of the more common tests themselves.

Normandy's move to Judd Street in 1850 coincided with the publication of his *Commercial Handbook of Chemical Analysis* [7], which he confirmed was the result of "ten years' investigation into bread, flour, tea and

coffee, milk, cocoa, gin and a host of other substances" [8]. The *Handbook* described "the various falsifications or impurities which naturally, accidentally or intentionally, may contaminate the various articles met with in commerce, and to enable the manufacturer, the miner, the trader and the public generally, to detect the nature and amount of these sophistications and impurities, in other words to ascertain the real or intrinsic value of such articles" [9].

Normandy's background

Normandy left no private papers, reminiscences or diary entries, so biographical accuracy is difficult, and much has to be arrived at by inference. Normandy introduces himself to the Parliamentary Committee in 1855 as "a physician, but I do not practice" [10]. This concurs with the 1841 Census records, where his occupation is registered as "Doctor" [11]. The French Revolution swept away the traditional system of professional recruitment [12], and this may have encouraged Alphonse to enter the medical profession, rather than pursue a career in commerce. Members of his family were *commerçants*, *négotiants* and *fabricants*; his paternal grandfather was a *vinagrier* [13]. Merchants and manufacturers were the most powerful, social, economic and political class in Rouen when Alphonse was growing up [14], but he obviously had an enquiring mind and chose to make chemistry his profession and London his home.

We learn from his obituary in *The Lancet* that Normandy trained as a surgeon, passed the necessary examinations, but "having in the course of his studies been led into chemical experiments, he found a greater attraction in their pursuit" [15]. Did he attend classes in Rouen under M. Girardin, who was Professor of Chemistry at the Municipal School of Rouen during the 1830s and 1840s? [16] Was he introduced to the work of the chemist Friedrich Accum (1769-1838), [17] who published *A Treatise on Adulterations of Food and Culinary Poisons* in 1820 and whose books were translated into French, Italian and German, reaching a wide readership in Europe. Unfortunately, one can only speculate.

Normandy taught students and established a laboratory at his home and was keen to ensure that chemistry had a practical application for a wider audience, not necessarily just for experts [18]. *The Lady's Newspaper*, a Victorian publication that reviewed Normandy's *Handbook of Chemical Analysis,* agreed: "Were we to select a work of genuine utility as a present to a lady about to take upon herself the duties and responsibilities of a married life, we know of no work that we could more confidently and consciously recommend" [19].

Extracts from the 1855 Transcript

The transcript of Alphonse Normandy's oral evidence before the Parliamentary Select Committee in July 1855 reveals his anger about the effect of food adulteration, particularly on the poor. "I have generally examined that which was purchased at low shops in preference to the better shops, my endeavour being to find out how the poor were treated, knowing perfectly well that the rich are more protected" [20]. Normandy's detailed descriptions of adulterated substances are sprinkled with references to confrontations with local shopkeepers.

> In the bread of a baker in Church Road I found actual crystals of alum; I went to him, and showed him his bread, and he said, 'I cannot help it.'... So far as I know, there is not a single baker in London who makes bread without alum. I once thought I had found a Phoenix – one who did not use alum: it was Mr. Gilbertson, of Judd Street. As I went to reside in the neighbourhood, I examined the bread at the same shop, and I found alum in it.

Normandy's sense of disappointment is palpable. Alum enabled the baker to introduce water into the dough and gave bread a whiteness, which hid its inferior quality. The unsuspecting customer therefore paid more for the loaf, obtained little nourishment from it, and repeated use resulted in a "disordered and dyspectic condition of the stomach".

Normandy explains at length how tea dealers defrauded customers, who were under the misapprehension that a tea chest sealed in China would contain pure goods. These chests could only have a small hole cut in them, to enable a hand to retrieve a sample of tea, but this did not stop incidents of fraud. He describes a room in which tea was poured onto the floor and mixed with inferior teas, as well as magnesia and Prussian blue (to produce a blue tint and glossy appearance). The tea, when examined, yielded an infusion "with about as much taste as an infusion of brown paper". The adulterated tea was then poured back through the hole. Some effort with a rope was required to systematically jerk the chest, ensuring layers of tea would be packed tightly, as though it had never been touched. In Normandy's opinion "all these mickles make a muckle", in other words it was the regular intake of small amounts of poisoned food and drink that created the greatest hazard to public health.

> There is a great quantity of purulent matter absorbed or taken into our food from the water which we use, the milk we consume and other substances...all of which, if only taken once or twice, would not do much injury, but which, being constantly repeated, must do a very great mischief.

Normandy is scathing about the habit of falsifying beer and puts the blame firmly on the publicans, not the brewers. "The beer is so greatly adulterated that I have purchased the beer I consume from the brewery ... Lately I was out of beer, and I sent to a public house for some, but I could not drink it: it was perfectly disgusting." Sulphate of iron was put into watered-down beer to produce "a kind of metallic smartness...which the drinkers of that beverage like to find", but this often resulted in vomiting and colic: a "true case of poisoning".

Cocculus indicus [21] was a widely used contaminant, "to create a feeling of intoxication without the previous excitement which alcohol produces...it knocks you down so to speak, without previous exhilaration". Normandy explains to the Committee how he had obtained evidence from two of the largest druggists in London who admitted that they regularly sold cocculus indicus, foots sugar (for stimulus and sweetening) liquor ammonia (for colouring) and extract of gentian (cheaper than hops) for the precise purpose of adulterating beer.

> The public believe that what publicans sell them is composed of malt and hops...but if you dilute with water, and replace the alcohol by cocculus indicus, then you are a fraudulent person; you are an adulterator and a poisoner [22].

Alphonse Normandy was not a person to mince his words.

Food Adulteration: Nineteenth Century Legislation

The 1855 Parliamentary Inquiry into adulteration was the result of initiatives by several medical practitioners who were extremely concerned about the deliberate abuse occurring during the production of food and drink. Dr Arthur Hill Hassall (a key witness) analysed 2500 samples of food and drink between January 1851 and the end of 1854. The results of this work, by the Analytical Sanitary Commission, were regularly published in *The Lancet*, with vendors named and shamed [23]. The campaigning effort made by John Postgate in Birmingham (who also gave evidence) was significant in that it was his MP, William Scholefield who eventually set up the Commission [24].

The 1855 Inquiry did not however immediately lead to legislation, and even the first Food Adulteration Act of 1860 failed to halt the tampering of food, drink and drugs. Whilst the Act empowered the appointment of public analysts only seven were appointed. There was always pressure by manufacturers, traders and the public to maintain the status quo. As Normandy had pointed out in 1850, the public themselves were far from blameless. In the preface to his *Chemical Handbook* he noted "the morbid appetite of numerous persons for decided bargains" suggesting that "the rage of cheapening, whatever be the price asked, has, if not created, at least increased the evil to an incredible extent" [25].

Normandy had been dead for eleven years by the time the 1875 Sale of Food and Drugs Act came into force and set up a network for monitoring food and drugs. In the same year a new enlarged and revised edition of his 1850 *Handbook* was published [26], edited by Henry Minchin Noad (1815–1877), Professor of Chemistry at St George's Hospital.

Food Adulteration Initiatives Today

Despite Acts of Parliament, new technologies and public watchdogs [27], there have been several major incidents of adulteration in a variety of countries such as infant formula contaminated with melamine in China in 2008 [28] and 'fake' extra virgin olive oil produced in Italy in 2015 [29]. Food authenticity and especially food fraud has become a serious concern to all stakeholders in the food industry, both from a food safety and a food quality perspective. The International Life Sciences Institute (Europe) is currently establishing a task force to develop a peer-reviewed guidance for the food industry. Initiatives include the *FoodIntegrity* project by the European Commission, which has a Food Fraud reporter gathering data [30]. Since 2011 Interpol and Europol have coordinated food fraud investigations and the aim of the National Food Crime Unit in London is to bring adulterators and fraudsters to account. In Northern Ireland, the Institute for Global Food Security uses rapid evaporative ionization mass spectrometry (Reims) to identify the molecular identification of a specific item of food, in order to confirm its true identity [31].

Dr Normandy's Legacy

162 years have passed since Normandy gave dramatic evidence of the way members of the public were being duped into buying goods that had been falsified and adulterated. Despite the absence of private correspondence and reminiscences, his testimony before the 1855 Parliamentary Committee provides a clue to his personality, his likes and dislikes, his ideas and achievements, his choice of expression, even his enjoyment of a pint of porter. He is a vivid storyteller and gives us a flavour of day-to-day life in mid-nineteenth-century London. He is not above a bit of self-promotion and refers to his own invention of an apparatus that can produce clean and tasty water, informing the Committee that units are being installed in Heligoland, by order of the Government. His suggestion that charcoal could be used to purify water and benefit public health led to an article in the Morning Post [32].
In 1850 Dr Alphonse Normandy wrote:

> If one of the principal characteristics of our epoch, from a commercial point of view, is the immense progress which every department of productive industry has achieved, it must be admitted that the arts of adulteration and sophistication have more than kept pace with the progress [33].

Despite the money being poured into preventing and exposing food adulteration in the modern era, it is dispiriting that elements of his statement are applicable today.

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ESSAY REVIEW

Paul David Blanc, *Fake Silk: The Lethal History of Viscose Rayon* (Yale: Yale University Press, 2016). Pp. xiv + 309. ISBN 978-0-300-204667. £30/$40 (hardback).

"The toxic effects of carbon disulphide are being re-examined because recent studies in this country [Britain] have suggested that people with long industrial exposure to supposedly safe atmospheric levels show an unusually high incidence of ischaemic heart disease." This introductory sentence in the May 1969 review of activities at the Medical Research Council's toxicology unit (Carshalton) gives no clue as to the industry where exposure was most prevalent. Nor in what follows is there any indication of what were "supposedly safe" exposure levels. Thanks to Paul Blanc's extensively researched study we learn that the industry was the manufacture of viscose rayon, and that in Britain it had for many years actively avoided collaborating with the MRC. That was a repetition of what had happened elsewhere, sometimes going back half a century. As the industry expanded, so did the number of victims suffering from the manufacturing process through exposure to the toxic solvent. They, as workers in the critical step, had suffered hallucinations and muscle and nerve dysfunction, and even died, from the toxic solvent carbon disulphide (disulfide). Their story is told sympathetically in this highly readable volume.

Without exception employers paid little or no attention to sicknesses or accidents, fume removal, ventilation or fatigue. Any changes introduced were incremental, and certainly never sufficient to stave off illness, as was explored by the MRC in 1969, and even later. As for evidence of the terrible working conditions, it was often hard to come by, and sometimes from unlikely sources, such as reports of fascist agents in Italy who became ill posing as rank and file workers in a SNIA Viscosa factory. At the same time, professionals in the field of occupational medicine became concerned when the solvent was shown to cause loss of sexual potency, certainly a matter of concern to the future of the Italian race. In the United States, the leading industrial toxicologist Alice Hamilton was linked to a study group at Bryn Mawr College, just outside Philadelphia. Blanc, as elsewhere by painstaking detective work, has managed to identify the facilities that came to her notice, which were not revealed in reports (since by their exposure this would have compromised her ongoing work in gaining access to companies). Reports of conditions experienced by forced and slave labourers in viscose factories of the Third Reich add a particularly disturbing dimension to the story.

Apart from addressing studies related to toxicology, Blanc tells the essential corporate history well, starting with manufacture of the solvent. The viscose - or as it was known from the 1920s rayon - thread and yarn industry emerged just before World War I, though its expansion was delayed until after 1918. The manufacturing process, invented in 1892 by the British chemists Cross and Bevan, and totally dependent on the use of carbon disulphide solvent, was taken over by Samuel Courtauld & Company. Viscose, based - like nitrocellulose (Chardonnet) and Bemberg (cuprammonium) yarns - on cellulose, became an international industry. The filament was manufactured on a large scale in Germany, and in the 1930s in Italy and Japan, as well as elsewhere. Its uses included as yarns, crepe fabric and as a velvet. Viscose rayon was a force to be reckoned with; it threatened the textile industries based on wool, cotton and silk. It was cheaper, half the price of pure silk (in the 1920s), and its manufacture required fewer workers. The impact was particularly strong in the early 1930s. Germany and Italy introduced a staple fibre, a short-length cut of rayon that facilitated admixture of viscose with cotton or wool for woven and non-woven applications. A pioneering German viscose staple facility was at Premnitz, where Köln-Rottweil AG produced Vistra fibre. In 1926, Köln-Rottweil was taken over by I.G. Farben. However, Glanzstoff was the dominant German rayon firm. The main producer in Italy was SNIA Viscosa. There was considerable growth from 1922 in Switzerland and the Netherlands. The Japanese viscose industry emerged as early as in 1916. Japan was the world's leading filament producer from 1935, and became a leader in synthetic materials manufacture. The Soviet Union began large scale production by 1924.

The prominent consultant Arthur D. Little played an important role in the introduction of viscose to the United States, where from the 1920s it was marketed as artificial silk, or rayon. Courtauld's, which produced viscose at three factories in North Wales (and elsewhere in Britain; the flagship factory was in Coventry), also took up manufacture in the United States, and set up the American Viscose Corporation (AVC) as an umbrella for its transatlantic operations. In 1920 Du Pont acquired rights to the French viscose process from the Comptoir des Textiles Artificiels, enabling Du Pont to break the Courtaulds viscose monopoly in America. By 1930, the US viscose industry was the fastest growing sector in both the chemical and textile industries. The value of the British owned AVC was such that in 1941 it was subject to a forced sale to American investors as one of the conditions for enabling the lend-lease programme.

As in other large chemical sectors, the viscose rayon industry was regulated by cartels and other collaborative arrangements. A large cartel existed in Europe before World War I. Between the wars this was replaced by interlocking directorates over continental Europe and Britain. Separately there was collusion involving Courtaulds, Du Pont and smaller US independents. Cellophane, manufactured in much the same way, was a sister industry to viscose textile. In France, La Cellophane from the early 1920s produced transparent viscose film. Rights were purchased by Du Pont, in 1923, and manufacture began in 1924. I.G. Farben on its formation in 1925 had inherited the Kalle cellophane facility though Hoechst. The Belgian-owned Sylvania opened in the United States in 1930. British Cellophane was founded in 1935, jointly by La Cellophane and Courtaulds.

Viscose textile products, and cellophane, served cultural, social and political roles far greater than their natures might suggest. Viscose rayon was at once high fashion in New York, and low fashion in Paris. It became well suited to the autarky programmes of fascist Italy and National Socialist Germany. But, increasingly, the lives of countless factory workers were ruined.

Thanks to *Fake Silk*, the solvent used in the processing of cellulose for rayon and cellophane, carbon disulphide, now joins other toxicants, such as chlorinated hydrocarbon solvents, mercury and carcinogenic aromatic amines, in alternative histories of large-scale, geographically spread, industrial chemistry.

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BOOK REVIEWS

Hannah Gay and William P. Griffith, *The Department of Chemistry at Imperial College London: A History, 1845-2000* (London: World Scientific, 2017). Pp. x + 569. ISBN 978-1-78326-973-0. £56 (hardback), available at £45.99 on Amazon on 17.07.17.

Beginning with the foundation of the Royal College of Chemistry (RCC) in 1845, Hannah Gay and Bill Griffith's book charts the development of the Department of Chemistry at Imperial College (IC) until 2000. Based on a detailed study of the institution's archives in conjunction with published papers and oral testimonies, it provides a comprehensive history of the institution and the staff based there. As the authors acknowledge, this is very much a "top-down history" with detailed accounts of the heads of departments and other figures, rather than an analysis of those who studied there. From the beginning, practical skills were of key value at IC, with laboratory instruction emphasised over lectures, and chemistry's utility as well as its purely scientific interest stressed.

For historians of nineteenth century chemistry, the chapters devoted to the RCC and the strong links to the Royal School of Mines (founded in 1851) and the chemistry department at the City and Guilds Central Technical College (founded in 1884) read almost as a *Who's Who* of chemists in the UK at the time. The key role of A.W. (Wilhelm) Hofmann, the first Professor at the RCC, in shaping the careers of many chemists is striking. The growing professionalization of chemistry provides a backdrop to these chapters, and the importance of consulting and industrial work, in addition to academic appointments, in the careers of those featured is underlined.

The chapter focussing on the Department of Chemistry's activities in the First World War is particularly poignant, especially in relation to the department's extensive work developing and testing respirators to counter poison gas attacks. Herbert Brotherton Baker (Head of Department from 1912) visited the Front in 1915 to investigate the gas used. Having determined it was chlorine, he returned to London to work on a respirator that could be mass-produced, with experimental trenches dug behind the Department at South Kensington. During the Second World War, the Department's activities included developing invisible inks to write messages on the human body and creating incendiary devices for decoy fires to confuse German bomber pilots, whilst IC staff worked outside of the institution on top secret projects. The period following the Second World War saw student numbers increasing as investment in science grew. The importance of mentorship for career development, even in the lives of extraordinarily gifted people, such as the Nobel Prize winners Derek Barton and Geoffrey Wilkinson, is underlined, with the book providing an interesting insight into the post-WW2 academic employment arena.
The inclusion of numerous personal reminiscences and amusing incidents give the book widespread appeal to anyone with links to the department. Frederick Field, one of the first students enrolled at the RCC, was the College poet whose works including witticisms on Faraday! There are also tales of pranks, explosions and party tricks. Given the influence of IC alumni on higher educational institutions in the UK, there will be few chemists reading who are not familiar with or have been taught by those featured in the book. Three current members of the RSCHG Historical Group Committee also make an appearance!

This book is an invaluable resource for anyone interested in the history of Imperial College and the chemists who worked there. It highlights the many strengths but also the weaknesses of the department, notably the problems of underfunding at IC. In bringing the story of IC up to date the book covers many of the ongoing issues facing academia today. In addition to a list of all IC Chemistry Department Staff from 1845 to 2000, combined with a comprehensive bibliography and index, extensive supplementary biographical information on the individuals featured is provided in each chapter's endnotes. The book also contains appendices covering Liebig at Giessen; Chemistry Teaching at British Universities before 1850; and the relationship between the RCC and its successors and the Chemical Society. The authors have adroitly brought together a vast amount of information to produce a fascinating history which will appeal to not only those with links to IC, but also anyone interested in higher education and science in the nineteenth and twentieth centuries.

Anna Simmons (UCL)

Balazs Hargittai and Istvan Hargittai, *Wisdom of the Martians of Science: History in their own Words with Commentaries* (Singapore: World Scientific, 2016). Pp. 255. ISBN 978-981-4723-81-7. £56 (hardback), £25 (paperback).

The five "Martians" grew up in *fin-de-siècle* Hungary, and were educated in Budapest schools and then Hungarian or German universities. Because they were Jewish they emigrated to the USA in the thirties, became American citizens and made significant contributions to science. "Martians" derives from a jokey suggestion that they came from Mars, disguising this by speaking a strange language (Hungarian).

An introduction precedes five chapters, each entitled for example "Edward Teller's Wisdom". The chapters have some twelve subsections, varying for each subject but all containing biographical and "human traits" entries. Other sections (for example politics, religion etc.) are quotations from the subjects themselves. Two have entries on "Research" (Kármán, Szilard) but these are only the subjects' own philosophical reflections on this, so it is difficult to establish from the book what research they actually did – *Wikipedia* is a far better source.

John von Neumann (1903-1967) studied chemistry and chemical engineering, becoming a mathematician and, in the US, a computer pioneer. His is the only chapter with a "Humour" section, but this won't have the reader rolling in the aisles. Theodore von Kármán (1881-1963) specialised in aerodynamics and aviation science, greatly assisting the US Air Force in WW2. Leo Szilard (1898-1964), an engineering and physical chemistry graduate, worked in Britain from 1933 on nuclear chain reactions and critical masses, emigrating to America in 1938. In 1939 he organised Einstein's famous letter to Roosevelt warning of Germany's likely development of an atomic bomb; at the University of Chicago he worked on the world's first nuclear reactors.

Eugene Paul Wigner (1902-1995) started as a chemical engineer and became the only Nobel laureate of the group, sharing the 1963 Physics Prize with Mayer and Jensen, for "his contributions to the theory of the atomic nucleus and elementary particles… and application of fundamental symmetry principles". His classic book on Group Theory gave me much trouble in my postgraduate days. Wigner's theoretical physics and chemical engineering background made him a unique figure for the Manhattan project.

Edward Teller (1908-2003) was a chemical engineer and physicist; moving from fission to fusion he is remembered for being "the father of the hydrogen bomb" and for testifying in 1954 against Robert Oppenheimer; some thought he was a model for Kubrick's *Dr Strangelove*. His many pronouncements on science include "I do not believe the scientist has the right to use his scientific prestige to influence politics" - the editors add that he pronounced this maxim on many occasions but never adhered to it.

This is a curious book, arresting and amusing in parts. It is generously illustrated with well-reproduced monochrome photographs. But, if you seek the work of these five Martians you will find little of it here, only their opinions.

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Trevor Levere, Larry Stewart and Hugh Torrens, with Joseph Wachelder, *The Enlightenment of Thomas Beddoes: Science, Medicine and Reform* (Abingdon & New York: Routledge, 2017). Pp. 263. ISBN 978-1-4724-8829-9. £78 Amazon (hardback), £35 (Kindle edition).

Thomas Beddoes (1760-1808) is a fascinating, enigmatic man who has been much written about, in part for his pioneering medical ideas, for his wide-ranging intellectual accomplishments (he was fluent in several languages, wrote poetry and novels, and was an expert in botany and geology, as well as in medicine and chemistry), and for his radical political activity at a time when such activity was being strongly suppressed by the British Government - in the wake of the French Revolution. Yet part of the fascination with Beddoes is also due to the seeming contradictions in his life and character. His novel medical practices were not really successful in his own lifetime, yet they laid the foundations for later progress, for example, in the field of anaesthetics. He argued with the senior doctors at the Infirmary in Bristol, but he pioneered formal medical education in the city, and laid the foundations for the much-needed reform of the medical profession. He was clearly *persona non grata* with the political establishment in London but, unlike his fellow chemist, Joseph Priestley, he was never directly attacked personally for his views. He had a reserved, unassuming personality, and was rather short and "dumpy" in appearance, but he married a beautiful, vivacious lady, thirteen years younger than himself.

Beddoes was born in Shropshire, took a degree in medicine at Oxford, then studied anatomy and physiology in London and spent time at Edinburgh University, where he came under the influence of one of the great chemists of his time, Joseph Black, who stimulated his interest in the possibility of using some of the newly discovered gases (such as carbon dioxide and oxygen) for the treatment of diseases like tuberculosis and asthma. He visited France where he met a number of the leading chemists, including Antoine Lavoisier. Oxford University was sufficiently impressed with him that he was appointed to a readership in chemistry, but his radical, dissenting views were not popular there and he moved in 1793 to Bristol, to put into practice his ideas about using gases to treat respiratory diseases. He would treat the poor for free, but charged the more affluent patients. This reflected Beddoes radical social and political views. He had married into an influential Anglo-Irish family, the Edgeworths, and through their literary connections he became friends with some of the romantic poets who were living in

Bristol, in particular Southey and Coleridge. Together with Coleridge he began his political campaigning in earnest, writing tracts and giving public addresses.
With the financial help of influential friends, Beddoes was able, in 1799, to open in Dowry Square, in Hotwells in Bristol, a research and clinical centre for the use of gases in medical treatment, the *Medical Pneumatic Institution* (MPI). On the recommendation of an old friend from Oxford days, Davis Giddy (by then a highly influential, Cornish politician and engineer), Beddoes appointed a precocious, but brilliant young man from Penzance, Humphry Davy, as the laboratory superintendent of the MPI. The MPI blossomed, treating large numbers of patients, whilst Davy began his pioneering research into nitrous oxide (laughing gas) and electrolysis. But after Davy left for the Royal Institution in London in 1801, the stock of the MPI started to decrease. In 1807, after Beddoes himself became ill, the Institution closed; he died the following year.

An indication of Beddoes' fame is the fact that there are four wall plaques honouring his memory in Bristol: at his two places of work, at his residence in Clifton and above his grave, also in Clifton. There have been numerous previous biographies of Beddoes, starting with Dr John Stock's account in 1811, one of the doctors whom Beddoes employed at the MPI in its latter years. Other authors, who have produced major biographies about Beddoes, are Dorothy Stansfield (1984), Roy Porter (1992) and Mike Jay (2009). The lead author of the present biography, Trevor Levere, has also written a number of scholarly articles about Beddoes, dating back to 1977. Professor Frank James, from the RSC Historical Group, gave the eighth Wheeler Lecture at the Royal Institution (Oct 2015 – available online) on Beddoes, and is currently compiling a series of papers about him and his work.

The current book on Beddoes by Levere *et al*. is the seventh book in a series, entitled: "Science, Technology and Culture, 1700-1945". Whereas the earlier biographies on Beddoes, referred to above, deal with Beddoes' life and work in a more-or-less chronological manner, the current book is essentially a collection of essays: an introduction and five separate articles relating to different aspects of Beddoes' life and work, each edited by one or more of the four listed authors. These five essays are concerned, in turn, with Beddoes' chemical and medical work, his interest is in geology and botany, his political activities, his literary interests (including an account of his own vast book collection) and his educational work. There are also two appendices - one about John Stock. As one who has, in a more modest way, written about and given lectures on Beddoes, I found each of the essays interesting and stimulating, well-presented and well-researched, but did not feel that I had learnt a great deal more about the man himself, having read all four of the earlier major biographies. I suspect this will be a book more for those with a specialist interest in Beddoes, rather than for the general reader, especially given its price!

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Marelene Rayner-Canham and Geoff Rayner-Canham, *A Chemical Passion: The Forgotten Story of Chemistry at British Independent Girls' Schools, 1820s-1930s* (London: UCL Institute of Education Press, 2017). Pp xxiv + 251. ISBN 978-1-78277-188-3. £26.99.

Marelene and Geoff Rayner-Canham have built a considerable reputation in recent years for their studies of the role of women in chemistry. This book is their latest offering, a carefully researched and exceptionally well written account of chemistry teaching in girls' schools from about 1820 to the Second World War. The prevailing assumption is that there was very little chemistry in these schools in this period. However, the latest research by the Rayner-Canhams shows that this is simply not true. There was plenty of chemistry, and by the end of the nineteenth century, it was a popular subject, much enjoyed by the girls who took it.

By the middle of the period covered, girls' independent schools typically had well-equipped teaching laboratories and sometimes dedicated chemistry lecture rooms as well. Girls were taught in these schools by inspiring teachers, many of whom gave their whole careers to the task of enthusing generations of girls about the subject of chemistry.

The teachers themselves were mainly women, though men were involved in initiating chemistry teaching at some of the schools covered. Female teachers had often studied at one of the two Cambridge women's colleges (Girton or Newnham) or at a London college (Royal Holloway or Bedford College). The Cambridge women were barred from taking degrees, though some became graduates by taking advantage of an arrangement whereby they could graduate from Trinity College, Dublin. London University was more liberal, having admitted women as full graduates from 1878, so that students of Royal Holloway or Bedford College were able to obtain BSc degrees before going off to teach. One important pioneering woman chemist, Millicent Taylor, actually studied for her external BSc (London) degree without leaving Cheltenham Ladies' College, graduating in 1893. She then joined the staff of the school, teaching there until 1917 and obtaining further degrees (MSc and DSc) from the University of Bristol on the basis of spare time research in organic and physical chemistry.

The book uses a variety of sources to build up a picture of the vibrancy of chemistry in girls' schools in the years in question. Not only official records have been consulted, but also school magazines, and here a really positive impression emerges. Girls contributed a variety of articles to these magazines, including science club reports, poems and short stories, and their delight in chemistry and the opportunity to study it comes through loud and clear.

However, as the book goes on to show, this era of girls' chemistry came to an end in the 1920s. A major reason was the malign influence of the Hadow Report of 1923. This report claimed, without evidence, that girls' intellects were better suited to the memorization work needed in biology, and that chemistry was really a boys' subject. Although this sexist nonsense never quite extinguished the flame of chemistry in girls' education, the light certainly grew dimmer as a result. As the book concludes, the "… exciting times documented in previous chapters were soon forgotten, even from the institutional memory of the schools themselves". The Rayner-Canhams have done a marvellous job in putting this right and showing just how important chemistry was in these schools in this period. It is a fascinating book, and I recommend it highly to anyone interested in the overlap of history, chemistry and education.

John Nicholson

Susan J. Smith, *Toxic Exposures: Mustard Gas and the Health Consequences of World War II in the United States* (New Jersey: Rutgers University Press, 2017). Pp. 256. £24.38. ISBN: 978-081-358-6090.

Although chemical weapons were not used in World War II, this book reveals that devastating consequences ensued from the precautionary measures taken by the Allies in case the enemy engaged in chemical warfare. Servicemen were subjected to experiments to determine the effectiveness of anti-gas measures and the extent to which their combat capability was reduced by exposure to mustard gas. Experiments were conducted to ascertain if different racial groups exhibited different degrees of susceptibility to chemical warfare agents. Although some subjects were genuine volunteers, most apparently had little or no choice about participating, and many suffered long term health problems. Whilst the book focuses mostly on US personnel, it refers to the fact that other nations, including the British, used their servicemen in experiments.

The disposal of chemical warfare agents has created problems of its own. Much has been dumped at sea, and the book details how the resulting pollution could last for generations, and that residues washed up on beaches or caught in fishermen's nets pose particular hazards. One chapter is concerned with research to develop anti-cancer drugs from chemical warfare agents. Some work on this topic had been done in the inter-war years, but was given a new stimulus when a German bombing raid on Bari harbour in 1943 released about 100 tons of mustard gas carried by an American ship for retaliation if the enemy used chemical weapons. Investigations conducted on those affected provided fresh impetus for the anti-cancer research.

This book is hard to categorise, but I guess a librarian would shelve it in a section devoted to the history of warfare. It contains little of interest to historians of chemistry. I have no room for it on my already overcrowded bookshelves, so if anyone would like my review copy, please get in touch.

John Hudson

Melvyn C. Usselman, *Pure Intelligence: The Life of William Hyde Wollaston* (University of Chicago Press, 2015). Pp. 413 + xv. ISBN-13: 978-0-226-24573-7. $35 (hardback).

Wollaston (1766-1828) was an outstanding chemist and a renowned polymath. Usselman's title comes from a fellow-polymath, William Whewell (1794-1866), writing that "(conversing with) Wollaston) ……was like talking to pure intelligence". His output in many areas of science was prodigious and poses a major challenge to any biographer: Usselman emerges with flying colours, arranging his complex material remarkably well. The chapter headings are masterpieces of concision and information. For example, chapter eight is entitled "Organic Chemicals and Multiple Combining Proportions: 1802-1815", and subsequently split into seven relevant topics.

Three early chapters trace his ancestry and early life including his unsatisfying start as a physician – he realised before 1800 that chemistry was his first love. Next follows an account of his greatest work, on platinum, palladium and rhodium. In 1800 his largely secret work on obtaining malleable platinum using *aqua regia* extraction from crude ores (platina), followed by advanced powder consolidation metallurgy to obtain the metal in a pure and malleable form, of quality unsurpassed for a century. He observed impurities in the *aqua-regia* soluble fractions of platina, leading to his discovery and isolation in 1802 of palladium and rhodium (his partner Smithson Tennant (1761-1815) in 1804 isolated osmium and iridium from the insoluble portions, as materials which Wollaston dubbed 'diabolite'). In one of the most bizarre episodes in chemical history. Wollaston anonymously put his newly isolated palladium metal on sale (1802) to avoid disclosing his platinum process. He made little money from this but earned much disapprobation (not least from Sir Joseph Banks) for his secrecy in the matter. Some of this palladium was bought by Richard Chenevix (1774-1830), who claimed incorrectly that it was a mercury-platinum alloy. Eventually Wollaston published the true circumstances of palladium's discovery. He never quite lived down this episode, nor his general predilection for secrecy.

Concurrently he manufactured for the textile industry citrates, tartrates and oxalates. During this work he recognised an inkling of what was to become the law of integral multiple combining proportions; he devised a logarithmic slide rule for calculating chemical equivalents. Physics was a twin passion. He invented a total internal reflection refractometer, periscopic spectacles, a periscopic *camera obscura* and *camera lucida*. Later he invented a reflective goniometer for measuring by light reflected from crystal faces, the interfacial angles with great accuracy, a device is still in use today. He dabbled in atomic theory but not as purposefully as Dalton. He detected dark lines in the solar spectrum, and invented a dip micrometer, a bimetallic thermometer and a differential

barometer. Later he became much interested in mineralogy: wollastonite ($CaSiO_3$) was so named in 1818 "in honour of one of the most respected chemists of this century".

This inexpensive book has a small font and, surprisingly, the index is not as detailed as it should be. Nevertheless, it is a magisterial volume, and will be the standard work on him for many years. Despite Wollaston's many interests Usselman manages to keep a roughly chronological and clear trajectory in the book which greatly helps the reader.

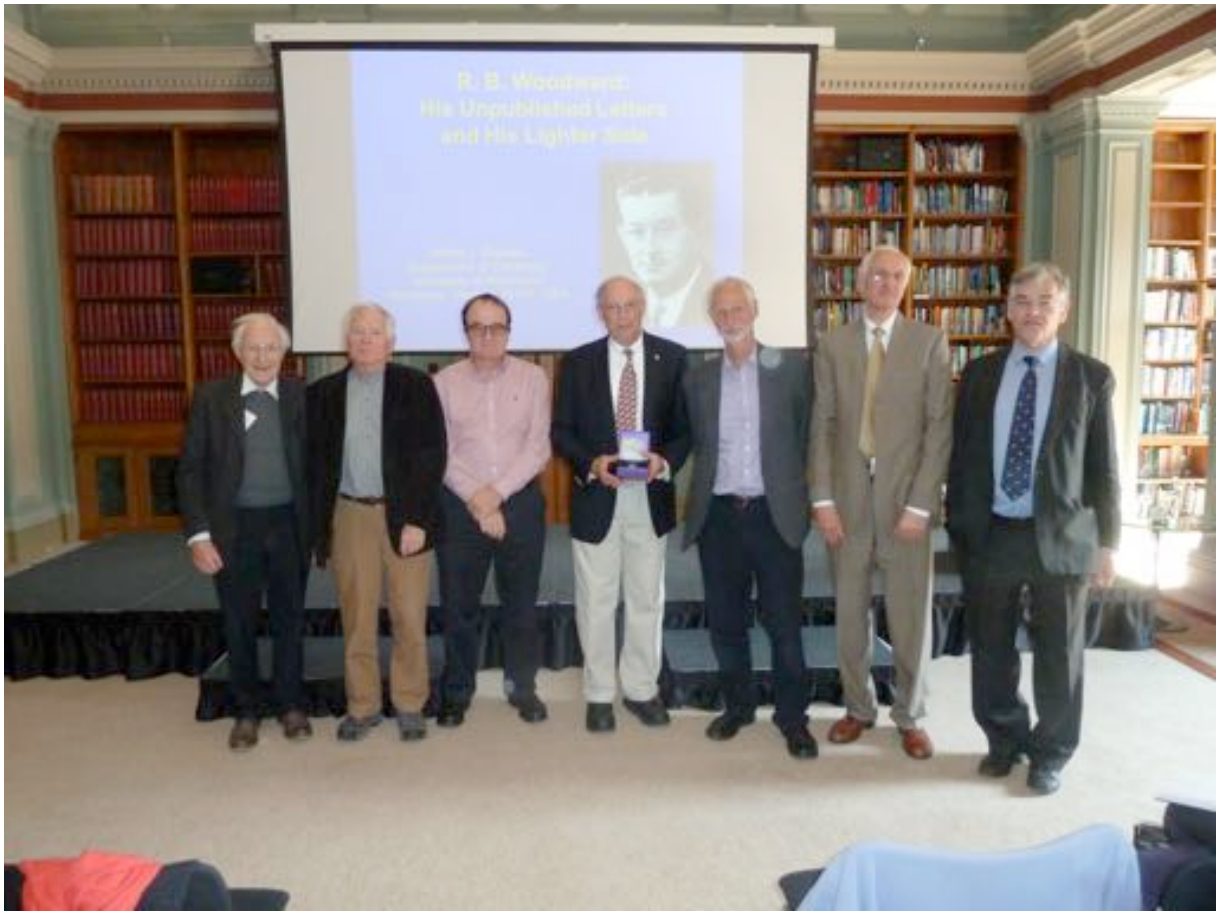
Bill Griffith
Imperial College London

MEETING AND CONFERENCE REPORTS

The Centenary of Robert Burns Woodward (1917-1979)

Royal Society of Chemistry, Burlington House, London Wednesday 10 May 2017

This meeting was held to commemorate (slightly belatedly) the centenary of the birth of the famous synthetic organic chemist Robert Burns Woodward in Boston on 10 April 1917. Around forty-five people were present for the meeting. Talks were given by Peter Morris, Pierre Laszlo and two former postdocs of Woodward, Michael Whiting (now ninety-one) and Stanley Roberts. In the second half of the meeting the Wheeler Award was presented to Jeffrey I. Seeman of the University of Richmond, Virginia. Jeff Seeman is best known for his editing of the series of autobiographies for the American Chemical Society ("Profiles, Pathways and Dreams") and his vindication of the quinine synthesis carried out by Woodward and William von Eggers Doering in 1944 against the criticism that the final step of the synthesis (left undone by Woodward and Doering) carried out by Paul Rabe and Karl Kindler in 1918 could not work. Jeff was also recently awarded the HIST Award of the American Chemical Society. His Wheeler Lecture entitled "Woodward's Unpublished Letters and His Lighter Side" will be published as a RSCHG Occasional Paper in due course. Jeff Seeman then gave a lecture on "Woodward, Corey, Hoffmann and the Rashomon Effect" which unusually included a short playlet reproducing the crucial conversation between Woodward and Elias Corey on 4 May 1964, with Jeff playing Corey and Anthony Barrett of Imperial College, a leading synthetic organic chemist in his own right, taking the role of Woodward.



Speakers at the Woodward Meeting

Was Robert Burns Woodward a Great Chemist?

Peter Morris (Science Museum)

What makes a chemist great? The acceptance that X is a great chemist is very much a social process: he or she is considered to be a great chemist by their peers and later by historians who are very much influenced by the views of contemporary chemists. One cannot therefore have an unknown great chemist. It might be said that many chemists (but not all) make advances in chemistry but only great chemists make major ones. I think the key thing here is the peer recognition of the advance or advances made by the chemist, rather than recognition of the chemist as a person. I would also make the point that the further back in time we go, the easier it is to tell who was a great chemist. One important reason for this is that the memory of lesser chemists quickly fades.

Specifically in the field of organic synthesis, greatness requires a deep understanding of reactivity, an ability to find new ways of making compounds react, and the skill to plan the path of the synthesis. The great synthetic organic chemists before Woodward include Hermann Kolbe (1818-1884), Marcellin Berthelot (1827-1907), Adolf von Baeyer (1835-1917), Albert Ladenburg (1842-1911), Emil Fischer (1852-1919), Richard Willstätter (1872-1942), Hans Fischer (1881-1945), and Robert Robinson (1886-1975). Perhaps part of the reason for Woodward's high profile from an early age was the relative lack of leading synthetic chemists ten years older than him.

So was Woodward the equal of these earlier chemists? I think we can conclude with no great difficulty that he was, for three reasons. Above all, he carried out several pathbreaking and complex syntheses, among which we would have to include at least quinine, strychnine and reserpine, chlorophyll and Vitamin B_{12}. Together with Roald Hoffmann, he then developed a new theoretical advance in organic chemistry, namely the Woodward-Hoffmann rules of orbital symmetry. In a less clearly defined way, he also helped to guide organic synthesis through its existential crisis in the 1950s when the original raison d'être of confirming structures was lost and a new rationale for synthesis had to be developed. In particular, Woodward saw the key role of organic reaction mechanisms (and confirmation analysis) as raising organic synthesis to a new plane of intellectual endeavour. It was therefore entirely fitting that he then developed a powerful new way of predicting the course of a specific group of chemical reactions which had been largely overlooked in the rise of organic reaction mechanisms.

How did Woodward become a great chemist? Many years ago the biochemist Hans Krebs made the observation that Nobel laureates in chemistry usually had supervisors who were themselves also Nobel laureates. This does not apply in the case of Woodward at all, neither of his supervisors won the Nobel Prize nor did his first employer Elmer Kohler. The only very faint hint of his future greatness in chemistry was that both his great-grandfather and his grandfather were apothecaries with an interest in medicine, a fact which has not hitherto been generally known. How did Woodward even become interested in chemistry? Unlike most chemists, he does not seem to have had an inspiring chemistry teacher; certainly he never gave credit to one. In short it is impossible to find any kind of genetic or sociological explanation for Woodward's greatness and he acts as a clear-cut counter-example to any attempt to explain scientific genius or achievement in these terms.

"The Simmons-Woodward Interaction"

Pierre Laszlo (Cornell University)

World-renowned Harvard professor and genius of chemistry R.B. Woodward surprised his graduate student, Howard E. Simmons III, son of Howard E. Simmons Jnr (HES) director of the Central Research Department of Dupont, with the question in 1978 or 1979 "how does it feel to be the son of a genius?" This assertion sets the tone for this account.

The two chemists had both been child prodigies. They had both studied at MIT. They both trained themselves in physical organic chemistry, in addition to other pursuits, synthesis in Woodward's case, molecular topology in Simmons's. The two scientists also shared research goals, such as the synthesis of dodecahedrane through triquinacene, an idea for which Simmons might have claimed priority. They shared some co-workers, in succession. RBW got HES invited for a visiting professorship at Harvard (1968), following which HES turned down a chair at Harvard.

Simmons's eldest son not only embraced chemistry he attended Harvard for graduate study and enrolled in Woodward's group. Since at this late stage in his career, RBW took only perfunctory care of his graduate students, trusting the postdocs in his laboratory with his research goals, HES provided his son with the topic for his PhD work, formally under RBW.

Working with Woodward, 1951-2

Mark Whiting (University of Bristol)

I want to start in 1945, when Franz Sondheimer and I graduated, as good friends, at Imperial College. By 1950 he was a postdoc with Woodward, and I was a Lecturer (tenured position) at Manchester. Bob Woodward was then by common consent by far the world's greatest organic chemist, and I was happy that Franz could recommend me as a postdoc. I crossed the Atlantic on the Mauretania in September 1951, Franz met me in New York and next day Bob drove me around in his car to find a room to stay in. I was installed, with Malcolm Clark (University of Cambridge and later Warwick), in a lab directly opposite Bob's office. In the following year Bob probably averaged more than an hour a day talking to us. He said he learned things best "by osmosis", cheerfully imparting

many insights to the person from whom he could hope to learn one thing new to him, which in my case involved some knowledge of ultraviolet spectra of chromophores related to possible structures of terramycin. Bob didn't like administration and seemed able to avoid it.

I began working on steroid synthesis but when the news of iron dicyclopentadienyl reached Harvard in early 1952 I had the advantages of knowing about Pauson's synthesis, from an airmail letter from a Manchester colleague. I had indeed noted a "paper received" for the *Journal of the Chemical Society*, entitled "iron dicyclopentadienyl", in August 1951, which when it appeared described the work of Miller *et al*. I envisaged this compound as related to iron pentacarbonyl with the ten CH groups equivalent to the five carbonyls. What I had not realised was its importance; Bob did. I was able to join the work (which shows what freedom Bob had with his sources of postdoc stipends), with Geoffrey Wilkinson and Mike Rosenblum, and made some of the new compound. Mike had run its IR (in the usual way for the Woodward group) in chloroform, but I used carbon tetrachloride and at once saw a sharp CH stretching band, actually sharper than benzene, which made the symmetrical structure obvious. I was also able to clarify the nature of the oxidation to the water-soluble cation, which made the names "ferrocene" and "ferricinium ion" natural choices. Mike had shown that, as Bob predicted, ferrocene underwent aromatic substitution, giving a diacetyl derivative; by using methylene chloride as solvent I easily separated the monoacetyl compound, and with difficulty isolated in small yield an isomeric diacetylferrocene, with both the acetyl groups in the same ring.

In 1951-2 Bob was already a chain smoker, and a keen participant at parties, but alcohol was not part of life during the day. I was invited to his home and had an enjoyable day playing with Bob and his children. The year at Harvard with Bob was as enjoyable as it was educative.

RBW and the Aroma of Yardley's Aftershave

Stanley M. Roberts (University of Manchester)

I joined the RBW Group in 1971 by which time Professor Woodward had already achieved international fame and recognition. I was immediately integrated into a twelve-strong post-doctoral research team engaged in the latter stages of the mammoth synthesis of Vitamin B_{12}.

As well as having formal team meetings, Woodward would often elect to take a turn around the laboratories, sit down in one or another, light a cigarette and listen to up-to-the-minute reports. These impromptu visits, which were usually between 8 pm and 10 pm, were known to be imminent by the aroma of his favourite Yardley aftershave wafting around the corridors. It was a signal to get your latest findings firmly in your brain.

If reactions did go wrong then two things I remember. First, the research team would willingly chip in with ideas to solve the problem. Secondly, if and when necessary, RBW would ask to be taken through the errant reaction in the most exact detail. His forensic analysis of the chemical step would often lead to his putting the finger on the problem and indicating a solution.

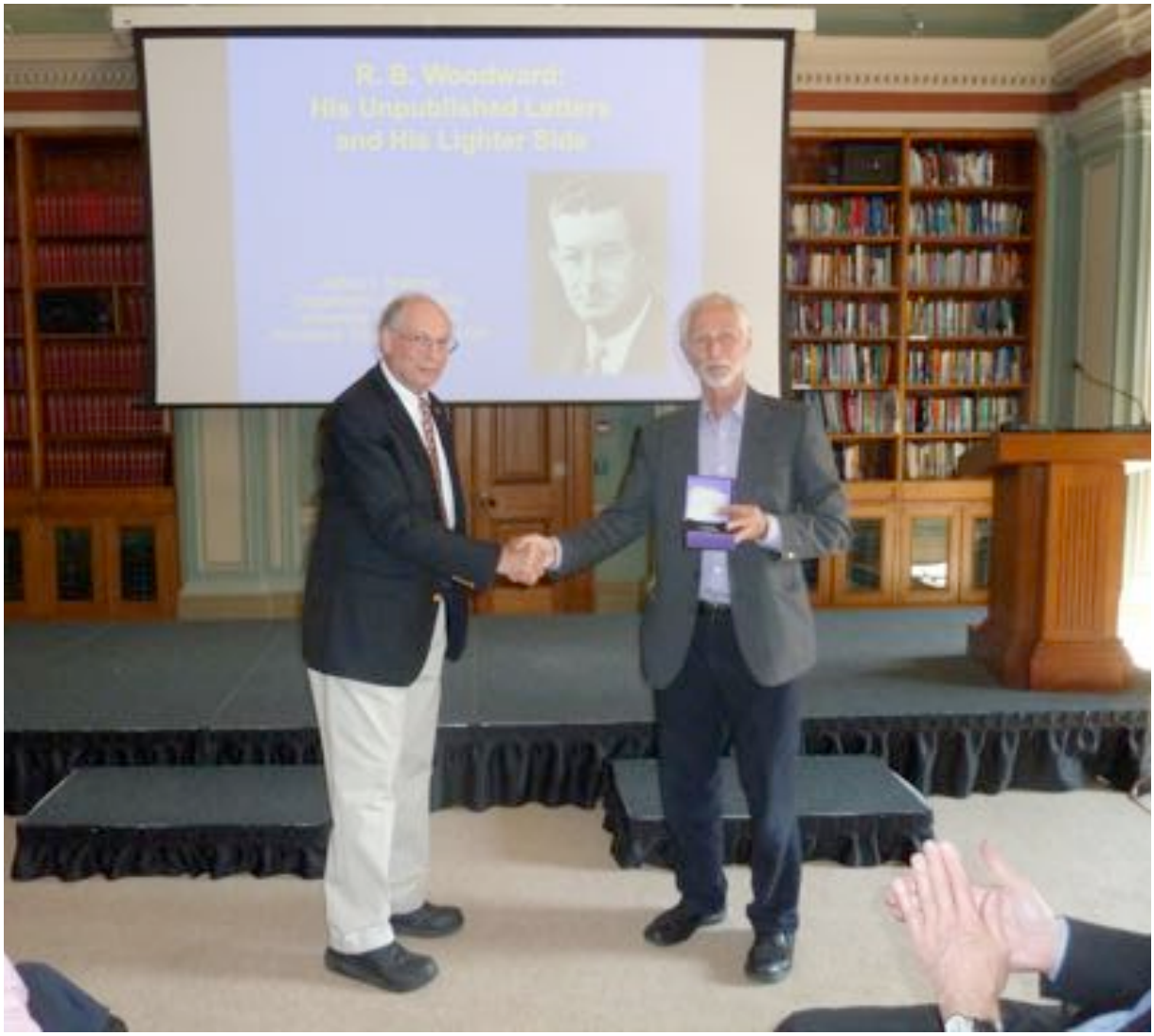
I did not learn a vast amount of chemistry during my eighteen-month stay, since the reactions we had to perform were quite clear-cut in order to advance from the late-stage intermediate to the target molecule. However, it did enable the group to become conversant with emerging techniques such as high pressure liquid chromatography. For me the most important outcome of working in the Woodward group was the confidence gained through having been part of an historic project in organic synthesis and having the privilege of working with a legend in chemistry, yet who was, as a person, affable, courteous, urbane.....and a fan of a classic aftershave. [During his talk Professor Roberts circulated a bottle of Yardley's aftershave (obtained on eBay) round the audience.]

Wheeler Lecture

R.B. Woodward: His Unpublished Letters and His Lighter Side

Jeffrey I. Seeman, University of Richmond, Virginia

R.B. Woodward's professional correspondence was extensive and varied. Woodward corresponded with individuals from many walks of life – former students, close colleagues and chemists around the world, grammar and high school students, and even individuals seeking medical advice (yes, Woodward published on many important naturally occurring pharmacologically active compounds). From letters that are ultra-serious to playful, a collection of excerpts was presented. These letters revealed the private side of Woodward and established that the grand style of writing exhibited in his scientific publications is found in his informal writings as well. Analysis of these letters provides a greater understanding of the workings within the chemistry profession in the 1940s to 1970s and these understandings were discussed in some detail.



Presentation of the Wheeler Award

Woodward, Hoffmann and Corey and the Rashomon Effect

Jeffrey Seeman, University of Richmond, Virginia

In 1981, Roald Hoffmann and Kenichi Fukui shared the Nobel Prize in Chemistry "for their theories, developed independently, concerning the course of chemical reactions". Had Robert B. Woodward (1917 – 1979) lived two years longer, he surely would have received his second Nobel Prize in Chemistry for his contributions to the Woodward-Hoffmann rules. In the 29 March 2004 issue of *Chemical & Engineering News*, E.J. Corey wrote in his Priestley Medal Address, "On May 4, 1964, I suggested to my colleague R.B. Woodward a simple explanation involving the symmetry of the perturbed (HOMO) molecular orbitals for the stereoselective cyclobutene/1,3-butadiene and 1,3,5-hexatriene/cyclohexadiene conversions that provided the basis for the further development of these ideas into what became known as the Woodward-Hoffmann rules". Corey is not credited in any of the Woodward-Hoffmann publications, indicating that Corey's intellection property claim stated above amounts to an assertion of plagiarism against Woodward. What did transpire in the 4 May 1964 meeting between Woodward and Corey, and in subsequent meetings between Hoffmann and Corey? As discussed in this presentation, the different recounts by the participants in these interactions may be due to differences in memory. But they also may be due, at least in part, to the Rashomon effect, "the circumstance when the same event[s] is given contradictory interpretations by the individuals involved". The Rashomon effect not only pertains to the general public but also to individual chemists pursuing their professional pathways. Letters between Corey and Hoffmann in 1981 and other relevant information were shown and discussed. The paper focused on the responsible conduct of science and the practice of science in today's complex and fast moving scientific, academic, and political environments.

RSC NATIONAL CHEMICAL LANDMARKS

New Dalton Landmark Plaque Now Installed

The previous *Newsletter* contained an account of the Dalton Anniversary celebrations which took place in Manchester on 26 October 2016. On that occasion, the plaque that had been removed from St Peter's Square was presented to the Manchester Literary and Philosophical Society to be on permanent display in their offices. A new plaque for public display had been cast, and this was presented to a representative of Holt Breweries, a company which was founded in Dalton's lifetime. The new plaque has now been erected on one of Holt's public houses, the *Ape and Apple*, appropriately situated in John Dalton Street, which in turn is very close to St Peter's Square. The unveiling ceremony took place on 26 March, and was performed by David Garner, past President of the RSC. Manchester has been home to many important figures in the history of science, but in the eyes of many Dalton was the most significant. Thanks are due to Historical Group member Diana Leitch that the 250th anniversary of Dalton's birth was marked last year, and that a permanent memorial to him is once again on view to all in a prominent location in the centre of Manchester.

John Hudson

FORTHCOMING MEETINGS

Society for the History of Alchemy and Chemistry Autumn Meeting

Saturday 30 September 2017, Maison Française, 2-10 Norham Road, Oxford

The SHAC autumn meeting will take place on Saturday 30 September 2017 at the Maison Française, Oxford on "European Chemistry". The Society's AGM will also be held at the meeting. Further details are available on the SHAC website www.ambix.org

FORTHCOMING COURSES

History of Pharmacy and the Pharmaceutical Industry

Wednesday 6 December to Friday 8 December 2017

The British Society for the History of Pharmacy (BSHP) and the Faculty of the History and Philosophy of Medicine and Pharmacy of the Society of Apothecaries are re-running the successful 2016 course on the History of Pharmacy and the Pharmaceutical Industry on 6-8 December 2017. Sessions will be held at the Wellcome Trust, the Royal College of Physicians, the Royal Pharmaceutical Society and the Society of Apothecaries, with the programme including various tours and visits as well as lectures. Delegates can attend on a one, two or three-day basis.

For full programme details, please see: http://www.apothecaries.org/faculty-of-the-history-philosophy-of-medicine-parm/who-we-are/history-pharm-course

The BSHP are supporting a subsidised student rate for the entire course on a first come first served basis. For more information and/or application form please contact Maria Ferran: facultyhp@apothecaries.org

FORTHCOMING CONFERENCES

Eleventh International Conference on the History of Chemistry

29 August -2 September 2017, Trondheim, Norway

A full programme is available at

http://www.ntnu.edu/web/11th-international-conference-on-the-history-of-chemistry-11ichc-/overall-program

Full details on how to register can be found at

http://www.ntnu.edu/web/11th-international-conference-on-the-history-of-chemistry-11ichc-/home

The late registration fee of 2600 NOK applies from 15 July 2017 to 20 August 2017. The fee for onsite registration after this date is 3000 NOK.

A report on this meeting will appear in the winter 2018 *RSCHG Newsletter*.

36th International Conference for Dyes in History and Archaeology (DHA35)

25–28 October 2017, London

The annual meeting of Dyes in History and Archaeology returns to the UK following successful outings to Thessaloniki (DHA34) and Pisa (DHA35). The venue for DHA36 is the Royal School of Needlework at Hampton Court Palace, London, and the dates are 25–28 October 2017. The meeting will follow the proven format of

previous meetings. There will be a welcome reception on the Wednesday evening, presentations and posters on the Thursday and Friday, the conference dinner on Thursday evening and outings on the Saturday to Dennis Severs' house and Spitalfields and a full afternoon at the Warner Textile Archive.

Due to restricted accommodation (100 places) early registration is recommended. Further details can be found at http://dha36.org.uk/. Details of previous meetings can be found at http://www.aslab.co.uk/textile-research/dyes-in-history-archaeology/