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RSC INTEREST GROUP
HISTORICAL

Historical Group

NEWSLETTER
and
SUMMARY OF PAPERS

Editor: Dr Anna Simmons

No. 84 Summer 2023

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COMMITTEE

Chairman:	**Prof. John W Nicholson** 52 Buckingham Road, Hampton, Middlesex, TW12 3JG [e-mail: jwnicholson01@gmail.com]
Secretary:	Dr **Peter J T Morris** 5 Helford Way, Upminster, Essex RM14 1RJ [e-mail: doctor@peterjtmorris.plus.com]
Membership Secretary:	**Prof Bill P Griffith** 48 Milton Road, London SW14 8JR [e-mail: w.griffith@ic.ac.uk]
Treasurer:	**Mr Stanley Langer** 31 Hallswelle Road, Temple Fortune, London NW11 0DH [e-mail: stanley1910@yahoo.co.uk]
Newsletter Editor	**Dr Anna Simmons** Epsom Lodge, La Grande Route de St Jean, St John, Jersey, JE3 4FL [e-mail: a.simmons@ucl.ac.uk]
Newsletter Production:	**Dr Gerry P Moss** School of Biological and Chemical Sciences, Queen Mary University of London, Mile End Road, London E1 4NS [e-mail: g.p.moss@qmul.ac.uk]
Committee:	**Dr Helen Cooke** (Nantwich) **Dr Christopher J Cooksey** (Watford, Hertfordshire) **Anna Coyle** (Sunbury-on-Thames) **Dr Vincent Daniels** (London) **Prof Alan T Dronsfield** (Swanwick, Derbyshire) **Andrea E. Gallio** (Bristol) **Dr Alice Halman** (Cumbria) **Prof Frank James** (University College London) **Dr Mike Leggett** (Milton Keynes) **Dr Fred Parrett** (Bromley, London) **Prof Henry Rzepa** (Imperial College) **Prof Michael Seery** (Cardiff)

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RSC Historical Group Newsletter No. 84 Summer 2023

Contents

From the Editor

Welcome to the summer 2023 RSC Historical Group Newsletter. The group's next meeting on **X-ray Crystallography** will be held on **18 October 2023** and we hope that you will be able to join us at Burlington House. Bookings have already opened and spaces are filling up. We recommend that you register soon if you would like to attend.

This issue contains three short articles and four book reviews, plus a tribute to John Gibson OBE, a long-time supporter of the Historical Group. Alan Dronsfield writes about the little-known unit of mass called the Crith; Mike Taylor showcases some of the holdings of Staines' Spelthorne Museum and the work of Frederick Walton in his paper "Linseed Oil Oxidation and Linoleum Manufacture"; and Stephen Cohen provides a fascinating insight into producing his highly ranked History of Chemistry podcast. Helen Cooke reviews Aileen Fyfe, Noah Moxham, Julie McDougall-Waters and Camilla Mørk Røstvik, *A History of Scientific Journals: Publishing at the Royal Society, 1665–2015;* Peter Morris reviews John G. D'Angelo, *Synthetic Organic Chemistry and the Nobel Prize*; Peter Reed reviews Arjan Linthorst, *Research between Science, Society and Politics: The History and Scientific Development of Green Chemistry* and Anna Simmons covers Bloomsbury's six *volume Cultural History of Chemistry*, edited by Peter Morris and Alan Rocke. There is also a report on the Pot Pourri meeting held in March 2023 and summaries of recent talks in the group's webinar series.

Finally, I would like to thank everyone who has sent material for this newsletter, particularly the RSCHG Committee who are extremely supportive in providing content. I also want to thank the newsletter production team of Gerry Moss and Bill Griffith for their work in bringing the final version together.

Contributions of articles of around 2,500 words in length on topics of current interest in the history of chemistry are warmly invited for inclusion in future newsletters. The deadline for the winter 2023 issue will be **Friday 1 December 2023**. Please send your contributions, to a.simmons@ucl.ac.uk as an attachment in Word. The newsletter usually appears on both group websites www.rsc.org/historical and https://rschg.qmul.ac.uk in January and late July/August of each year, with members informed through the monthly e-alert sent out via the RSC. It is free for all to access online so please share with colleagues and friends who may be interested.

Anna Simmons

ROYAL SOCIETY OF CHEMISTRY HISTORICAL GROUP NEWS

From the Chair

Having introduced myself in the previous issue of the Newsletter, I thought it would be helpful to outline what I see as the way forward for the next stage in the evolution of the Group. First, I should say that I have no strong inclination to change anything very much. Our mix of topics for our twice-yearly one-day symposia continues to attract good numbers of participants, and our monthly webinars, initially developed in response to the Covid emergency, go from strength to strength under the wise leadership of Peter Morris. I certainly want all of these to continue much as they are.

However, we do face challenges. Like many organisations, the RSC is increasingly focussed on the issues of diversity and inclusion. The problem is that, by modern standards, history (including of chemistry) has not been very diverse or inclusive. We therefore have to be sensitive about how we reflect on the chemists and chemistry of earlier times. One thing that is likely to change going forward is to move away from symposia on this or that "great man of chemistry" and instead to concentrate on key developments in the subject. In that way, we hope to be able to highlight the co-operative nature of chemical research, and to identify the contribution of a more diverse range of chemists.

Despite this evolving emphasis, I have every intention of ensuring that our main activities continue as they have. This means the provision of interesting meetings and presentations on the history of chemistry, and the publication of our high-quality Newsletter. I want the committee to remain responsive to new ideas, so if there is something you would like to see us do, or if you have any suggestions of topics for future one-day meetings, please get in touch. My contact details are at the front of the Newsletter, and I would welcome any thoughts you may have.

John Nicholson

Six New Committee Members Elected in Our First Ever Ballot

I am delighted to say that six well-qualified candidates were elected in our recent ballot for new Historical Group committee members. They are:

- Anna Coyle who has retired from a career in science and compliance publishing, most recently at WoltersKluwer UK.

- Vincent Daniels who worked in conservation at the British Museum and the Royal College of Art.
- Andrea Gallio, a research associate in bioinorganic chemistry at the University of Bristol.
- Alice Halman who is a Senior Technical Advisor at Sellafield Ltd.
- Michael Leggett, a retired Standards Development Manager at the British Standards Institution, who is also on the council of the Society for the History of Astronomy.
- Michael Seery, Head of Digital Learning at Cardiff Metropolitan University.

We welcome them all most warmly and look forward to working with them to make the Historical Group attractive to members of the Royal Society of Chemistry and to introduce the public at large to the riches of the history of chemistry. This is the first major influx of new members to the committee for several years and in fact the largest increase in its membership in our long history as a group. It is particularly good that two of the new members (Alice Halman and Andrea Gallio) are early career members of the RSC. We can look forward to our fiftieth anniversary in 2025 knowing that the group is in good hands.

Peter Morris

Online Seminar Series

The Historical Group's webinars will be taking a break in August 2023 but will resume in September, in their usual slot at 2 pm on the third Tuesday of the month. The September seminar will be given by Anita Quye on the Crutchley Archive of eighteenth-century dyes. Recordings of past lectures can be found at our playlist in the RSC YouTube Channel: https://www.youtube.com/playlist?list=PLLnAFJxOjzZu7N0f5-nVtHcLNxU2tKmpC.

Award for Exceptional Service to Stanley Langer

We are delighted to announce that the RSC has recognised the contributions of the Historical Group's Treasurer, Stanley Langer, through its Awards for Exceptional Service. Stanley's award is "For outstanding service to the Royal Society of Chemistry Chilterns & Middlesex Local Section, South East Regional Steering Group and Historical Group".

Stanley spent thirty-seven plus years working at the Royal Society of Chemistry, during which time he held a variety of jobs under the title of International Affairs Officer, including Secretary of the Industrial Division and the International Committee, and he was responsible for all Endowed Lectureships and Prizes. On behalf of the RSC, he was a member of a small international delegation to visit UNESCO, Paris, in an attempt to persuade it to designate an International Year of Chemistry (IYC). This needed to be formally requested by a developing country and Stanley visited Ethiopia to ask its equivalent body to make the application. This eventually led to the UN designating 2011 as the IYC for which the RSC organised many events throughout the UK. Stanley was also Secretary of the RSC's IUPAC Committee, has been a Member of the Chilterns and Middlesex Section Committee for twelve years and a Trustee of the RSC Pension Fund Committee for seventeen years. He is the organiser of the Humphry Davy Lecture, whose speakers have included Helen Sharman, Pallab Ghosh and Sir Patrick Vallance. He was also a member of the Chilterns and Middlesex Section Committee that was awarded the 2020 Inspirational Chemistry Award for "developing the Chemistry Communicators' Challenge to promote science communication across their diverse member Community".

ROYAL SOCIETY OF CHEMISTRY HISTORICAL GROUP MEETINGS

X-Ray Crystallography

Wednesday 18 October 2023, Royal Society of Chemistry, Burlington House, Piccadilly, London W1J 0BA

On 18 October 2023, the Historical Group will hold its autumn meeting on the topic of British X-ray Crystallographers at Burlington House, between 10 am and 5 pm. The meeting is free and open to everyone who is interested. Coffee and tea will be available, but lunch is not included, although there are plenty of cafes nearby in Piccadilly and adjoining streets. The subjects of the talks include Desmond Bernal, Dorothy Crowfoot Hodgkin, Kathleen Lonsdale and Rosalind Franklin, among others. The speakers include Judith Howard, Tom Blundell, Georgina Ferry, Mike Glazer and Elspeth Garmen. Registration is now open and places can be booked via:

https://www.rsc.org/events/detail/76719/british-x-ray-crystallographers

Programme

10.00: Registration and coffee

10.30: Welcome by Peter Morris (organizer)

10.35: Opening remarks by Mike Glazer (chair of first session)

10.40: John Finney on Desmond Bernal

11.10: Jenny Wilson on Kathleen Lonsdale

11.40: Judith Howard on Dorothy Crowfoot Hodgkin

12.10: Lunch Interval

Second Session - Chaired by Judith Howard

1.30: Elspeth Garmen on John Kendrew

2.00: Georgina Ferry on Max Perutz

2.30: Tom Blundell on David Phillips

3.00: Tea

Third Session – Chaired by Peter Morris

3.20: Stephen Neidle on Rosalind Franklin

3.50: Mike Glazer on Helen Megaw

4.20: Ian Wood on Judith Milledge

4.50: Peter Morris, Closing remarks

5.00: Meeting ends

If, having registered, you are unable to attend, please cancel through the link provided in the confirmation e-mail.

DATES FOR THE DIARY - FUTURE RSCHG MEETINGS

The Development of the Chemist's Notebook – Wednesday 13 March 2024

The RSC Historical Group is in the early stages of planning this in-person meeting to be held at Burlington House, London, on 13 March 2024. Key examples of the development of the practices, recording, retrieval and use of

chemical information will be discussed. This will include analysis of the notebook practices of some famous chemists. More information will be provided in the next Newsletter. Please send offers of papers for presentation to Dr Helen Cooke, helen.cooke100@gmail.com.

Chemistry, History and Medicine - Wednesday 16 October 2024

Without chemistry's contributions to medicine, especially with respect to drug-discovery and development, life indeed would have remained, to use Thomas Hobbes' 1651 phrase, "Poor, brutish and short". Only a few effective medicaments were in use up to the mid-nineteenth century. These were mainly of natural origin such as: quinine as both a cure for (and a prophylactic against) malaria, castor oil as a purgative (and its cousin, the more mildly-acting senna, extracted from the shrub *Senna alexandrina*) and laudanum (an alcoholic tincture from opium poppies) to alleviate pain and induce euphoria. This meeting will consider how the development of chemistry in the nineteenth and twentieth centuries contributed to the amelioration of disease, and the prolonging of life.

- Among the topics to be included in the meeting to be held at Burlington House will be
- the discovery of insulin and the methods used over the last century to monitor its effectiveness in the treatment of diabetes, via glucose estimations in blood and urine
- the discovery of the drugs used to attack, cure and control the scourge of tuberculosis
- some aspects of the history of anaesthesia, with special reference to the early use of chloroform.

TRIBUTE TO JOHN GIBSON OBE (1938-2022)

Dr John Gibson FRSC OBE was a chemical engineer by training. He was born on 26 January 1938 in Darlington and he studied at Imperial College London, obtaining his first degree in 1961 and then a PhD in 1964, also at Imperial College. He was employed by the Chemical Society at Burlington House from 1966 to 1980 as Secretary, Scientific Affairs, and thereafter, with the founding of the Royal Society of Chemistry in 1980, he was appointed General Manager of Conferences and Awards. He was awarded the Order of the British Empire in 1998.

We were very sad when we learned that John Gibson had passed away late last year. Subsequently we were asked to write a tribute to him for the RSC Historical Group; we were honoured to be asked so to do.

A tribute to John was published recently in the April 2023 edition of the RSC's quarterly magazine 'Voice' (page 13), with warm personal recollections given by Professors Duncan Bruce and David Grayson. Following this tribute, we agreed that it would be remiss not to remember John's very substantial contributions to the history of the RSC's formation and development. It was appropriate therefore that this should be done through a tribute from the Historical Group. In fact, John was a key player in managing and facilitating the historic changes which occurred in the late 1970s, leading to the formation of the RSC in 1980, and thereafter.

At the beginning of the article in 'Voice', Duncan wrote that "for many chemists of a certain generation, to all intents and purposes, John Gibson was the RSC". We endorse wholeheartedly this comment – he embodied the Society to many of its members, to whom he was a first point of contact for the numerous members' multifarious activities within the RSC, not only directly through Conference and Awards but also through activities within the Divisions and Subject Groups. This was not only because of the extent of his contacts within and without the RSC but also because he had a real understanding of current key science issues within the subdivisions which make up together the modern chemical sciences. He was therefore a true polymath who used his knowledge to help shape the emergent new body. He was successful because he was also a first-class people manager, managing discreetly and diplomatically both members and staff working at the many interfaces between numerous Divisions and Subject Groups to get them to own the structural changes taking place. Therefore he became a key builder of the RSC throughout the last twenty years of his career.

One of us (RT) can personally witness to this: I belonged to that "certain generation" (*sic*) to which Duncan refers in 'Voice'. John was very frequently my first point of contact when I was building my career as a young university lecturer. My growing appreciation for John Gibson's truly ubiquitous activities in support of the chemical sciences rapidly became a "hands-on" collaboration when I was approached jointly by the Chemical Society and the Society of Chemical Industry to act as the local organizer for a major symposium on zeolites in 1979. I was honoured and thrilled to be invited to do this yet keenly aware that I was entirely inexperienced in doing any such thing. However, I did not need to be concerned – it was just

as Duncan Bruce describes – I found I could rely absolutely on John Gibson "going the second mile" with constant advice based on experience and scientific knowledge coupled with his allowing me free access to his extensive network of contacts. This extended to sound advice and help in the subsequent editing and publication of the symposium proceedings (John was famous as a stickler for avoiding split infinitives in manuscripts; we hope we haven't erred this way in writing this tribute!).

We referred earlier to the major governance changes that took place in the late 1970s which were large and complicated. The key objective of these changes was highly ambitious: an amalgamation of a very prestigious yet highly diverse set of historic learned and professional bodies that then represented key different facets of the discipline of chemistry in the UK. These bodies comprised the Chemical Society, the Royal Institute of Chemistry, the Faraday Society and the Society for Analytical Chemistry. The amalgamation finally took place in 1980 when the newly merged body, entitled the Royal Society of Chemistry, came into existence together with a new Royal Charter.

It is no exaggeration to affirm that John was a major actor in facilitating to this amalgamation. Thereafter, John's role changed, from being the essentially administrative one of Secretary, Scientific Affairs within the old Chemical Society, to that of RSC General Manager of Conferences and Awards. The merger may have been complete on paper but the outworking of the amalgamation process continued to evolve rapidly: a major task for John then lay ahead over the following twenty years in getting membership governance to agree, shape, develop and implement the diverse conference and awards portfolios of the four newly-merged professional bodies and thence the subsequent evolution of new and old Divisions within the RSC.

RT has described briefly how, as a young and inexperienced member of the Society, he was helped enormously through the support of John Gibson and his group in ensuring that the international symposium for which he was responsible was a success. We are aware that one might say, "Well, isn't that what we should expect anyway from the staff of a professional body?" Our response is simply this: that an exceptionally busy time for John and his team in managing major governance changes, John always made individual members' needs a high priority. Above all, he and his team personally "delivered the goods" in a highly professional manner to everyone and in an imitable personal manner.

In due time, John and RT were set to work together closely once more not just as collaborators but as work colleagues. In 1999, RT was appointed to the post of Director of Science and Technology within the RSC, with a remit inherited from John to take over the responsibilities of managing the Divisions as well as Conferences and Awards. Part of the remit set him was to continue to extend John's legacy further by creating new groupings to serve burgeoning developments in chemistry, especially in Chemical Biology, Materials, Energy and the Environment and of course, Sustainability. John's retirement was imminent, yet once more RT found his bigheartedness, wisdom and experience an immeasurable help as he "took over the reins". Similarly, SL's role in supporting John's responsibilities for Awards was enhanced greatly by John's extensive knowledge in this area.

With regard to John Gibson and the Historical Group, he is remembered as having been very supportive of the Group's involvement with the old Annual Congress. From 1981, the Group had regular symposia as part of the Congress, which John supported. From 1986, with his agreement, we also staged an Open Lecture. This was generally an evening event with a strong historical theme and aimed at more general interest. John Nicholson (Historical Group Chair) was convenor for a symposium in 1988 and on the local organising committee in 1991. SL remembers enjoying the banter between John and the committee chair, Charles Rees. Happy days!

In his spare time, John was extremely interested in military history and campaigns - he used to go on battlefield visits to World War I and World War II sites. He was fanatical about cricket and frequently went on cricket tours for his holidays, often to South Africa where he had many friends. One of us (SL) is a qualified cricket umpire and so we often had things to discuss!

Thank you, John, for all the wisdom and support you imparted to all the members of the RSC throughout the years. As Helen Pain rightly says in the 'Voice' article, "John will be missed by the community but his legacy at the RSC will live on".

Stanley Langer and Rodney Townsend

MEMBERS' PUBLICATIONS

If members 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.

Helen Cooke, Fabio Parmeggiani and Nicholas L. Wood, "Analysis of a Seventeenth Century English Apothecary's Probate Inventory," *Pharmaceutical Historian*, 2023, **53(2),** 51-57.

https://www.ingentaconnect.com/contentone/bshp/ph/2023/00000053/00000002/art00003

The transcript of the inventory of the contents of an apothecary's home and shop in Nantwich, a market town in Cheshire, England, was discovered during research for an exhibition on health and disease through the ages at the town's museum. This article demonstrates how analysis of the inventory, in combination with exploration of the apothecary's family history, investigation into the location of his business, and the impact of external events, builds a picture of his trade, business, life and work.

Keith Ramig, Timone Eskaros, Tazrian Islam, Olga Lavinda, Sasan Karimi, Lou Massa and Christopher Cooksey, "Thermochromicity in Wool Dyed with 6-Bromoindigo Depends on the Presence and Identity of a Solvent", *Heritage*, 2023, **6(1)**, 672-680.

https://www.mdpi.com/2571-9408/6/1/36

The thermochromic effect of wool dyed with 6-bromoindigo was found to depend on both heat and a solvent. The dyed fabric must be immersed in a solvent while heating for a colour change from purple to blue to occur. Ethanol was the most effective solvent in causing the colour change. Water was effective as well. 1-Butanol caused a slight colour change, while toluene was completely ineffective. These results are interpreted as interaction of the solvent with both the wool surface and adsorbed dye molecular aggregates, causing changes in the size of large red aggregates to smaller blue ones. The mildest conditions for the colour change, immersion in water at 60 °C, are so easily obtained that it is possible that ancient dyers knew of this as a finishing process for their dyeing, or knew to avoid post-dyeing heat treatment.

Peter Reed, "George E. Davis: Editing the Chemical Trade Journal, 1887–1906", *Ambix*, 2023, **70(2),** 131–149.

This article explores George Davis's editing of the *Chemical Trades Journal* (*CTJ*) between 1887 and 1906, a period during which he was also working as a consultant chemist and consultant chemical engineer. Davis had worked from 1870 in various sectors of the chemical industry before becoming a sub-inspector in the Alkali Inspectorate between 1878 and 1884. It was during this period that the British chemical industry was facing severe

economic pressure and to remain competitive was having to adapt to less wasteful and more efficient production. Drawing on this wide industrial experience, Davis developed a framework for chemical engineering with the broad aim of making chemical manufacture as economic as the latest science and technology would allow. Several important issues are raised by Davis's editorship of the weekly *CTJ* alongside his extensive consultancy work and other responsibilities: Davis's motivation given the likely impact on his consultancy work; the community the *CTJ* hoped to serve; competitive periodicals addressing the same market niche; the degree of focus on his chemical engineering framework; the changing content of the *CTJ*; and Davis's role as editor over a period of nearly twenty years.

Klaas van Berkel and Ernst Homburg (eds.), *The Laboratory Revolution and the Creation of the Modern University, 1830-1940* (Amsterdam: Amsterdam University Press, 2023)

This volume brings together more than a dozen new studies about the rapid, even revolutionary, development of the laboratory in the nineteenth and early twentieth centuries, especially in the context of the expanding universities, and includes papers by Peter Ramberg, Alan Rocke, and Peter Morris. The importance of the research laboratory for the development of science in the second half of the nineteenth century is uncontested, as is the revival of the universities as centres of innovative science and scholarship in the same period. The connections between these two revolutionary developments are seldom studied in detail though. This is partly due to a current lack of interest in laboratory studies as well as in institutional history, but a main reason is also that histories of universities are commonly written by authors with a background in the humanities. This collection of essays tries to bridge the gap and bring representatives from the sciences and the humanities together in a concerted effort to integrate laboratory studies and the history of universities. The table of contents and introduction of this book can be downloaded for free from the website of the publisher:

https://assets.ctfassets.net/4wrp2um278k7/2mwRq9g2DEvTLreiVmldyH/9169ec35fac684d8033200b3a7712bee/TOC___Intro_9789463720434.pdf

PUBLICATIONS OF INTEREST

Ambix: The Journal of the Society for the History of Alchemy and Chemistry February 2023, volume 70, issue 1

Special Issue: Gold and Mercury: Amalgamated Histories in Chemistry, Culture and Environment

Donna Bilak "Living Then and Now with Gold and Mercury".

Vincenzo Carlotta and Matteo Martelli, "Metals as Living Bodies. Founts of Mercury, Amalgams and Chrysocolla".

Donna Bilak and George Vrtis, " Environmental Alchemy: Mercury-Gold Amalgamation Mining and the Transformation of the Earth".

Sebastián Rubiano-Galvis, Jimena Diaz Leiva and Ruth Goldstein, "Amalgamated Histories: Tracing Quicksilver's Legacy Through Environmental and Political Bodies in Andean and Amazonian Gold Mining".

Peter Oakley, "Making Mercury's Histories; Mercury in Gold Mining's Past and Present".

Ambix, May 2023, volume 70, issue 2

Barry Sturman and David Garrioch, "Amateur Science and Innovation in Fireworks in Nineteenth Century Europe".

Peter Reed, "George E. Davis: Editing the Chemical Trade Journal, 1887–1906".

Megan Piorko, Sarah Lang and Richard Bean, "Deciphering the *Hermeticae Philosophaie Medulla:* Textual Cultures of Alchemical Secrecy".

Reviews: Special Focus: *A Cultural History of Chemistry*, Peter J.T. Morris and Alan Rocke (eds.).

Ambix Article Collection: Centres and Peripheries of Chymical Knowledge: Tracing Traditions of Alchemy and Chemistry in Eastern Europe

This collection of free access papers from *Ambix* celebrates the 13th International Conference on the History of Chemistry held in Vilnius, Lithuania. From the patronage networks of Rudolph II to the military campaigns of World Wars I and II, chymical knowledge was highly sought after in Eastern Europe, especially as a means to exert political power. The articles featured in this collection trace historical evidence of Eastern European chymical traditions, from a fourteenth-century Bohemian alchemical manuscript to twentieth-century global approaches to chemistry,

to illustrate the mutual influence of Western and Eastern European chymical knowledge exchange. The insularity of Eastern European science before the establishment of the port of Archangel was not intentional but forced by feuding neighbouring lands. Ivan the Terrible attempted to create a Moscow medical school, but the Western European instructors he tried to bring in were blocked by the Danes and Swedes. The establishment of the port of Archangel in 1553 expedited cross-cultural chymical exchange between Eastern and Western Europe. As a result, the Russo-English trading organization Muscovy Company formed in 1555. By the 1620s, Tsar Mikhail Romanov had succeeded in forming the Apothecary Chancery at his court in Moscow. While there has been a history of Eastern European monarchs importing courtly alchemists from the West, including both John Dee (1527-1608) and his son Arthur Dee (1579-1651), many influential chymical practitioners were born and worked in Eastern Europe—such as Polish alchemist Michael Sendivogius (1566-1636), Hungarian Janos Banfihunyadi (1576-1646), Mikhail Vasil'evich Lomonosov (1711-1765) of St. Petersburg, Russian born chemists Nikolai Nikolaevich Zinin (1812-1880) and Dmitrii Ivanovich Mendeleeve (1834-1907), as well as many notable Soviet chemists of the twentieth century. Papers are free access until at the end of July 2023. After this date selected papers will remain available for free. Please visit:

https://www.tandfonline.com/journals/yamb20/collections/Centres-and-Peripheries-of-Chymical-Knowledge

Bulletin for the History of Chemistry, vol. 47, number 3, 2022

Francesco Di Giacomo, "Ancient Analogues of Chemical Equations".

Michael Witty and Theppawut Ayudhya, "Role for Hypochlorite Saponification in Semmelweis's Suppression of Puerperal Fever Epidemics".

William B. Jensen, "The Trouble with Thermodynamics".

Howard D. Dewald, "Development of Chemistry at Ohio University and Its First Women Graduates".

Anne M. Wilson, "Eda Bachman Walden: What Were Her Contributions?"

Marelene Rayner-Canham and Geoff Rayner-Canham. "Sir William Ramsay: Pioneering Advocate for Woman Chemists".

Ivoni de Freitas-Reis and Beatriz Gatti de Castro, “Marguerite Catherine Perey (1909-1975): The Discovery of Francium and the Election of the First Woman to the French Academy of Sciences”.

Sarah Cummings, Amy Robinson, and Martin Saltzman, “HIST Centennial Memories Paul Raymond Jones (1930-2019)”.

Book Reviews

Peter J. T. Morris and Alan Rocke (eds.), *A Cultural History of Chemistry*, in 6 volumes.

Mary Virginia Orna, *March of the Pigments: Color History, Science and Impact*.

Istvan Hargittai and Magdolna Hargittai, *Science in London: A Guide to Memorials*.

Robert S. Jack and Fritz Scholz (eds.), *Wilhelm Ostwald: The Autobiography*.

E. Thomas Strom and Vera V. Mainz (eds.), *Pioneers of Magnetic Resonance*.

Jeffrey L. Sturchio and Bruce Lewenstein (eds.), *Science: Has its Present Past a Future? Selected Essays by Arnold Thackray*.

Jeffrey I. Seeman, “The Back Story: Vladimir Prelog, Albert Eschenmoser and I. A Friend of a Friend is a Friend”.

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Mary Virginia Orna, “Truly, and Necessarily, on the Shoulders of Giants: An Astonishing Historic Journey”.

Seth C. Rasmussen, “Boon or Bane? Colour and Transparency in Early Silica Glass”.

Joe Jeffers, “Caddo Nation Chemistry: Art, Commerce, Pottery and Tools”.

Gary Patterson, “John Mercer (1791-1866): The Most Colorful Chemist in the Nineteenth Century”.

David E. Lewis, “ ‘The Chemical History of Color’, but Just Two Kinds of Them”.

Arthur Greenberg, “The Mulhouse Chemistry School, Professor Emilio Noelting and Triphenylcarbinyl Dyes”.

Marco Fontani and Mariagrazia Costa, “A New Colorful World: George Urbain (1872-1938), the Red Star who Disappeared Off the Horizon”.

Sharon L. Haynie, “Margaret Strickland Collins, Termites and Chemical Defense”.

Jeffery I. Seeman, “ ‘The Whole Truth, and Nothing but the Truth’: Writing the History of the Woodward Hoffmann Rules”.

Mary Ellen Bowden, “Lasting Bonds: The American Chemical Society’s History Division and the Center for the History of Chemistry (now Science History Institute)”.

Carmen J. Giunta and Martin D. Saltzman, “History of Chemistry in the *Journal of Chemical Education*”.

Zvi C. Koren, “The Seraph of the Edelstein Center”.

Patricia J. Smith, “ChemSource: A Resource for K-12 Teachers”.

Jeffrey I. Seeman, “The Back Story: KC, EJ and Arbie: Three Generations of Eminent Synthetic Organic Chemists”.

Catherine M. Jackson, *Molecular World: Making Modern Chemistry* (Cambridge, MA: MIT Press, 2023)

According to existing histories, theory drove chemistry’s remarkable nineteenth-century development. In *Molecular World*, Catherine M. Jackson shows instead how novel experimental approaches combined with what she calls “laboratory reasoning” enabled chemists to bridge wet chemistry and abstract concepts and, in so doing, create the molecular world. Jackson introduces a series of practice-based breakthroughs that include chemistry’s move into lampworked glassware, the field’s turn to synthesis and subsequent struggles to characterize and differentiate the products of synthesis, and the gradual development of institutional chemical laboratories, an advance accelerated by synthesis and the dangers it introduced.

Jackson’s historical reassessment emerges from the investigation of alkaloids by German chemists Justus Liebig, August Wilhelm Hofmann, and Albert Ladenburg. Stymied in his own research, Liebig steered his student Hofmann into pioneering synthesis as a new investigative method. Hofmann’s practice-based laboratory reasoning produced a major theoretical advance, but he failed to make alkaloids. That landmark fell to Ladenburg, who turned to cutting-edge theory only after his successful synthesis. In

telling the story of these scientists and their peers, Jackson reveals organic synthesis as the ground chemists stood upon to forge a new relationship between experiment and theory—with far-reaching consequences for chemistry as a discipline. A review of this book will appear in a subsequent issue of the *Newsletter*.

Marco Beretta and Paolo Brenni, *The Arsenal of Eighteenth Century Chemistry: The Laboratories of Antoine Laurent Lavoisier (1743-1794)* (Leiden: Brill, 2022)

The substantial collection of Antoine Laurent Lavoisier's apparatus is not the only surviving collection of eighteenth-century chemical apparatus and instrumentation, but it is without question the most important. The present study provides the first scientific catalogue of Lavoisier's surviving apparatus. This collection of instruments is remarkable not only for the quality of many of them but, above all, for the number of items that have survived (ca. 600 items). Given such a wealth and variety of instruments, this study also offers the first comprehensive attempt to reconstruct the cultural and social context of Lavoisier's experimental activities. This book is available open access until August 2023 at: https://brill.com/display/title/55706?language=en

History of Insulin

Papers from a meeting held at the Royal College of Physicians in July 2022 are now available free access in a supplement to the *British Journal of Diabetes*. https://bjd-abcd.com/index.php/bjd/issue/view/45 . This includes papers on the Discovery of Insulin, the life of R.D. Lawrence (1892-1968), a pioneering doctor and survivor of diabetes, and the history of insulin discovery over fifty years.

SOCIETY NEWS

Society for the History of Alchemy and Chemistry – Partington Prize 2023

The Society for the History of Alchemy and Chemistry is delighted to announce that the winner of the 2023 Partington Prize is Dr Armel Cornu of the Science History Institute for her entry "Senses and utility in the New Chemistry". Armel Cornu is a postdoctoral researcher at the Science History Institute in Philadelphia. She majored in chemistry and history before graduating with a masters degree in the history of science a Université

Panthéon-Sorbonne in Paris. She obtained her doctorate at the University of Uppsala in 2022 with a dissertation centring on the market, regulation, and science of mineral waters in eighteenth-century France. Her research is characterised by a social and economic approach to the development of chemistry throughout the Enlightenment. She currently works on the uses of sensorial impressions in the practice and perception of eighteenth-century chemistry. The Society for the History of Alchemy and Chemistry established the Partington Prize in memory of Professor James Riddick Partington, the Society's first Chairman. It is awarded every three years for an original and unpublished essay on any aspect of the history of alchemy or chemistry. The prize-winning article will appear in the Society's journal, *Ambix,* in due course.

The Joseph B. Lambert HIST Award for Excellence in the History of Chemistry

The recipients of the 2023 Joseph B. Lambert HIST Award of the History of Chemistry (HIST) Division of the History of Chemistry of the American Chemical Society are Marelene F. and Geoffrey W. Rayner-Canham for their work on the history of women in science, with particular focus on British female chemists. This award is will be presented to the Rayner-Canhams at the fall national meeting of the American Chemical Society in San Francisco in August, 2023.

Geoffrey Rayner-Canham was born and educated in England. He received his B.Sc. in Chemistry from the University of London in 1966, his Diploma of Imperial College (D. I. C.) from Imperial College in 1969, and his Ph.D. in Inorganic Chemistry from the University of London in 1969. He is currently Professor Emeritus at the University of Newfoundland and Labrador. Marelene F. Rayner-Canham was also born and educated in England. She received her B.Sc. in General Science from the University of Waterloo, Ontario in 1986. She taught laboratory physics at the University of Newfoundland. The saga that led to their HIST Award started in the 1980s when they noticed a remarkable Canadian woman, Harriet Brooks, while reading the classic work, *Discovery of the Elements* by Mary Elvira Weeks (and her final collaborator Henry M. Leicester). The extensive research into her career resulted in the book: *Harriet Brooks – Pioneer Nuclear Scientist* (1992). This research also revealed other neglected women scientists: Fanny Cook Gates, Ellen Gleditsch, Jadwiga Szmidt and May Sybil Leslie. This project resulted in the book: *A Devotion to their Science: Pioneer Women of Radioactivity* (1997). This was then followed with a

more targeted focus on women in chemistry, which resulted in the book: *Women in Chemistry: Their Changing Roles from Alchemical Times to the Mid-Twentieth Century* (1998). Another major effort in this area produced: *Chemistry was Their Life: Pioneering British Women Chemists, 1880-1949* (2008). Lastly, the Rayner-Canham team was also a major contributor to the European project and book: *Women in their Element: Selected Women's Contributions to the Periodic System* (2019).

MUSEUM NEWS

"A Summer of Science" Festival at Nantwich Museum, Cheshire

From 20 July to 30 September 2023 Nantwich's local-history Museum will be holding a science festival, featuring an exciting programme of events for visitors of all ages. These will include family workshops, talks, guided walking tours featuring science around the town, live chemistry and physics demonstrations, plus a range of trails and exhibitions. A number of events will focus on biodiversity and sustainability.

Key to the success of the festival will be presenting science in a context to which visitors, young and old, can relate. To achieve this, the focus will be to present science in the context of items in the Museum's collection which reflect historic local industries and agriculture. Examples include artefacts from the local salt industry, some of which originate from Roman times when brine springs were discovered in Nantwich. The festival will also feature local people associated with science, for example Joseph Priestley, who lived in Nantwich from 1758-61 and taught science at his small school.

The festival will run in parallel with the Museum's "Nantwich Illuminated" exhibition on the history of the town's gas works, which provides considerable scope for chemistry demonstrations and activities. Some objects on display will be loaned by the National Gas Museum in Leicester.

Family events will be free of charge, to encourage participation by families from deprived areas. It is planned that a legacy from the festival will be enhancement of the Museum's education programme for school visits, building on workshops developed for the festival.

Driving the chemistry aspects of this initiative are Museum volunteers Dr Helen Cooke FRSC, Dr Glynn Skerratt FRSC, Dr Graham Dodd, Dr David Nellist FIChemE, and Professor Fabio Parmeggiani (Politecnico di Milano). Nantwich Museum is extremely grateful for support from the RSC's Outreach fund and from the North Staffordshire / South Cheshire Local

Section. For more information please email Helen Cooke (helen.cooke100@gmail.com), visit the Museum's website: https://nantwichmuseum.org.uk/ or phone Nantwich Museum on 01270 627104.

Helen Cooke,
RSC Historical Group Committee and volunteer at Nantwich Museum

Historical Landmark Status to Justus Liebig Laboratory

The Justus Liebig Laboratory in Giessen, Germany**, has** been awarded the EuChemS Historical Landmarks Award in recognition of its pioneering research and teaching role in the development of chemistry as a modern science. The award was presented in a ceremony on 29 March 2023 where a plaque was installed at the entrance of the building where Liebig conducted his research and trained international scientists from 1824 to 1852. The building has been a museum since 1920 and receives approximately 8,000 visitors from all over the world every year. Last December a fire caused serious damage to Liebig's historical lecture hall. This was the starting signal for profound renovations and structural improvements to the museum. The cleaning has been completed, the restorers are at work, and the museum is already open to the public again through guided tours.

SHORT ESSAYS

The Rise and Fall of the Crith

The event that influenced most in my chemical development was the gift of Frank Sherwood Taylor's book *The Young Chemist* [1]. This moved my chemistry up a notch from the tame experiments in the booklet that accompanied my Lott's 1954 chemistry set, to the construction of a home laboratory based on the kitchen table and later, the garden shed. The experiments were usually larger in scale, distinctly less safe, and inevitably attractive to an eleven-year-old Alan Dronsfield. But some were doomed to failure. These were those that demanded the use of a "few grains" of this or that chemical, and at the time I only knew of grains in the context of salt, sugar or sand. Knowledge that a grain had a fixed mass (= 64.80 mg) and could be used for measuring out chemicals was a concept alien to me. Really, Taylor should not have been using it in his book as it was in desuetude long before its publication, along with scruples (1 scruple = 1.296g) and drachms (1 drachm = 3.888g).

Some half a century later, with a developing interest in the history of our subject, even the oldest of my lecturer colleagues, including the physical chemists, regarded me with suspicion when I mentioned the 'crith' as a unit of mass. This is curious since August Wilhelm von Hofmann (see figure 1), who invented it, said "There is probably no figure in chemical science more important than this to be borne in mind and to be kept in readiness for use in calculation at a moment's notice... The key or coefficient is *the crith = 0.0896 gramme*; and I think you will now see the grounds of my oft-repeated hope that you will firmly commit it to memory" [2].

Figure 1: August Wilhelm von Hofmann. Hofmann was Director of the Royal College of Chemistry, Oxford Street, London, 1845-1865. The Royal College of Chemistry had become part of the School of Mines, and later, Imperial College, London.

Image available copyright-free from https://commons.wikimedia.org/wiki/File:August_Wilhelm_von_Hofmann01.jpg

The crith, then, is a measure of mass, named by Hofmann after the Greek for barleycorn, a seed which he saw as having an approximately a similar size. It is the mass of 1 dm^3 of hydrogen gas under standard temperature and pressure. Thus in the case of oxygen, with the relative molecular mass of 32 compared with hydrogen's two, the mass of 1 dm^3 at stp will be 16 criths.

In the case of 'compound gases', Hofmann said "the relative volume weight of each is equal to half the weight of the product volume. Hydrochloric acid gas (HCl), for example, consists of 1 volume of hydrogen gas plus 1 volume of chlorine equals 2 volumes, or by weight, 1 plus 35.5 units, whence it follows that the relative volume weight of hydrochloric acid gas is 36.5/2 = 18.25 units, which therefore expresses the number of criths which 1 litre of hydrochloric acid gas weighs at 0°C and 760 mm pressure, and the crith being (as I trust you already bear in mind) 0.0896 grammes, we have 18.25 x 0.0896 = 1.6352 as the actual weight in grammes of 1 litre of hydrochloric acid gas". He goes on, and this is the essence of its usefulness, "Thus by the aid of the hydrogen litre weight or crith (= 0.0896 grammes) employed as the common multiple, the actual weight of 1 litre of any gas, simple or compound, may be deduced, from the more abstract figure expressing its volume weight relative to hydrogen". He enthuses further: "with these additions to our stock of knowledge the symbols of the volatile elements and the formulae of the volatile compounds acquire for us a new significance... We find with the aid of one coefficient, the key to them all; these are abstract weights may be transformed into the corresponding concrete or actual weights at 0ºC and 760 mm pressure. That key or coefficient is the crith (= 0.0896 grammes) and I think you will see the grounds for my oft-repeated hope that you will firmly commit it to memory".

Enthusiasm indeed. But as a unit, it never really caught on [3]. Admittedly, it featured in some of the more introductory textbooks on chemistry published in the late nineteenth century. John Buckmaster in his *Elements of Inorganic Chemistry* was one of the few UK supporters [4]. But in more advanced texts it scarcely gets a mention. Even Partington in his *Fundamental Principles: The Properties of Gases* dismisses it in under three lines [5] and I cannot find a mention of it in any of his monumental works on the history of chemistry.

The crith has been, of course, supplanted by the gram molecular volume (molar volume) of 22.4 dm^3. Using our earlier example of gaseous oxygen, M = 32 g and its 'normal density' (the mass in grams of 1 dm^3 at STP) will be 16 criths, namely 1.4336 g per dm^3. Using the 21st century value for gas

densities this can be recalculated as 1.429 grams per dm^3. Given that the molar volume = M/'normal density', we derive the ubiquitous volume of 22.4 dm^3.

Essentially, what could be done with the crith could be done with the molar volume. Both relate molar volumes to molar masses. Exactly who must be credited with the discovery of 22.4 dm^3 remains unclear. Partington suggests that we have Mendeleev to thank, but he himself refers to it as "the Law of Avogadro and Gerhardt", so a mystery remains.

On the 23 June 2016, the UK narrowly voted to leave the European Union, the 'leavers' presumably preferring the image of Britain of the 1950s to the then present one influenced by, and arguably in thrall to, the EEC. In what he termed the "Brexit Dividend"), Prime Minister Boris Johnson proposed, as part of the 2022 Jubilee celebrations, the re-introduction of Imperial units, including the pound and ounce as units of mass [6]. Perhaps we, as chemists, should agree to eschew the use of the molar volume term of 22.4 dm^3, a foreign construct, and bring back the crith. But we would be faced with a problem – it was invented by a German, albeit an Anglophile one!

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3. Arguably, the crith enjoyed greater success in the USA under the advocacy of chemical educator Josiah Parsons Cooke. See W. Jensen, *Bull. Hist. Chem.*, 1988, 2, 16.

4. J.C. Buckmaster, *The Elements of Inorganic Chemistry* (London: Longman & Co., 1874).

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6. The pound and ounce were finally abolished on 1 January 2000 for the sale of "loose goods".

This article first appeared in a less-personalised form in *Education in Chemistry*: T. M. Brown, C. Cheetham and A. T. Dronsfield, *Educ. Chem.* 1996, 33(2), 56.

Alan Dronsfield

Linseed Oil Oxidation and Linoleum Manufacture

If you are of an age similar to mine, you will definitely have walked on a lino floor at school, or in a library, a hospital or other public building. If, like my parents, yours valued a durable floor covering that was easy to keep clean, you will have walked on it in the kitchen and hallway. For such a popular product, surprisingly few have heard of its inventor, Frederick Walton, or the chemical process he developed to make linoleum a reality.

Figure 1: Frederick Walton (1834-1928)

Frederick was born at Sowerby Bridge, Yorkshire, in 1834. He was the second of seven children and was educated in Bradford and Wakefield. His father was an engineer and invented a process for the manufacture of wire cards for the teasing of cotton. At the age of twenty-one Frederick worked with his father at their Haugton Dale factory manufacturing those wire cards. It is here that he first experimented with various ways of making 'plastic materials', filing nine patents, the majority of which involved linseed oil. Frederick died in a road traffic accident at Nice in 1928 aged

ninety-four. Figure 1 shows a portrait photograph of Frederick, who was described "In dress he was careful but by no means a dandy" [1].

Before I start, I need to say a few words about my sources, the most important of which is a collection of hand written factory notes dating to about 1890 [2]. That factory was located in what is now the Two Rivers shopping centre in Staines-upon-Thames, simply Staines in 1864 when the lino factory opened. The notes were in the private collection of Ralph Parsons, a former curator of Spelthorne Museum, also located in Staines. Ralph gifted the notes to the museum archive and used it as a source for his booklet on the history of linoleum [3], which I thoroughly recommend to the interested reader. He did not have space to transcribe all of the text, particularly details of the chemical processes, hence this article. I have tried to preserve the voice of the nineteenth-century factory narrator as best I can by leaving his grammar and spelling uncorrected. The transcript is reproduced in italic type below. The author of our notes remains unknown, and the notes are dated only because he tells us: (linoleum) *was introduced by F Walton Esq at Chiswick about 26 years ago*.

Some nineteenth-century terminology we need to keep in mind is that linseed oil is a 'drying oil', it forms a solid skin (dries) on exposure to air. Substances (lead compounds in 1890) that accelerate that drying were called 'dryers'. Note also, units of the day were pounds, ounces and Fahrenheit.

The heart of the linoleum manufacturing process is the oxidation of linseed oil. This required the degree of cross-linking (which of course was an entirely unknown concept in 1890) to be controlled such that linoleum processing/rolling remained possible, but a tough durable surface could also be generated by a final curing of the finished linoleum product.

Walton patented numerous ways to oxidise linseed oil, working on the topic throughout most of his life: his British Patent 1860 00209 scrim oil process was used for linoleum production, 1872 02845 and 1895 08250 were blown oil processes developed to eliminate the scrim cloth, and the wonderfully named 1894 07126 'shower bath and smacker' process was developed for rapid bulk oxidation. During his lifetime Frederick would file over one hundred patents, fifty-five of which would involve 'plastic materials' derived from oils [4].

Walton was amongst the first to recognise that linseed oil drying was an oxidation process. In a presentation to the Society of Arts in 1862 he said "…with the oil there in an increase of weight (ascertained by accurate

experiments) from the absorption of oxygen" [5], but note he was already referring to 'oxidised oil' in his 1860 patent.

Walton's 1863 patents 01037 and 03210 for the use of oxidised oil for floor coverings were filed from his British Grove works in Chiswick [6]. He moved to Staines in 1864 to establish a manufacturing site and named the flooring material 'linoleum'. A schematic summary of the linoleum manufacturing process is shown in Fig. 2.

Linoleum Raw Materials

Linseed Oil

Linseed Oil is the oil crushed from the Linseed. Linseed is the seed of the Flax Plant.

In the manufacture of Linoleum Pure Linseed Oil must be used. It used to be adulterated with Resin and Cotton Oils but now as they are so much about the same price it is not so often the case. Before stowing the oil away in the tanks it is first tested either by acid or boiling it till it thickens. A spot of Nitric Acid will soon show whether it is adulterated or not. By putting a little oil on a piece of glass if there is any adulteration a spot of nitric acid will cause a dark brown place to appear.

In testing the oil by boiling (as done at Staines) 100oz of oil is put into an iron saucepan and heated up to 300º when the dryers namely 1oz of Red Lead and 1oz of Litharge are added and stirred until they are thoroughly taken up. When the heat has risen to 520º a current of air is blown into it and the heat kept as near as possible to that height and should take about 2 ½ hours to thicken from the time of starting to blow it. By experienced persons tasting is a good way of testing the oil. It should be sweet and soft and of a light colour.

Lead Dryers

Litharge, a semi-vitreous oxide of lead. The protoxide may be prepared in the pure state by heat(ing) carbonate or oxalate of lead at a dull red heat in a crucible in which a current of air is made to circulate. Here the salt radical is dispersed and there remains a straw-yellow substance which is pure oxide of lead. When the temperature at which it is produced is elevated it assumes a brownish-red colour which in part disappears as it cools. It is very heavy and on being fused and allowed to cool it forms itself into crystals. Oxide of lead is slightly soluble in water. In potassium or soda liquor the oxide is easily dissolved.

With oils is seems to enter into peculiar combination which confer on them the property of drying rapidly on exposure to air.

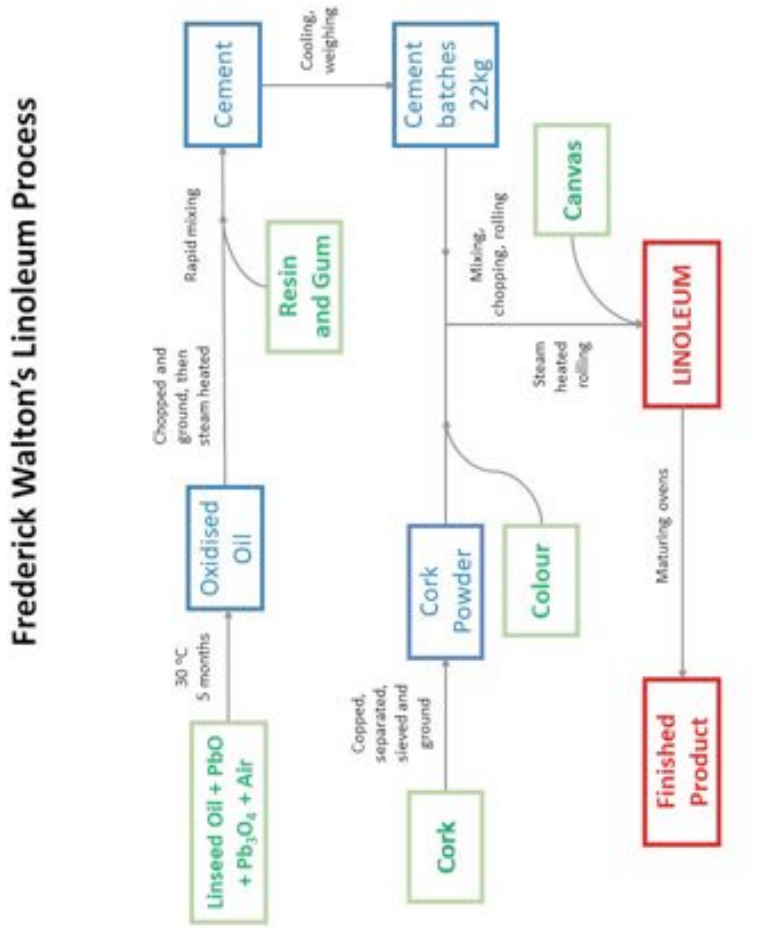

Figure 2: Schematic Summary of Frederick Walton's Linoleum Process. Compiled by author from the handwritten notes.

Litharge is obtained by the oxidation of lead, raised to a high degree of heat by a blast of air the temperature being as elevated as to fuse it.

Red Lead. The purest lead is melted in a reverberatory furnace with a spacious hearth or bed and having a high bridge and arch, so that the flame and gases revolve from the latter to the metal over the entire space. The fire is never right to render the interior hotter than a dull redness. In consequence of the air passing into the furnace through the fire and by the other apertures, a covering of oxide forms on the surface of the bath; this is raked aside by the workmen and a fresh surface exposed , which in a short time be coated as before, and cleaned in the same way. This operation, which is called drossing, is continued until the whole of the lead is oxidised and a yellowish powder of oxide results. Process occupies about 22 hours.

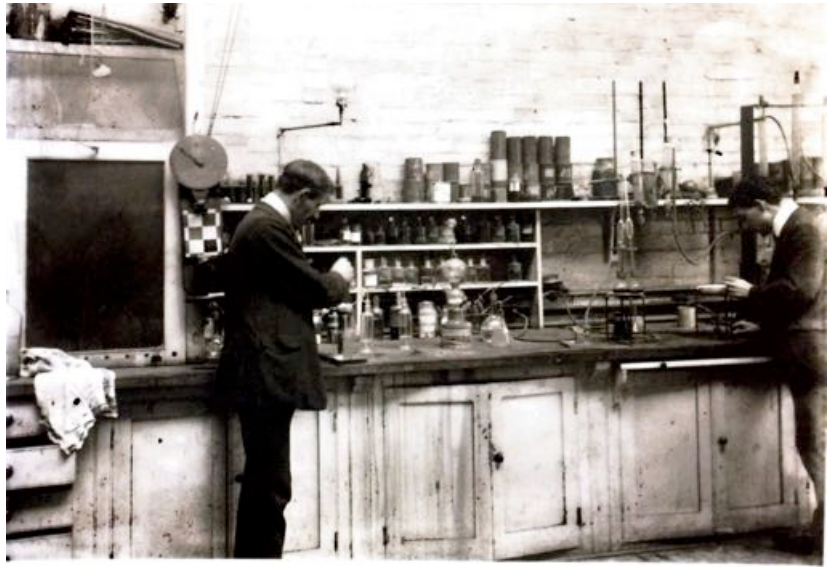

Figure 3: The Linoleum Testing Laboratory in the Early Twentieth Century.

As the massicot, or litharge, is increased in quantity it is carefully disposed into channels for the purpose of allowing contact of the metallic portion with the air, to favor its oxidation. After the metallic character of the lead introduced has disappeared, the oxide, or dross, is spread out on the sole and turned occasionally in order that any particles removed during the

drossing in the semi-metallic state, or in that of suboxide, may be wholly converted into litharge. When completely oxidised it forms a layer 2 ½ to 3 in thick on the bed of the furnace. The powder is raked out into iron waggons at the working door and conveyed to the coloring furnace which is similar to the last only temperature somewhat lower. Here it is spread on the sole in a layer, and left exposed to the oxidising effects of air passing through the fire in a partly undecomposed state and also to that which enters at the doors, which, unless the temperature be too low are left half or quarter part opened. Great attention is necessary to maintain the heat of the furnace its due degree – that is somewhat below dull redness or between 550º and 600º also in exposing a fresh surface till the proper shade of color is attained. 48 hrs is time generally used.

The factory notes also specify the preparation of cork, gums and resins. A full transcript is available from:

https://drive.google.com/drive/folders/1z8Dg8LPlPoNpiBuAR08rmWpj1z7rOi6D

Sourcing of pigments is not specified in our factory notes, but patent 1863 03210 tells us Venetian Red and Ochre were typically used.

Linoleum Production

These are the 1890 notes on the initial stages of the process.

When the oil is pumped into the tanks the mucilage of course sinks to the bottom and it is known by the name of Raw Oil Fools. The clear oil is pumped from there into the pans for boiling. It is there heated up to 300º when 1 percent of Red Lead and 1 percent of Litharge is put into it and stirred by stirrers connected with a small steam engine. Only a certain quantity of dryers can be taken up so it is of no use putting more than the above mentioned quantity as that is found to be quite sufficient. The oxide of lead is by the heat and constantly being stirred taken into the oil which helps it in its oxidation and often what is not taken up by the oil is found at the bottom of the pans in the shape of metallic lead.

From the pans the oil is pumped into a tank to allow any sediment to sink to the bottom and the good clear oil can then be drawn off and taken to the sheds to be oxidised.

The Sheds are long lofty buildings and are filled with rows of a thin kind of material known as Scrim 2 widths of 3 feet wide on a bar and about 1½ inches apart on which the oil is to be oxidised.

The oil is pumped to the top of the buildings into a trough which by means of a mechanical arrangement the cloths are flooded. This little tramway arrangement is very good and allows the oil to drop over each bar and the cloths to become saturated. Formerly men had to go up stairs and push the tramway along by this method the cloths did not get half so well flooded as it was a very nasty job for the men on account of the gases but now they are worked by chains from outside. The buildings are heated to about 86º and causes the oil to dry on the scrim and are constantly reflooded, when the skins as they are called are tackey they generally get to about ½ inch in thickness and take about 5 months in getting to that state. The heat and each skin being exposed to the air causes the oil to take in the oxigen. Care must be taken in starting a shed to part the skins so as to allow the air to pass freely between each.

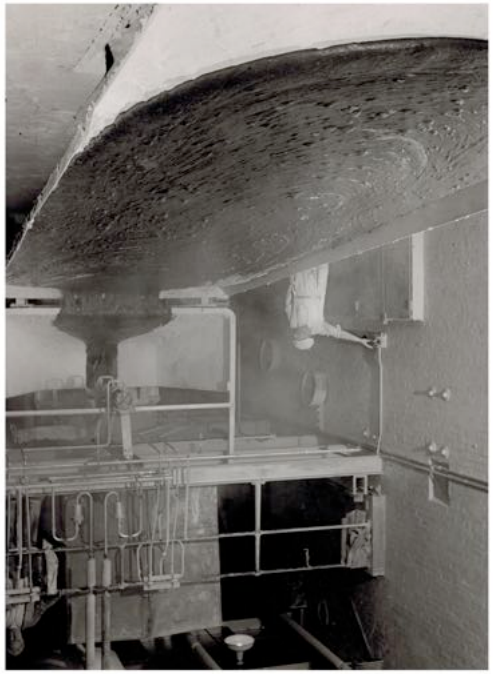

Figure 4: The ‘cement’ preparation part of the production process in the early twentieth century. A transcript of the complete process is available from: https://drive.google.com/drive/folders/1z8Dg8LPlPoNpiBuAR08rmWpj1z7rOi6D

The Scum is the sediment found at the bottom of the wells from the boiled oil and is a light yellow colour and when dried forms a useful ingredient in the making of the Backing Cement.

Factory Health and Safety

In his book *The Infancy and Development of Linoleum Floorcloth* [7], Frederick devotes considerable space to an anecdote about a manager reprimanding an employee at Staines for not following instruction on disposing of linseed oil soaked rags, and showing the employee exactly what can happen – the rag smoulders and bursts into flames. This 'spontaneous inflammation' effect was first reported in a letter published in the *Philosophical Transactions of the Royal Society* in 1794 [8] and it is likely that this was also the cause of the terrible fire at Frederick's Chiswick works in 1862.

Figure 5: Steam Fire Engine at the Linoleum Works in 1880.

In addition to the fire hazard associated with handling linseed oil, milling cork also posed a particular problem from ignition of dust suspensions, with the miller reported a jumping for their lives into the river on more than

one occasion. Frederick was therefore very careful about fire safety, laying out the buildings with space between each, and his was one of the earliest industrial sites to employ its own fire service. Fig 5 shows the linoleum works steam fire engine in 1880.

All chemists understand that PPE is a last resort, and extraction of harmful substances is always preferred. The same was true in the Staines lino factory in 1890:

There is naturally a lot of very objectionable gases given off in the process of oxidation in the sheds and these are at Staines drawn off in pipes and burnt through passing through a furnace and a very high shaft so prevents the objectionable smell being a nuisance to the immediate neighbourhood.

One of the 'very objectionable gases' was acrolein, the odour of which I can still recall from Harry Kroto's laboratory, where it was used to instruct new students in the art of using his microwave spectrometer.

Walton's Legacy

This is how *The Industrial Chemist* started its 1925 article "The Manufacture of Linoleum", "It is now sixty-one years ago since linoleum was first made at Staines under the Walton Patents. Frederick Walton, perhaps one of the most brilliant inventors of this country…." [9].

Walton's obituary in *The Times* in 1928 noted, in addition to his many achievements with oxidised oil and linoleum, "Mr Walton also introduced into this country flexible metal tubing which has proved of enormous value in the world's oil fields" [10].

In 1934, the centenary of his birth, was marked by the Royal Society of Arts with an article in its journal which noted, "He deserves to be remembered, not only as one who originated a great industry, but as a pioneer, on similar lines to his contemporary William Morris, in the linking of Art with Industry" [11].

We also remember him in Spelthorne Museum.

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Acknowledgements: I gratefully acknowledge the assistance of Eve Watson, archivist at the Royal Society of Arts, for assistance in finding records associated with Frederick Walton and to the Spelthorne Museum Trustees for permission to publish and allowing reproduction of the photographs.

Notes: Spelthorne Museum, established in 1980, is entirely volunteer run and is located in Staines-Upon-Thames. Exhibits span the period from the last Ice Age to the relatively modern. The author became a museum volunteer after retiring from teaching secondary science/A-level chemistry and prior to that working for over twenty years in petrochemical R&D.

Mike Taylor

The History of Chemistry Podcast: Reaching the World

In a previous issue of the *Historical Group Newsletter* [1] I described reasons for my history of chemistry published in graphic format, aimed at the teen-and-up layperson [2]. While the book was in press and after publication, though, I wondered how I could keep the "history of chemistry" momentum going. One bitterly cold evening in March 2022, my car refused to start, and I called the AAA (the American equivalent of the AA) for a jump-start. While I was on my mobile telephone, the dispatcher chatted with me, and commented that, with my voice, I should be the host of a radio show. I laughed nervously.

But not long after, I considered the AAA dispatcher's light-hearted remarks seriously. Perhaps I *could* do a podcast. Bear in mind that I have listened to almost no podcasts in my life, except a long-running one recommended to me by a friend, called "The History of English" [3]. After some consideration, I decided to try my hand hosting a podcast. Audio recording and processing techniques are not new to me: since my early teens I have been interested in high-fidelity stereo equipment, and among my first acquisitions were a semi-professional-quality cassette deck and two professional microphones. I used them to record school musical concerts and, later, choral concerts in which I performed, for many years thereafter. At the dawn of the internet, I learned how to transfer these analogue recordings to digital format. Over the past decade, I have become accustomed to home digital recording and processing.

Given my lack of familiarity with podcasts themselves, I decided to model, at least superficially, my own podcast on "The History of English." The host, Kevin Stroud, takes on a small chunk of English linguistic history for approximately one hour per episode, and advances in chronological order. He uses appropriate introductory music and ending music. He starts with pre-English, that is, proto-Indo-European, the postulated language of a population living in Eastern Europe, from which most European languages have evolved. As of writing this article, his podcast numbers 167 episodes and has only reached the early effects on English of colonizing North

America in the 1580s. My design for a podcast, therefore, was to start with chemical pre-history, and slowly advance with time towards the modern era.

Though I certainly want to sell as many of my books as possible, the rationale for a podcast over a book is two-fold:

For those who cannot or do not like to read, audio instead of visual imagery expands the audience for chemical topics.

My book was limited to 200 or so pages, so nearly every historical figure only merits a cartoon panel or two. I run through chemical history, picking only the highest points, with no chance for nuance. A podcast series can run so long as I choose, offering me the opportunity to delve into particular topics and historical characters.

A downside is that I cannot depict molecules or chemical reactions visually, nor offer illustrations of chemicals, materials, or people.

I spoke to several friends about podcasts, and collected their advice on length and style. Ultimately, after discussion, consideration, and research into the nuts and bolts of podcast production, I aimed for the following format:

Each episode lasts approximately twenty minutes. (This is roughly how long my voice lasts while speaking in front of a microphone before I get weary.)

Topics, like the book, often link chemistry to other fields, whether artistic, social, or historical. I mention interesting facts about people or events related to the chemical topic of the episode.

The level of discussion is for the non-scientist adult, who may (not) have taken a chemistry class in secondary school. (This raises the intellectual level beyond the book, which is nominally aimed at the teen market.)

Occasionally I ask a guest to talk uninterrupted for about five to ten minutes on a topic peripherally related to chemistry.

I add sound effects on occasion to liven up the episodes. All sound effects I use are in the public domain. My favourite source for them is Freesound.org, plus some musical backgrounds at musopen.org.

There is a tag-line at the end of every episode. After looking up chemical-related idioms in English on the Internet, I finally settled on “Brave the Elements!”

I purchased the podcast rights to a piece of music, Chemical Logo, by Plastic3, on the www.tribeofnoise.com website to use as my musical signature. It has a strong modern beat, and vaguely reminds me of the *Futurama* animated situation comedy theme music [4]. I record my voice with one of my original Audio Technica AT-801 microphones from my teen years, plugged into a Behringer 302USB mixer, and connected to a USB input on my laptop computer. For digital recording and mixing I use Audacity freeware. I do not own a recording studio, but my home office is carpeted, which helps to dampen reverberations where I record. Rather than purchasing an expensive pop-filter to remove the explosive sound of the consonant “p,” I improvised with a tiny felt bag such as one might use to store a small piece of jewellery, and placed it over the microphone head. It is not perfect, but it works fairly well for the price (free). Apparently, saliva has a deleterious effect on microphone innards, so a cover or filter is recommended for microphones [5].

I wrote a sample episode, recorded it, and sent it to half a dozen friends. I collected their thoughts, and readjusted somewhat based on their comments. For guests, so far I include an expert on the Hebrew Bible to talk about metals in the Hebrew Bible (for Iron-Age chemistry); a retired professor of art history to discuss Enlightenment art such as the works of Joseph Wright of Derby and the *Portrait of Antoine-Laurent Lavoisier and his Wife* by Jacques-Louis David (in the episode on Lavoisier’s chemical revolution); a retired professor of English Literature to discuss a piece of fiction as a chemical allegory by Goethe (in an episode on nineteenth-century chemistry), a writer of programme notes for classical performances to talk on the music of Alexander Borodin (in the episode on Mendeleev’s periodic system), an engineer to talk about practical aspects of friction (in the episode on hydrocarbons), a brewmaster to discuss pH and beer (in the episode on pH), a lecturer in English on the literature of Primo Levi (for post World War II chemical warfare), and a toxicologist talking about methylmercury (when discussing Japanese pollution diseases). I plan on more experts as the series progresses.

Based on my book, I had projected something over fifty episodes to cover all of chemistry’s evolution, but as of this writing, I have posted sixty-nine episodes, reaching the 1960s, recorded seventy-four episodes (entering the 1970s), and written eighty-two episodes (starting the 1980s). Obviously, there is still a lot more chemical history to cover. I post an episode approximately every six days. The hosting site is Buzzsprout, which allows

podcast hosts to register for an array of podcast apps. For premium content, which is early access to episodes plus supplemental sheets with diagrams of molecules and reactions, I use Patreon. Podcast hosting companies prefer if the series has a logo for visual appeal while potential listeners scroll through possible series, so I designed and created in Photoshop software a bold image of a conical flask pouring lurid green liquid into the title of the series [Figure 1].

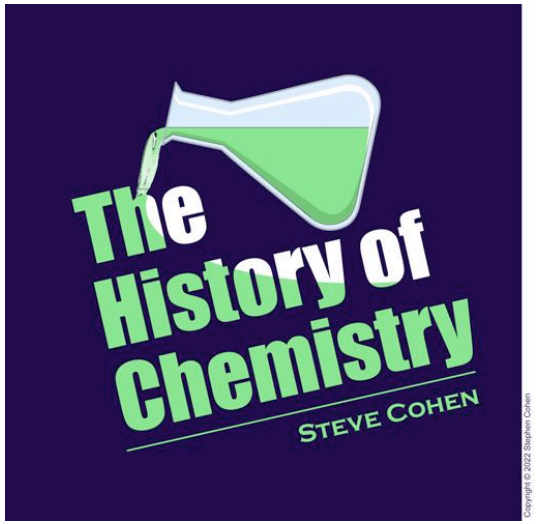

Figure 1: Logo for "The History of Chemistry" podcast. Image copyright © 2022 by Stephen Cohen.

As to subject matter, I avoid almost entirely mathematics: the idea is to introduce a layperson to the grand ideas of chemistry and how they developed, not to teach the listener how to be a chemist, or do chemistry. As of this writing, I also have not used the word "mole." In my view, moles are not necessary for these grand ideas, and seem to give non-scientists anxiety in classroom settings. When I describe molecules, I use general terms, like "a benzene ring with a chlorine hanging off," and try to stay away from much jargon. My general tone is conversational, not formal, and I personally approach the subject as a non-expert in science history: my background is a PhD in physical chemistry. Having lived in Nottingham, England for a year in 1985–86 for postgraduate research at the University of Nottingham, I try

to be sensitive to variations in British versus American English. I avoid the Imperial System of units, and almost only use SI units. One exception is, for example, when talking about Eunice Foote's 1856 seminal report on the heat capacity of gases [6], she used Imperial measurements in her article, which I quote, but also provide equivalent metric units. I aim not for an academic treatment of the field, but a general-interest one.

Each episode takes on a small topic in chemical history, such as phlogiston (episode ten), synthetic dyes of the nineteenth century (episode twenty-six), the first nineteenth-century polymers (episode thirty-four), or twentieth-century spectroscopy (episode forty-seven). Most of the time I try to name these episodes with common English idioms or titles from popular music ("Polythene Pam," "Teflon Don," "Metallica and More") as an extra demonstration of chemistry's relevance to popular culture. I do not hold back on difficult topics such as gas warfare, the Nazi-collaborating German conglomerate I.G. Farben, environmental problems, and sexism in chemical institutions. The rhetorical goal is to be even-handed, talking about chemistry's successes and its failures, while hoping that the listener will gain my trust in talking rationally about such topics. Unlike my graphic history, I can delve into more obscure topics, such as the development of chemical laboratories in the nineteenth century, the instrumental revolution of the mid-twentieth century, and the role of chemical societies.

Because my standard sources date from the 1960s to 1990s, as I move to more recent chemical events from the late twentieth century onward, I scan several scientific news magazines for worthy topics: *Chemistry World*, *Chemical & Engineering News*, and *Physics Today*. Among themes I have culled from recent issues of these journals for possible inclusion in my podcast are:

- Philosophy of chemistry, such as "Is water H_2O?," "How do we know that we know?," "The quantum measurement problem," and "What is a chemical bond?"
- Qubit chemistry
- Synthetic diamonds
- Molecular machines
- Automated chemical instrumentation
- Microplastics

- Electrically-conductive organic polymers
- Removal of “forever chemicals”
- Laboratory safety and Karen Wetterhan’s legacy
- Chemistry deep in the Earth

Obviously, I am not an expert in most of the topics I discuss. My background is surface chemistry in the realm of physical chemistry, therefore the controversies over organic reaction mechanisms are doubtless out of my depth—and I often approach organic chemistry topics with much trepidation (as I did in my undergraduate years). Because my goal is to provide the overarching ideas rather than tiny details, all explained at the lay level, I feel my overall expertise in chemistry combined with my non-expertise in certain branches of chemistry make a good background for compromise in presentation. I learn quite a lot as I write each episode. After writing a script, I often finding myself excitedly describing some oddity of that episode to my wife, who has a PhD in organometallic chemistry.

I don’t hide my American accent, but neither do I emphasize it, nor do I promote a regional dialect (mine is largely Middle Atlantic). I speak slower, enunciate more clearly, and even modulate my pitch to a wider degree than conversational speech while recording, knowing that many listeners are non-native English speakers, or may have hearing limitations. Occasionally I offer a British translation of an American term (“lobbying organization” versus “pressure group”). Having a background interest in languages, I attempt to pronounce foreign names and words as accurately as I can. My philosophy is to show that the chemical enterprise, though beginning in Europe mostly as a hobby of rich white Christian men, is now a global science, so everyone gets a chance.

Posting episodes of my series began on 7 May 2022. Buzzsprout offers podcast hosts some statistical information on their podcasts. As of this writing, the listenership to “The History of Chemistry” is international. While the bulk of downloads (68%) are in the USA, there are listeners on every continent, including 5% in the UK (Table 1). The number of downloads is rising, and nearing 50,000 (Figure 2). I estimate, based on Buzzsprout’s statistics, that between 300 and 350 listeners hear an episode in the first week after posting it, about 450 hear an episode within the first thirty days of posting it, and around 550–600 hear an episode within ninety days of me posting it.

United States	68 %
United Kingdom	5 %
Canada	5 %
Australia	2 %
Germany	2 %
Norway	1 %

Table 1: Downloads of “The History of Chemistry” by country, with at least 1% of total downloads, as of 22 May 2023. Data taken from the “History of Chemistry” Stats section at Buzzsprout.com.

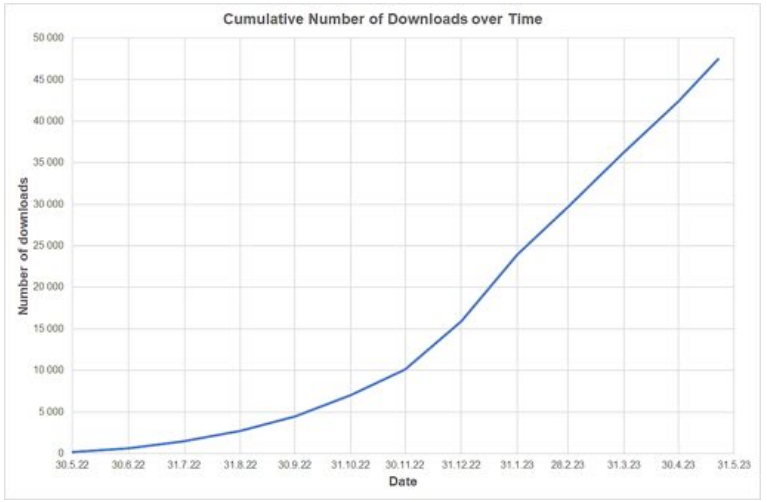

Figure 2: Cumulative number of downloads since the start of the podcast series, as of 22 May 2023. Data taken from “The History of Chemistry” Stats section at Buzzsprout.com.

The independent website *Listen Notes* ranks my podcast as in the top ten percent in popularity globally out of over three million podcasts [7]. Apple podcasts rates it 4.4 out of 5 [8]. Chartable ranks it number four of all USA Chemistry podcasts [9], and number two in Canada [10]. Recently I began

receiving e-mailed comments from listeners on the series; the comments are all positive.

The goals of the podcast, like my book, are to bring chemistry to the forefront of people's minds when they think of science, to counter the chemophobia often encountered among the public, and to generally increase awareness of scientific ideas among non-scientists.

References

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Stephen M. Cohen

BOOK REVIEWS

Aileen Fyfe, Noah Moxham, Julie McDougall-Waters and Camilla Mørk Røstvik, *A History of Scientific Journals: Publishing at the Royal Society, 1665–2015* (UCL*5* Press, 2022). Illus., Index, Pp 664. £60 (hardback), £40

(paperback). ISBN: 9781800082328. Pdf of book is available for free from: https://www.uclpress.co.uk/products/187262

This book focuses primarily (but not exclusively) on *Philosophical Transactions*, the world's longest-running science journal. It is arranged in chronological order, covering the 350 years from its first issue published in 1665 (soon after the English Civil War) until 2015. The authors used the Royal Society's archives to explore the journal's history, leading to a unique study of scientific journal publishing.

For those like myself who have an interest in the history of chemical information and publishing, the book provides an illuminating, well rounded picture of the evolution of a journal in an ever-changing landscape. It is well written and nicely illustrated with images from Royal Society publications and other relevant documents. It becomes particularly interesting when the human dimensions are explored, such as changes of editors and their different styles, the influence of external parties such as printers, and relationships with authors and the Royal Society itself.

The first editor was Henry Oldenburg (1617-1677), who was also the secretary to the Royal Society, and in 1753 *Transactions* was adopted as the Society's official publication. Concerning the journal's early history, navigating potential hazards of the period such as plague, the fire of London, the imprisonment of Oldenburg and the impact of his death make this section a fascinating read, as does the influence of well known scientists, both in this period (e.g. Robert Hooke) and later.

From the late seventeenth century until the late eighteenth century, the sciences were not differentiated as they are today and the journals which acted as the vehicle for publication of science were diverse in their coverage - *Transactions* predated journals covering purely chemistry by over a century. As well as developments in subject coverage over time, changes to the type of content are discussed. In the early days letters and notifications of books dominated the contents and this continued until the late nineteenth century and the professionalism of science when more structured papers written in impersonal language became predominant. Many aspects of publishing and their changing impact over time are discussed, such as production technologies, the changing role of journals, relationships with other publishers, financial fluctuations, refereeing/peer review, editorial approach, the information explosion, and cultural and social issues of the day. The book concludes with discussion of twenty-first century challenges

from the increasingly commercialised, competitive scientific publishing environment, internationalisation and digital technologies.

The book also covers other Royal Society publications, including the *Proceedings of the Royal Society* (first produced in 1831) and more recent journals (e.g. *Biology Letters*), providing a more complete history of the Society's publications.

As the online version of the book is open access, this should bring it to the attention of a wider audience than a print-only publication. It is likely to appeal particularly to those with an interest in the history of science, scientific information, librarianship, and publishing.

Helen Cooke

John G. D'Angelo, *Synthetic Organic Chemistry and the Nobel Prize, volume 1* (Boca Raton: CRC Press, 2023). Pp 108. Hardback. £44.99. ISBN 9780367438975.

This is a slim volume and one immediately wonders why it had to be broken up into four volumes given that volume two has appeared already. The title is rather opaque, is it about synthetic organic chemistry or the relationship between synthetic organic chemistry and the Nobel Prize? The first volume is a book of two halves, the first half is about the Nobel Prizes themselves and the second half is about six chemists who won the Nobel Prize up to 1965, about half the lifetime of the Nobel Prize in chemistry. One could query whether the Nobel Prize is the correct method of deciding which chemists to cover, but it is a commonly used criterion. The background material on the Nobel Prizes is interesting but not always relevant to the current volume and contains a number of personal remarks not usually found in a historical volume. Each of the subsequent chapters are brief (with one exception) and do not contain much biographical material nor, surprisingly, much about the syntheses which won the Nobel Prize for the chemist in question. Indeed, the first chapter lists the reactions (e.g. the Fischer indole synthesis) that did not win the Nobel Prize for Emil Fischer. The following chapters are about Wallach, and Sabatier and Grignard. The one fairly long chapter is the one on Diels and Alder, but this additional space is given to the later use of the Diels-Alder reaction rather than their own work. The final chapter is about R.B. Woodward. This chapter can only be described as a damp squib. There is nothing biographical here at all and much of the chapter is given over to two controversies, namely the quinine synthesis and the question of whether Corey gave Woodward the idea for

the orbital symmetry mechanism of electrocyclizations. This is followed by very brief descriptions of Woodward's synthesis of reserpine and strychnine. The major problem here is not the briefness of the chapter, but the author's failure to even cite the excellent work of Jeffrey I. Seeman and Robert M. Williams on the quinine controversy which has been published in *Angewandte Chemie* [1, 2] and the extensive discussion of these two syntheses by the reviewer in the volume he co-authored with O. Theodor Benfey, *Robert Burns Woodward: Architect and Artist in the World of Molecules* (CHF, 2001) [3]. Furthermore, Woodward's Nobel Prize was given for his synthetic achievements prior to 1965, the year that the first Woodward-Hoffmann publications appeared [4]. Thus, the Corey-Woodward story is unrelated to the theme of this volume. The reader will not be surprised to learn that the author is a synthetic organic chemist, who has previously written a textbook of organic chemistry. The volume under review is absurdly expensive at 45p a page and the reader would be better served (for example, in terms of the chemist's biography) by reading the relevant webpages of the Nobel Foundation's website. I would be unwilling to recommend it even if all four volumes had been published as one book priced at around £30, as they should have been, but at least it would be both complete and better value.

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Peter Morris

Johan Alfredo Linthorst, *Research between Science, Society and Politics. The History and Scientific Development of Green Chemistry* (Utrecht: Eburon Academic Publishers, 2023). Illus., index. Pp. 269. €36.00 (softback). ISBN: 978-94-6301-434-2.

The development of green chemistry has acquired a considerable body of scholarship over many years, often under the heading of related terms, sustainable chemistry, environmental chemistry, clean technology, and "benign by design chemistry". Linthorst's book builds on his earlier research and addresses the research question: "how did environmental concerns and the public image of chemistry shape the emergence and (scientific) development of green chemistry in the USA, the UK and the Netherlands?" [1] The three countries were chosen because of the origin of green chemistry in the USA in the mid-1990s (from Linthorst's earlier work), the major interest in green chemistry in the UK, while the Netherlands is a continental European country that showed a growing interest. In advancing his analysis, Linthorst looks through the lens of the country's chemical societies, the American Chemical Society (ACS), the Royal Society of Chemistry (RSC) and the Royal Netherlands Chemical Society (Koninklijke Nederlandse Chemische Vereniging) (KNCV).

The narrative is divided into six chapters. Chapter 1: Introduction – the Emergence of Green Chemistry; Chapter 2: Chemistry, Politics and Society - the Rise of Green Chemistry in the USA; Chapter 3: Recognition and Institutionalization of Green Chemistry in the UK; Chapter 4: The Rise of Green Chemistry and Sustainable Chemistry in the Netherlands; Chapter 5 Intellectual Origins of Green Chemistry – Diverging Views on Scope and Content; and Chapter 6: The Emergence of Green Chemistry – Discussion and Conclusions. There is also a very useful appendix: sources and bibliography.

While all the chapters make interesting points, it is chapter 2 that is the most intriguing. It reviews the major developments in environmental policy in the USA that emerged from 1970 when the Environmental Protection Agency (EPA) was established, and how out of its interface with the American Chemical Society, the theoretical and practical underpinning of green chemistry gathered a momentum as its influence spread. The leadership of Joseph Breen and Paul Anastas (within the EPA) and the establishment of the Green Chemistry Institute in 1997 were important components.

Readers of this Newsletter will find chapter 3 very informative since it explores the RSC's role in green chemistry. It outlines the role of the Environmental Chemistry Group (within the RSC), the launch of the Green Chemistry Network (GCN) in 1998, also within the RSC but located at the University of York, and the role of James Clark (University of York) at the GCN and with the *Green Chemistry* journal (launched in 1999).

It is disappointing that a book devoted to green chemistry has little about the chemistry underpinning green chemistry or any of the related terms mentioned earlier. It would be beneficial to have some examples of green chemistry processes; to what extent did such processes depend on the specificity of the catalysts? At an Annual Meeting of the RSC in the late 1990s devoted to green chemistry, catalysts were a major research focus and the debate was about how specific and effective particular catalysts were or were not. This was linked to the need to reduce waste products through green chemistry processes.

With the subtitle, *The History and Scientific Development of Green Chemistry*, the book might have mentioned the origin of air pollution regulation in Britain with the Alkali Inspectorate in 1864, and that in both the UK and the USA community organizations campaigned against air pollution during the last few decades of the nineteenth century.

Unfortunately reading the book is marred by a lack of thorough copy editing. There are far too many repetitions (often several on the same page) and too many inconsistencies, which disturb the flow of the narrative. The regular reference to "my thesis" is annoying and it is not clear whether this is referring to the author's doctoral thesis or to the thesis of the book. The omission of an index makes the book difficult to navigate.

However, setting aside these criticisms, readers of the Newsletter with an interest in green chemistry or its origins and those with a general interest in industrial chemistry and the need to clean up chemical processes will find many sections of this book informative. The detailed bibliography will enable readers to delve more fully into their particular interest in green chemistry.

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Peter Reed

Peter J.T. Morris and Alan Rocke (general editors), *A Cultural History of Chemistry* (Bloomsbury: London, 2022). 6 vols. Illus., notes, bibliography, index. Pp. 1728. 6 volume hardback set, RRP £440. ISBN 978-1-4724-9453-9. Also available digitally as an annual subscription or for perpetual access.

A Cultural History of Chemistry is a most welcome addition to this Bloomsbury series which at present covers around forty diverse subjects ranging from animals to food, law, money, medicine, theatre, women and work. Marketed as an interdisciplinary, fully cross-searchable digital resource that engages with culture throughout the ages, the histories are also published as a set of six hard-back volumes. *A Cultural History of Chemistry* brings together contributors from a range of career stages with different methodologies and perspectives to create an in-depth reference source for both specialists and general readers. With volumes covering Antiquity, the Middle Ages, the Early Modern Age, the Eighteenth Century, the Nineteenth Century and the Modern Age, each volume in turn assesses the same key themes in its chapters, enabling readers to follow one particular interest, for example "Trade and Industry" or "Laboratories and Technology" over time. All chapters are replete with references which allow the reader to investigate in further detail should they wish, with comprehensive bibliographies also provided for each volume. Editorial introductions provide engaging and informative overviews of the subject although some succeed more than others in unifying the contents of the volume. Somewhat constrained by the imposition of the eight chapter titles, the use of chapter sub-titles informs the reader as to the subject matter covered. All volumes provide an excellent, up-to-date guide to the historiography, combined with well-chosen and attractive illustrations.

With six volumes surveying the last 5,000 years of chemistry, it is difficult to do justice to the strengths of such a publication in a relatively short review. For readers who wish to reflect on issues such as anachronism and 'What is Cultural History?', *Ambix*, the journal of the Society for the History of Alchemy and Chemistry [1], and the *Bulletin for the History of Chemistry* have published extensive reviews on each volume [2]. The Historical Group's History of Chemistry Online Seminar Series has also included presentations by a number of the authors involved, with talks by John Powers, Peter Ramberg and Matteo Martelli, amongst those on the group's YouTube Playlist:

https://www.youtube.com/playlist?list=PLLnAFJxOjzZu7N0f5-nVtHcLNxU2tKmpC

The first volume, *A Cultural History of Chemistry in Antiquity*, combines the work of Sydney Aufrère on Egypt, Cale Johnson on Mesopotamia and Matteo Martelli on the Graeco-Roman, and is skilfully brought together in each chapter by Marco Beretta. The volume's authors have succeeded in producing an eminently readable and in-depth analysis across a huge timespan (3000 BCE to 600 CE) which will have strong appeal outside what might be considered *A Cultural History of Chemistry's* core readership. This volume is available open access funded by the European Research Council, with the set chapter headings linked to subjects including the Invention of Chemical Recipes; the Circulation of Trade in the Mediterranean; and Gods, Myths and Religion. I would strongly encourage readers to look at this open access volume so they can enjoy and appreciate at least one part of this ambitious project.

https://www.bloomsburycollections.com/book/a-cultural-history-of-chemistry-volume-volume-1-in-antiquity/

Volume two, edited by Charles Burnett and Sébastien Moureau, covers the fifth to fifteenth centuries with an all-encompassing approach covering a broad geographical area. Far-removed from images of crazy old men chasing the impossible, medieval alchemists were the scientists of their time, with the subject pursued by some of the greatest scholars. Readers will find numerous topics of interest. The various difficulties of studying alchemical processes in terms of the transmission of knowledge and identification of ingredients are highlighted. Nicholas Thomas' schematic representations of processes such as distillation, sublimation and cupellation guide the reader through laboratory practice. Alchemical images from technical drawings to allegorical representations such as the chemical wedding of sun and moon are explored.

One of the joys for the chemist of a publication with such range, particularly in the first three volumes, are the insights given into the roles chemical processes play in daily life. Smelting, assaying, dyeing, refining, distillation, metal and glasswork are amongst the many covered, with nuggets of information shared on topics ranging from Galen's criticism of perfume-makers adulterating rose oil to the identity of colourants in medieval glass and enamel. Across the series, the "Art and Representation" chapter is particularly insightful and enjoyable, bringing a multitude of artistic, visual

and literary sources, ranging from Jacques-Louis David's portrait of Antoine and Marie-Anne Lavoisier to Mary Shelley's *Frankenstein* and the DC and Marvel comic books, into a wide-ranging analysis. Some processes have been chosen to receive further scrutiny enabling authors to maintain analytical focus across a wide brief. For example, the early modern chapter on trade and industry focusses on distillation, chosen due to its position cutting across technical and intellectual histories of chemistry, medicine, knowledge and production. The early modern volume, eruditely introduced and edited by Bruce Moran, encourages the reader to explore the question "What is chemistry and where does it belong?" and shows how modern preoccupations with what counts as 'science' do not work well in the premodern world. Chemistry was a vital aspect of the period's culture made evident through the theories, commodities, institutions, processes, practices, objects, social landscapes and visual representations that provide the focus for the chapters.

In the eighteenth-century volume, editors Ursula Klein and Matthew Eddy explore the question "How did chymistry expand from being a philosophy and art practised in a variety of local contexts into a fully fledged critical discipline?" Moving through the institutionalization of chemistry and the formation of chemical communities, there is a focus on the production of local knowledge at many different sites and a science of material substances and their reactions in a 'golden age' for the subject. Peter Ramberg, editor of the nineteenth-century volume, provides an excellent overview of development in institutions, education, industry and content during the period when fundamental ideas were established and chemists were preoccupied with the unification of their discipline. Many of the authors in this and the final volume are well-known to members of the Historical Group and readers may find their contributions of particular interest, with key topics such as research schools, professionalization of the chemist, chemical warfare, pollution and women in science covered in an accessible and informative way. The final volume, *A History of Chemistry in the Modern Age*, edited by Peter Morris, highlights how chemistry in terms of head count, productivity, process and instrumentation has changed more in this one hundred year period than any other, with an enormous impact on society through the introduction of new materials, chemicals and pharmaceuticals.

In bringing together fifty experts to discuss the relationships between chemistry and technology, the other sciences, art, culture and knowledge,

more broadly, and covering a period of 5,000 years, Peter Morris and Alan Rocke have produced an outstanding set of volumes which deserve to be widely consulted and referenced. The volumes showcase the breadth of scholarship and the diversity of subject matter in the history of chemistry in an accessible yet comprehensive way. Together, the editors and authors have created an impressive resource of lasting value, useful for both new and established scholars, which hopefully will introduce different audiences to the discipline.

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Anna Simmons

RSCHG WEBINAR REPORTS

Newton and the Apothecary – Anna Marie Roos (January 2023)

The talk focussed upon the influence of social and intellectual networks on Newton's developing chymical interests, set in the milieu of practices of apothecaries in seventeenth-century Lincolnshire. The memoirs of Lincolnshire antiquary William Stukeley, and the Grantham Corporation Minute Books and inventories from the apothecary shop of Ralph and William Clarke were analysed to illuminate neglected aspects of the life and letters of the young Isaac Newton.

Eighty Years of Astrochemistry - From the First Detections of Molecules in Space to the Present Day - Catherine Walsh (February 2023)

From the dawn of astronomy to the early twentieth century, there had prevailed the notion that interstellar space was a harsh environment, full of energetic particles and radiation, that would prevent the formation and survival of molecules. Through the development of observational facilities (and some luck along the way), we now know that we live in a molecular universe: stars are born in molecular clouds that have a unique and exotic chemistry, planets are born in the dusty gas-rich disks that encircle young stars creating key molecules needed to seed life on planets forming therein, and when stars come to the end of their lives, they create a unique suite of physical conditions that allows the formation of some of the most exotic

species discovered in space. This talk described the origins and development of astrochemistry from the detection of the first molecules in space to the present day. Walsh described the unique chemistry that we now know happens in space, the current state-of-the-art observational facilities, and also how the co-development of laboratory astrophysics has accelerated the field and our understanding of chemistry in space.

Putting the Chemistry Back into the History and Philosophy of Chemistry – Jeff Seeman (March 2023)

Some historians and philosophers of chemistry have recently displayed the tendency to omit the "chemistry" from their studies. In this presentation, Jeff Seeman provided several examples from his recent research in which the "chemistry" was critical to the understanding of the topic. Examples will be taken from historical research on the Woodward-Doering total synthesis of quinine, on the structure of strychnine, on the chemistry of Russell Marker and steroid synthesis in Mexico in the 1940s, on the research of Percy Lavon Julian, the first Black chemist to be inducted into the US National Academy of Sciences, and on Emanuel Vogel's "laboratory curiosity" from 1954 that led to the Woodward-Hoffmann rules and the 1981 Nobel Prize in Chemistry for Roald Hoffmann.

Henry Enfield Roscoe: A Campaigning Chemist – Peter Morris (April 2023)

Henry Roscoe was one of the most prominent chemists in Victorian Britain, yet he has become largely forgotten, perhaps because he did not produce any new theories or have a reaction named after him. Yet his impact on Britain at the time and even on our society today was enormous. Having studied under Bunsen in Heidelberg, he embarked on a crusade to transform English education by using Germany as a model. His first task was to make Owens College, Manchester, viable and then to convert into a university called Victoria University (the University of Manchester's official name until 2004). Fresh from this triumph, he campaigned for the reform of technical education in an alliance with like-minded campaigners such as Norman Lockyer and Philip Magnus, which resulted in the Technical Instruction Act of 1889, with funding from the so-called "whisky money". By this time, he was the Liberal MP for South Manchester, one of the few academic chemists to become a member of the House of Commons. He was also an advisor to chemical companies and local authorities. In his "retirement", he oversaw the reform of the University of London as its Vice-Chancellor,

assisted with the formation of Imperial College and help to found the Lister Institute of Preventive Medicine. He was also the motivating force for the formation of the Society of Chemical Industry and the forerunner of the Association for Science Education.

A Life-Changing Story: Harriet Brooks (1876-1933), Long-Forgotten Pioneering Woman Nuclear Scientist - Geoff and Marelene Rayner-Canham (May 2023)

Back in 1986, Geoff Rayner-Canham was reading a book on the history of chemistry. In the book, he spotted, in amongst many photos of 'old white males', a cameo photo of a young woman: Harriet Brooks. Geoff, and his partner, Marelene Rayner-Canham, both academics at the Grenfell Campus of Memorial University in Corner Brook, Newfoundland, could not find any published work on Brooks. They decided to research her life and work – a project which consumed their lives for many years. The research involved archives in Canada, United States, England, France, and Russia. They discovered that she had undertaken research with Ernest Rutherford, then later with J.J. Thompson, and with Marie Curie. Rutherford remarked about Brooks: "next to Mme Curie she is the most prominent woman physicist in the department of radioactivity". Among other claims to fame, she was the first to conclude that 'radioactive emanation' was, in fact, a gas – radon. Since the publication of her biography, there has been recognition of the importance of Harriet Brooks in the history of science. In particular, she was posthumously inducted into the Canadian Science and Technology Hall of Fame. There is also the Harriet Brooks Award for women in the nuclear industry in Canada, and she was profiled on the cover of the *Canadian Journal of Physics*. It was even proposed that her face be placed on the new plastic Canadian $100 bill. In this presentation, Geoff and Marelene described highlights of her life and work and review her recent rise to much-belated fame – and how it has changed their own life-paths.

Quinine-Urea: A Local Anaesthetic That Possibly Didn't Work – Alan Dronsfield (June 2023)

Historians of chemistry with an interest in the history of medicine will have their own list of discoveries that benefited humankind to a marked degree. Top of my list are:

1. the discovery of general anaesthesia using ether (1846) and chloroform (1847)

2. the application of antiseptic techniques to reduce the risk of infection from surgical operations (1867)

3. the discovery of penicillin (1928), later elaborated by Florey (1939-43).

Quite near the top of my list, possibly even at number 4, would be the discovery of local anaesthesia using injections of cocaine (1884). But it soon became apparent that the use of this drug was risky due to its unpredictable side effects, and chemists began to search for safer alternatives. From a knowledge of the features of its structure, molecules were constructed that were safer. Novocaine was the most successful and enjoyed half a century of popularity until the late 1950s. Attempts to achieve success via an "inject and see" approach using a host of unconnected substances were unfruitful, save one. A strange substance concocted from urea and quinine appeared to be effective and allegedly induced local anaesthesia for a long period. But was it, and did it? It had a limited popularity from 1907-1920, with Novocaine winning the battle for its use. But its demise might have been caused by the ever-increasing suggestions that it had no local anaesthetic effect to speak of at all! This was the story told in this webinar.

A Hundred Years of Conservation Research at the British Museum – Vincent Daniels (July 2023)

The first British Laboratory for research into the conservation of museum objects was set up in the British Museum after the First World War due to concerns about deterioration that had occurred to objects in storage. This talk described some of the conservation research which was performed before the laboratory's formation and how it developed over the following century. The range of materials studied included those on objects and storage and conservation products. Several examples of the speaker's own research were also described.

Historical Group Online Lecture Series on the History of Chemistry

From March 2022 until May 2023, the Historical Group has been running a series of online lectures on the history of chemistry between 2019 and 3000 BCE, loosely based on the Bloomsbury *Cultural History of Chemistry***.** The series started with Peter Morris on chemistry in the twentieth century and ended with Eduardo Escobar and Matteo Martelli **on** "Where did Chemistry Begin?". Abstracts for the final lectures in this series are given below.

The Devil's Doctor: Paracelsus and the World of Renaissance Magic and Science – Philip Ball (January 2023)

The Swiss physician Paracelsus (1494-1541) changed the course of Western medicine by insisting that the medical theories of antiquity, based on the notion of the four humours, should be replaced by an alchemical vision of how the body works. 'Don't make gold, make medicines', he exhorted the alchemists, while his 'bio-alchemy' anticipated the modern understanding of how chemistry underpins all life. But Paracelsus's scheme was broader than that: for him, the entire universe was an alchemical process wrought by God, in which 'occult' forces governed the relationships between the stars, the earth and the body. Philip Ball outlined this vision and described Paracelsus's colourful, troubled life as he wandered throughout a Europe that was exploding with religious, political and intellectual tensions.

Medieval Alchemy in the Christian West - Peter Forshaw (February 2023)

In this talk Peter Forshaw discussed some of the theories and concepts underpinning the practice of alchemy in the Middle Ages. Beginning with the first alchemical work to appear in the Christian West in the twelfth century, Morienus the monk's *Liber de Compositione Alchemiae* (Book on the Compositione of Alchemy), it considered theories of matter, the belief in the possibility of metallic transmutation through the production of the Tincture, Elixir or Philosophers' Stone, together with the distillation of animal, vegetable and mineral products for the preparation of alchemical medicines, including the Quintessence. Forshaw introduced some of the famous names in the history of alchemy (Geber, Ramon Lull, Petrus Bonus, John of Rupescissa) and the varying ways that they presented their art. In the final part of the talk he looked at the ways medieval alchemy was communicated over the centuries, with a move from purely textual transmission and the early appearance of marginal sketches of laboratory apparatus, to the fascinating and often perplexing allegorical images found in famous works like the *Aurora Consurgens* (Rising Dawn) and *Buch der heiligen Dreifaltigkeit* (Book of the Holy Trinity) in the early fifteenth century.

Medieval Alchemy in the Arab-Muslim World - Sébastien Moureau (March 2023)

In the twelfth and thirteenth centuries, a large movement of translation of Arabic texts into Latin took place in Italy, Sicily and Spain. Within the scientific knowledge transmitted from the Arab-Muslim world to the West,

alchemy occupies a prominent place: this science was unknown to Latin scholars until then. In this talk, Moreau focused on the transmission of alchemy, and proposed an analysis of different medieval definitions of this science, a description of the major texts translated, and a study of the different alchemical trends represented and the people involved and their motivations.

Graeco-Roman Alchemy - Matteo Martelli (April 2023)

Matteo Martelli's talk focussed on the earliest phases of ancient alchemy (1st–4th cent. CE), with particular attention to the origins of this art (techne in Greek) in the Graeco-Roman Egypt. After a short introduction to the history of the term 'alchemy' and the most seminal definitions of 'ancient alchemy' which have been proposed in secondary literature, it discussed these elements in light of three key primary sources: (a) the Leiden and Stockholm papyri (3rd c. CE); (b) the books on dyeing attributed to the philosopher Democritus (1st c. CE); (c) the treatises by Zosimus of Panopolis, in their Greek versions as well as in Syriac and Arabic translations (3rd-4th c. CE). Along with the discussion of important passages (always provided in English translation), Martelli also showed some replications of ancient alchemical recipes in modern laboratories. These experiments help us to better understand the workshop practices of ancient practitioners as well as how they developed their earliest attempts to conceptualize metallic transmutation.

Where Did Chemistry Begin? A Search for its Origins - Eduardo Escobar and Matteo Martelli (May 2023)

This talk discussed the origins of Graeco-Egyptian alchemy and its possible links with the earlier Babylonian textual tradition of procedural recipes. Ancient alchemical authors often provided narratives on the origins of the alchemical art, which stressed the contribution given by different territories of the ancient Mediterranean world. Zosimus of Panopolis, for example, emphasized the role played by Egyptian and Jewish authors; other Graeco-Egyptian alchemists mention sages who hailed from the ancient Middle East, these figures may possibly be linked to the Persian and Babylonian traditions. After providing an overview of these narratives, the speakers discussed the possible historical elements encapsulated in these sources and contrasted them with the textual and archaeological evidence concerning chemical arts in ancient Babylonia. This comparison enables us to better assess the Babylonian contribution to the history of chemistry along with its

alleged influence on the early development of alchemy in the Graeco-Roman Egypt.

MEETING REPORTS

"Pot-Pourri" Meeting,

Monday 14 March 2023, Burlington House, Piccadilly, London

The last time the Historical Group had an open ("pot-pourri") meeting was in 1996, twenty-seven years ago. Fears that we might not have enough papers were soon dissipated and we had six excellent papers on the day (sadly Alan Dronsfield had to pull out because it clashed with a funeral). There was also a very good turn-out, at least for the post-Covid era, and about thirty-five people were present. This meeting was unusual for two reasons. Because of a misunderstanding about the date, the meeting was held in the Science Room instead of our usual venue, the Library, and it was very suitable. And for the first time ever, as far as I am aware, we had a demonstration (of distillation) by Andrea Sella. Given the success of this meeting, we should perhaps have similar meetings again somewhat sooner than 2050!

When is a Lattice not a Lattice?

Robert Palgrave

The concept of the lattice is central to the understanding of crystalline solids. However, usage of this word can differ between crystallographers, for whom a lattice is a mathematical object that describes the symmetry of a crystal, and chemists, for whom lattice is commonly used as a word for a regular array of particles. The similarity between the two definitions means they can easily be confused by students or inexperienced practitioners, but the fundamental differences can make the consequences of such confusion significant, an issue rarely tackled directly in popular textbooks. The roots of this dual meaning seem to lie with two important discoveries at the start of the twentieth century: firstly the discovery of X-ray diffraction (1912) and secondly development of lattice dynamics by Max Born (1915) and others. Born used the term lattice in accord with crystallographers of his day, setting the terminology for the fields of solid-state chemistry and condensed matter physics up to the present day (e.g. terms like lattice enthalpy). However, soon after this, crystallographers began to change their definition of lattice. As it became necessary for crystallographers to interpret

ever more complex X-ray diffraction patterns, the word lattice came to adopt a purely mathematical meaning from the 1920s onwards. This divergence persists to the present day.

Perkin's Other Legacy: The Lives and Careers of his Sons

John Nicholson

Perkin's discovery of the first synthetic dyestuff, mauveine, in 1856 while a student at the Royal College of Chemistry is well-known. By commercialising his discovery, he changed the face of the chemical industry. For one thing, it became research based, providing new opportunities for chemical research. This is his first legacy.

His other legacy lay in the careers of his sons. Perkin had three sons, who all became chemists, namely William Henry Jnr and Arthur George by his first wife (who died in 1862) and one, Frederick Mollwo, by his second wife. He also had four daughters, all by his second marriage.

William Henry Jnr and Arthur both studied at the Royal College of Chemistry. William took a PhD at Würzburg, then worked in Munch with Baeyer. His work there included the synthesis of small ring organic compounds containing only three or four carbon atoms. In 1887 he was appointed professor at Heriot Watt College, Edinburgh, where, despite a heavy teaching load, he published a number of papers in a series entitled "Contributions from Heriot Watt College, Edinburgh". Arthur also contributed three papers and Frederick one. During this time, William was elected FRS. William moved to Owen's College, Manchester, in 1892, and there established the first research school in organic chemistry in the UK. He did much experimental work himself, and oversaw three building projects to increase the laboratory space for his group. In 1913, he moved again, this time to Oxford as Waynflete Professor of Chemistry. There, he had to secure funds for a new research institute, which became the Dyson Perrins Laboratory. It was completed in 1916 and remained the home of organic chemistry in Oxford until 2003. Perkin was instrumental in introducing the DPhil degree and also the research year as Part 2 of the BA degree. He never really retired, and eventually died in 1929.

Arthur did not do a PhD but, after the Royal College of Chemistry, studied dyestuffs chemistry at Anderson's College, Glasgow, and Yorkshire College, Leeds. Then he worked as an industrial research chemist for ten years. In 1892, he joined Yorkshire College (FRS in 1902; Professor in 1916). Like William, he was highly productive, and did much of the work

himself. He retired formally in 1926, but continued working until the year of his death in 1937.

Lastly, Frederick. He went to what had become the Royal College of Science, then spent some time at Edinburgh University. Eventually he went to Würzburg to take a PhD, also in organic chemistry. In 1897 he became Head of the Chemical Department at the Borough Polytechnic Institute in London. Here, he established an Electrochemical Laboratory, and turned his attention to physical chemistry, publishing most of his work in *Transactions of the Faraday Society*. In 1909, he left to become a consulting chemist, mainly on technical problems of coal and peat. Frederick studied war-related problems between 1914 and 1918, and was awarded an OBE in 1920. After the war, he continued his consultancy work from home in Lewisham until he died in 1928.

The Stairway to Heaven – Reconstructing the History of Laboratory Fractional Distillation

Rupert Cole, John Cowley, Talitha Humphrey, and Andrea Sella (UCL Chemistry and Science Museum), presented by Andrea Sella

Historical discussions of distillation, most notably Forbes' magisterial "History of Distillation" focus on the development of alchemical distillation, through the work of the chymists, before shifting to the industrial hooch stills that accompanied the industrial revolution. These stills featured "dephlegmators" consisting of plates or trays through with alcohol rich vapour ascended, often bubbling through depleted, descending "phlegm". What has been overlooked have been the development of small-scale laboratory distillation that accompanied the shift away from retorts to dedicated round-bottom reaction flasks. In 1852 Wurtz isolated butanol in a single distillation using a fractionator tube blown with two bubbles (the vertical analogue of today's "Kugelrohr" short path still). However, the belief that efficient fractionation required the "washing" of vapour by the liquid (phlegm) led to the invention of a family of dephlegmators containing platinum meshes or glass beads designed to force the vapour through the liquid, most notably by Linnemann in 1871. Difficulties with flooding of these columns led to designs with increasingly elaborate lateral loops such as that introduced by Le Bel and Henninger in 1874. It was not until 1904, when Vigreux introduced fractionators with internal spikes, that the idea of maximising the surface area of liquid in contact with the vapour truly caught on. Although Walther Hempel had proposed the filling of a tube with glass

beads as early as 1881, the mistaken belief in the need for "washing" together with the considerable hold-up of Hempel's fractionator may have delayed the development of packed columns. Sorel's mathematical treatment of the equilibria between liquid and vapour in 1894 set the stage for the quantitative idea of "theoretical plates" by Lewis, work that would accompany the development of the various column packings introduced by Raschig, Lessing, and Fenske; together with Vigreux these mark the end of laboratory bubble/wash columns. The sole survivor is the Snyder column, developed in 1919 which is still used in the Kuderna-Danish pesticide concentrator to prevent the loss of sample via aerosol droplets.

Dame Kathleen Lonsdale FRS (1903-1971) and the Pugwash Conferences on Science and World Affairs

Jennifer M. Wilson

Kathleen Lonsdale was a prominent scientist in the field of X-ray crystallography. She was also a campaigner for peace and involved with peace organisations such as Pugwash. The talk discussed how Pugwash was established, following the issue of the Russell-Einstein Manifesto in 1955 and the First Pugwash Conference held in Pugwash, Nova Scotia, Canada in 1957. Lonsdale attended the Third Conference held in Austria in 1958, at which she was the only female participant. She wrote a paper about the conference, which included the Vienna Declaration, a vision of Pugwash and its agenda.

As a member of the British Pugwash Group, Lonsdale was particularly involved in the organisation of the Ninth and Tenth Conferences to be held in London in 1962. This included extensive discussions with the Royal Society, regarding their role as hosts of the conferences and fundraising to obtain the necessary financial resources. It was at this conference that the decision was made to introduce the title 'Conferences on Science and World Affairs'.

Lonsdale's last involvement was in 1969 when she attended the Fifth Pugwash Symposium held in Czechoslovakia, when she gave a paper. She died in 1971, but during her thirteen years of involvement, had made a definite contribution to the early days of the Pugwash Conferences on Science and World Affairs.

The Pre-History of Infrared Spectroscopy

John Hudson

Over one hundred infrared spectra were recorded around 1903 by William Weber Coblentz as part of his PhD project in Physics at Cornell. He built two spectrometers for this task; both were single beam machines using a cell in – cell out technique. The data were recorded manually and the results were presented both as hand-drawn graphs and as line spectra. But prior to this, other workers had investigated the absorption of infrared radiation, and probably the most important figures were John Tyndall and William Abney.

In the 1860s Tyndall investigated the absorption of "radiant heat" (i.e. infrared radiation) by the gases of the atmosphere. He found that oxygen and nitrogen were transparent, but carbon dioxide and water vapour absorbed. He then extended his investigations to organic liquids and their vapours using a variety of infrared sources (which would have had different wavelength ranges). He also conducted experiments with the samples at different temperatures. Tyndall was not performing spectroscopy but was looking at the integrated absorption of his samples over the entire infrared range of his source. He obtained strong evidence that IR absorption was an intramolecular phenomenon and was caused by specific parts of molecules absorbing over different IR ranges.

By 1880 Abney had discovered a method of treating photographic emulsions to make them sensitive to near infrared radiation. With R.E. Festing he then conducted experiments using a commercial spectroscope equipped with flint glass prisms, a flint glass sample holder, and a camera to record spectra of samples in the very near infrared (700 – 1200nm). He observed definite absorption bands, but in this region they are combination and overtone bands which were impossible to interpret at the time.

Coblentz's results provided evidence of the potential application of IR spectroscopy in chemistry, but it appears that he, as a physicist, didn't fully realise the possibilities. For many years IR remained a research tool. No commercial instruments were available, but some specially constructed instruments (set to a specific wavelength to quantify an individual substance) found application in areas such as monitoring a purification process or in reaction kinetics. It was World War II which provided the necessary impetus. The projects to determine the structure of penicillin, to synthesise synthetic rubber, and to investigate the fuel obtained from enemy aircraft, all employed infrared. After the war commercial double beam recording instruments became available, and by the late 1960s IR spectroscopy had become a routinely used technique in chemistry.

Speakers at the Pot-Pourri meeting

The Discovery of Sodium Cromoglycate (Intal)

Robert Slinn

This talk covered the history of Fisons Pharmaceuticals Ltd (previously Benger's Ltd) and the discovery there in 1965 of the 'blockbuster' anti-asthma drug Sodium Cromoglycate (INTAL), along with the story of one remarkable man, Dr Roger Altounyan, its discoverer. Roger, a physician and lifelong chronic asthma sufferer, discovered (together with Fisons Pharma researchers) the life-saving drug Sodium Cromoglycate following years of research at Benger's and Fisons Pharmaceuticals, which was then located in Holmes Chapel, Cheshire. Its chemical synthesis, structure and clinical pharmacology were determined collaboratively by Fisons research chemists and pharmacologists at Holmes Chapel and then confirmed later at their new research laboratories at Loughborough in Leicestershire. Roger had accomplished this feat in his own clinics following years of self-

experimentation (as a human 'guinea pig'), inhaling numerous compounds including Khellin (an active ingredient from the Khella plant), taken well in advance of an asthma attack. Then, after a period of some eight years testing about ninety synthetised compounds a year, Roger and Fisons Pharma found that one of the synthetic chromone derivatives (FPL 670) was pharmacologically active. Roger then also developed the Spinhaler, the propeller-driven dry-powder drug inhaler in order to self-administer Intal.

FORTHCOMING MEETINGS, CONFERENCES AND WEBINARS

Society for the History of Alchemy and Chemistry

The next SHAC webinar will be live on Zoom on Thursday 28 September 2023 beginning at 5.00pm BST (6.00pm CET, 12 noon EST, 9.00am PST). It will be given by Gabriele Ferrario of Bologna University on his forthcoming publication in the series *Sources of Alchemy and Early Chemistry*, entitled "On Alums and Salts". The format will be a talk of twenty to thirty minutes, followed by a moderated discussion of half an hour. Anyone, member of SHAC or not, may attend by registering with Eventbrite in advance. Please see information on www.ambix.org or circulated in advance via Chem-Hist and Mersenne. SHAC will also be holding an in-person meeting in London in November 2023, with further details on www.ambix.org and on social media in due course.

Apothecaries' Hall Visit - Chiltern and Middlesex Retired Members Section

On Thursday 26 October 2023, the Chiltern and Middlesex retired members section will be visiting Apothecaries` Hall near Blackfriars Station, with lunch at the "Glean" restaurant immediately opposite and Historical Group members are very welcome to attend. This event will cost £50 person (£15 Hall fee, £35 Lunch). Please contact Stephen Robinson (StephenRobinson_3@hotmail.com) for further details. Apothecaries` Hall is the oldest guildhall in London by virtue of the fact that it was the first one to be rebuilt after the Fire of London. It is the home of the City of London Livery Company, the Society of Apothecaries, which dates back to 1617 when it received its Royal Charter. From 1672 until 1922, the Society of Apothecaries operated a pharmaceutical trade from its premises at Apothecaries' Hall, with the original laboratory situated under the

ceremonial Great Hall. More information on the Society can be found at https://www.apothecaries.org/ and in Anna Simmons' talk "Pills, Powders and Purgatives: The story of how drugs from a London livery company were used throughout the world" on the RSCHG YouTube Channel.