COMMITTEE

http://www.chem.qmul.ac.uk/rschg/
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RSC Historical Group Newsletter August 2010

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From the Editor

It is with great pleasure that I introduce another rich issue of the RSC Historical Group *Newsletter*, but also with some sadness as this will be my last one. In this issue we have three excellent essays, kindly provided by Chris Cooksey on Chinese Green, Michael Jewess on Thomsen's kiln, and last but not least Tony Travis on Raphael Meldola. We also have two book reviews written by Alan Dronsfield, and the reports of two National Chemical Landmarks Awards, the first for the nutrition chemist Elsie Widdowson, the second for Sanofi-Aventis (formerly May & Baker) to commemorate its research and manufacturing activities at the Dagenham site in East London. I am most grateful to all of you who have sent in short essays and other items that have made working on these issues such fun. I would also like to take this opportunity to thank especially the Newsletter's 'editorial team', Gerry Moss and Bill Griffith, for their help and assistance, our chairman, Alan Dronsfield, for always sending me interesting and timely contributions for each issue, and finally Anna Simmons, for agreeing to take on the task of producing the Newsletter for you. I think I leave her with a very healthy and lively publication of the RSC Historical Group. There are a couple of issues you might all wish to consider for the future of the *Newsletter* however, and the change of editor might provide the opportunity to implement them: 1) the digitisation of past and future issues of the *Newsletter*, an issue that was raised at the last AGM; 2) the format of the *Newsletter* (would an A4 glossy format not better reflect the liveliness of the Group and its activities?). In any case, I shall look forward to being involved in the *Newsletter* in the future, but perhaps more from the sidelines, and as an occasional contributor rather than as an editor. The deadline for the next issue will be 15 December 2010. Please send your contributions to (a.simmons@ucl.ac.uk) as an attachment in Word or rich text format, or on CD-Rom (post to Epsom Lodge, La Grande Route de St Jean, St John, Jersey, JE3 4FL).

Viviane Quirke
Oxford Brookes University

Minutes of the thirty fifth Annual General Meeting of the RSC Historical Group: These were held in the Council Chamber, Burlington House at 13.45 on Friday March 19, 2010.

1. **Apologies for Absence** were received from Colin Russell and Anna Simmons

2. **Minutes of AGM** at Burlington House, Friday March 20, 2009. These were distributed and approved.

3. **Matters arising from the Minutes**. No matters arising

4. **Reports**:

Chairman's Report. Alan Dronsfield said that the Group had had a good year and paid tribute to the Officers and members of the Committee for ensuring smooth running generally. The Group was perceived by the officers of the RSC to be one of the more active ones, and even with a £10 subscription, gave good value for money. The plan for RSC members to have 'free' subscriptions was getting closer and may even apply to 2011 subscriptions (i. e., the forthcoming renewals). There will be complications if our membership increases from hundreds to thousands, but we have been assured by the RSC that such a change will not financially embarrass us. Those present today will have noticed the imposition of charges for tea and coffee. Because the Group continues to give much help to the RSC in handling 'historical' and other enquiries, we are not being charged for room hire (and in passing, the full commercial rate for the Library for a day's conference is £940 + VAT). The Committee is taking an interest in this and although payment for tea and coffee will now be a feature of BH meetings, we hope at least for the foreseeable future, not to have to factor in any costs for the use of BH premises.

Secretary's Report. Bill Griffith distributed his report for the year March 2009 - March 2010

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

Organometallic Chemistry: Past and Present. Friday March 20, 2009, organised by Bill Griffith and Colin Russell. A one-day meeting in the Council Chamber, jointly with the RSC Chiltern and Middlesex Section, March 20, 2009. For a report *cf*. August 2009 Newsletter p. 36).

Pharmacy in History, a joint afternoon meeting with SHAC and the Society of Apothecaries on Tuesday May 12, 2009. For a report *cf*. August 2009 Newsletter p. 41.

Chemists and the Law. Friday October 23, 2009, organised by Peter Reed. For a report *cf*. February 2010 Newsletter p. 34.

RSC National Chemical Landmarks. The group was represented at three of these: for Joseph Swan at Newcastle-upon-Tyne, 23 February 2009 (report Newsletter August 2009 p. 31; for Joseph Black at Glasgow University, 4 July 2009 (report *Newsletter* February 2010 p. 26); Chemistry Department, Bangor University; 23 October 2009; commemorating 125 years of chemistry at Bangor University and the work of Professor Edward D Hughes

in kinetics and organic chemistry (*cf.* report by Dr. Malcolm Jones, Newsletter Feb. 2010, p. 37; at Harwell on 25 November 2009 (report appeared in Nov 2009 Newsletter p29 ; MRC Human Nutrition Research Laboratory, Fulbourn, Cambridge; 1 Dec. 2009; commemorating the work of Elsie Widdowson, the chemist who oversaw rationing and nutrition in the Second World War. A report will appear in the Summer 2010 *Newsletter*.

Treasurer's Report. John Hudson said that membership of the Group was up by 50 this year. He tabled the audited financial report for 2009. He noted the deficit for 2009 of £650: this arose from an outstanding bill to Queen Mary Westfield College for Newsletter publication and for expenses in connection with the Wheeler bequest. He was not unduly disturbed by the deficit as income from the RSC should be some £3,300 this year.

A proposal that the accounts be accepted was made by Jack Betteridge, seconded by Frank James and carried *nem. con.*

5. Future Meetings. Bill Griffith distributed a document on meetings for 2010 and provisional meetings for 2011.

The Rise and Fall of ICI is the current meeting (Friday March 19, 2010); 120 attendees.

The history of chemical information. Monday 29 November 2010. Joint meeting with the Chemical Information Group (CICAG). Chris Cooksey is the RSCHG organiser.

Marie Curie and the History of Radiochemistry. A one-day meeting Friday March 18, 2011, in the Chemistry Centre, organised by Alan Dronsfield and Bill Griffith.

An *autumn 2011* meeting is likely, on an environmental topic.

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

Alan said that members of the Committee were prepared to serve for another year. If any other members of the HG wished to serve on the committee they should have a word with Bill. He proposed that the committee serve for another year: proposed by Martyn Twigg seconded by Ray Anderson and carried *nem. con.*

As to the Officers, Alan will have served for four years by autumn 2010. He can serve for a further four years, subject to committee and AGM approval. HG members wishing to take over as Chairman, or who would like to see a change in the Chairmanship should send an e-mail to Bill (w.griffith@ic.ac.uk) who will set the election procedure in motion Bill, however, by Autumn 2010, will have served two four-year periods as

Secretary and in theory should serve no longer. At the recent Committee meeting, no-one was prepared to take over the Secretaryship. If any member of the HG wished to take on the rôle, they should have a word with Alan, who will set the election procedure in motion. The Committee felt, though, that if no volunteer was forthcoming, Bill should be asked to serve a further year, this time as 'Acting Secretary'. A proposal that, in the absence of volunteers to serve as HG Secretary, Bill Griffith be asked to serve for 12 months as Acting Secretary was made by Alan Dronsfield, seconded by Eddie Abel, and carried *nem. con.*

7. **Any Other Business.**

Several members present expressed considerable satisfaction with our Newsletter and said that they looked forward to its twice yearly publication. Alan paid particular tribute to its editor, Viviane Quirke, and also to the 'production assistants', Bill Griffith and Gerry Moss. The printing of the Newsletters, and the associated postage, is at present our major expense. Fiona McMillan, our new RSC coordinator, has offered to place it on our RSC website. Alan called for a show of hands at to how many would like to receive an electronic copy; some 60% favoured this, but a sizeable minority (including the three Officers) would prefer to receive hard copy as at present.

8. **Date, time and place of next AGM**. This will form part of our Autumn 2011 meeting, details of which will be published in the Summer 2011 Newsletter.

Other RSC News

Free On-line Access to the RSC's Journal Archives (pre-1939)

This information is for RSC members who have recently joined the Historical Group, and for others who have asked for a reminder. The login name and login password may be obtained by emailing John Hudson, our Membership Secretary.

From RSC Publishing (originally sent May 2008)

'As you are no doubt aware, the Historical Group Committee has for some time been in negotiation with RSC Publishing to see how its RSC members might gain access to parts of the RSC journals archive, without the need for you to pay document delivery fees. I am pleased to confirm that agreement has been reached, which allows RSC members free access to full text articles in the archive published between 1841 and 1939. Instructions on how to access an article are detailed below. If you have any difficulties with the

service please email library@rsc.org, indicating you are a member of the Historical Group. Archive articles from 1940 and beyond are available for the member-reduced fee of £5.

Please note that access to articles is for non-commercial fair use only; by "fair" we mean that extensive article downloading is forbidden. Access levels are monitored and any abuse may result in the service being withdrawn temporarily. However, it is hoped that this initiative helps group members in their work. If you have any feedback, please let me or your Chair – Alan Dronsfield – know what you think of the new service.

To gain access:

First, go to the RSC site listing available archive titles: http://www.rsc.org/Publishing/Journals/DigitalArchive/available.asp

Click on the title of the journal you wish to view. Remember that only journals up to 1939 are available, free, to Historical Group members.

Fill in the details in the box "Find a previous issue" and click on "Go"

Click on an article in the "Contents list"

Click on "Journals archive purchasers" > PDF

The Log-in screen will pop up. Please fill in the details (login name: XXXXXX; login password: xxxxxxx) requested. These may change from time to time; if this is the case you will be notified. If your login details are not recognised, please contact library@rsc.org for updates.

You should get a screen that says "Welcome Historical Group". Click on the "Proceed to requested content option", and the article should download.'

Alan Dronsfield,
University of Derby

NEWS AND UPDATES

The 2010 Liebig-Wöhler-Freundschaft-Preis

The 2010 Liebig-Wöhler-Freundschaft-Preis awarded by the Göttinger Chemische Gesellschaft in association with the Wilhelm Lewicki Stiftung has been presented to Horst Remane, Professor of the History of Science at the Martin-Luther-Universität Halle-Wittenberg in Leipzig for his many contributions to the history of chemistry over the last thirty years. He is probably best known to British historians for his papers on the history of chemical education, Emil Fischer and other organic chemists, and for the

beautifully-illustrated book on scientific postage stamps that he compiled with Hans Wussing, *Wissenschaftsgeschichte en miniature* (Berlin, 1989).

Bill Brock
University of Leicester

A Lucky Escape: news of an accident at the Liebig Museum

During a popular lecture demonstration given by Professor Wolfgang Laqua in the old lecture theatre of Liebig's laboratory at Giessen in May 2009, a shelf holding a row of Liebig's busts suddenly collapsed. Luckily for Professor Laqua the sculptures weighing some 9 kg narrowly missed his head; but the sculptures broke into 42 pieces and two handfuls of rubble. The heads were originally moulded in marble by the famous Munich sculptor Michael Wagmüller (1839-1881) for the Liebig Memorial in the Südfriedhof cemetery in Munich which was destroyed during WW2. The Liebig Museum's busts were gypsum copies of the original and fortunately this meant the broken pieces could be reassembled. Due to the generosity of the Sculpture Museum in Frankfurt the busts have been restored, beautifully cleaned and returned to Giessen.

(News item from the Liebig Museum's 2010 New Year's Letter, sent by Bill Griffith)

Ambix archive now on-line

Newsletter readers might like to know that the digitisation of the back issues of *Ambix* from Volume 1 (1937) is now complete and they are available free to members of the Society of the History of Alchemy and Chemistry (SHAC) to read or download from the IngentaConnect website. Access to the back issues is via the 'Member Services' page on the SHAC's website at www.ambix.org. This page is *only* available to SHAC members and access to it from the Home Page is via a username and password generated by the Society. Historical Group members *who are also members of the RSC* are reminded that they have free access to the Society's on-line archives (up to 1939). Again, access is via username and password. Recent members of the Group (or those who have mislaid the information) should contact our Membership Secretary, Dr John Hudson, for help in this connection.

Alan Dronsfield
University of Derby

News from the Chemical Heritage Foundation (CHF)

***Distillations* podcast**

Listen to the *Distillations* episodes awarded Bronze World Medals by New York Festivals. Subscribe to *Distillations* or stream past episodes at:.

Episode 41: Self-Experimentation
Episode 50: Children's Health
Episode 51: Global Health

T.T. Chao Symposium on Innovation

See this video clip of Mae C. Jemison, founder of The Jemison Group and a former astronaut aboard the space shuttle *Endeavor*, talking about the role of science in society. More video clips of standout moments from CHF's inaugural Chao Symposium in Houston are available at: http://chemheritage.org/Chao.

CHF are also looking forward to exciting future moments and projects, including:

100th episode of *Distillations*, airing 30 July;
The launch of CHF's new Web site on 30 July;
2011's *International Year of Chemistry* celebration; and
Dynamic new programs that inspire a passion for chemistry.

Events will take place in Philadelphia, New York City, Houston, Palo Alto, and North Carolina.

Useful websites and addresses

American Chemical Society Division of the History of Chemistry:
http://www.scs.uiuc.edu/~mainzv/HIST/index.php

Chemical Heritage Foundation:
http://www.chemheritage.org/

Club d'Histoire de la Société Chimique de France:
http://www.societechimiquedefrance.fr/fr/club-histoire-de-la-chimie.html

The Commission on the History of Modern Chemistry (CHMC)
http://www-wissenschaftsgeschichte.uni-regensburg.de/CHMC.htm

The European Association for Chemical and Molecular Sciences:
(EuCheMS) http://www.euchems.org/

The Society for the History of Alchemy and Chemistry
For details of how to join the Society, please see the on-line form (follow the links from the main page), or contact the Treasurer and Membership Secretary: John Perkins, Hon Treasurer, Centre for Health, Medicine and Society, Oxford Brookes University, Gipsy Lane, Headington, Oxford OX3 0BP [jperkins@brookes.ac.uk].

The Society for the Propagation of the Music of the Chemist-Composers:
http://faculty.cua.edu/SPMCC.htm

The Working Party on History of Chemistry (WP):
http://www.euchems.org/Divisions/History/index.asp

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

Website for the history of science and technology in Europe:
http://histsciences.univ-paris1.fr/

Website based lecture course by Georges Bram, professor of chemistry and history of chemistry at the Faculty of Science, Paris Sud-Orsay:
http://histoirechimie.free.fr/

Website of the Bibliothèque Nationale de France:
http://gallica.bnf.fr

Digital library of the Conservatoire National des Arts et Métiers:
http://cnum.cnam.fr

Website of the Historical Centre of the Ecole Polytechnique:
http://www.bibliotheque.polytechnique.fr/centrehistorique/crh.htm

Website of the Max Planck Institute for the History of Science (Berlin):
http://www.mpiwg-berlin.mpg.de/en/index.html

Russian Academy of Sciences. Website of the Institute for the History of Science and Technology: http://www.ihst.ru

Selection of English-language papers relevant to the history of chemistry:
http ://web.lemoyne.edu/~giunta/papers.html

Website for the Nobel Prizes:
http://nobelprize.org/

SHORT ESSAYS

Chinese Green

Henry Rzepa mentions the utility of preserving chemical samples (*Newsletter* February 2010, p. 5) and in particular, the case of mauveine

which was born in 1856, then enjoyed fame but not much fortune, before becoming commercially extinct by 1870. While mauveine remains well known, another dye with a remarkably similar story has been nearly forgotten – Chinese green, *Lo-kao*.

Lo-kao (sometimes rendered as Lŭh-kaou, literally, green colour) was first brought from China to France in 1845 but the price was high (224 FF/kg, the same as silver metal), so it was only a curiosity. And curious it was. Investigations by chemists showed that it did not contain indigo. At that time green had only been achieved in two stages, by dyeing with blue (invariably using indigo) and yellow, but *Lo-kao* was the first one-pot green dye. Another virtue was soon recognised. In gas-light or candle-light, the green colour was retained, unlike the indigo based greens which appeared blue. In 1853 the Chamber of Commerce in Lyon offered 10 – 50 gram free samples of *Lo-kao* to chemists, dyers and painters. Commercial dyeing using *Lo-kao* started in 1855 and the colour was marketed under the names *vert-Venus* and Azof green. Just one dyer (Guignon) used 1500 kg in 1856 and 3500 kg in 1857. *Lo-kao* had arrived.

In spite of the high cost, or perhaps because of it, Chinese green became fashionable. Empress Eugénie, wife of the French emperor Napoleon III, was said to have worn a green dress dyed with *Lo-kao* in Paris. Indeed, there is a portrait of her painted by Franz-Xaver Winterhalter (1805 – 1873) in 1855 which shows her in a green dress, so it could be true. But in a painting, you choose the colour you like. As the popularity increased, so did the price. By 1852, Lo-kao cost 508 FF/kg, but later, in 1857 it had stabilised to 373 FF/kg. In London, the 1853 price for small samples was ten shillings per ounce (about 28 g), 20 times more expensive than indigo, litmus or Prussian blue (six pence per ounce).

The origin of *Lo-kao* is curious, or perhaps bizarre. The fresh bark from two varieties of buckthorn (*Rhamnus dahurica* Pall. and *Rhamnus tinctoria* Waldst. & Kit.) was separately boiled in water and then allowed to stand for two or ten days depending on the species. After adding lime (or some say alum) cotton was immersed in the liquid, removed without rinsing, dried overnight in the air then exposed to sunshine. The green colour developed on

the side exposed to light. The process was repeated using the extract from both species a total of 15-20 times until the cloth was saturated with the pigment. Then repeatedly rubbing the cloth in cold water detached the colour from the cotton and these washings were transferred to a boiler. The surface of the water was covered with a coarse cloth and on boiling, the pigment rose to the surface and was trapped in the cloth. The pigment was removed from the cloth by soaking in water and after settling, the sludge was poured on to sheets of paper and allowed to dry. This gave dark blue irregular plates 1-4 mm thick. (1)

Because of the high price of *Lo-kao*, the Chamber of Commerce in Lyon promoted investigations into a possible substitute which could be produced more cheaply in France. They offered a prize of 6000 FF for a satisfactory solution to the problem. Investigators did not have to look far. In Europe and Asia, for centuries, native buckthorn (*Rhamnus cathartica* L.) had been used as a source of colour. The mature fruit was used to prepare sap green which was used to dye paper and leather and as a water colour in painting. Immature fruits, known as Avignon berries or Persian berries, were used to dye cotton, wool, silk and linen mordanted with alum a brilliant yellow colour. The dried bark, boiled with water, gives alum-mordanted wool a red-brown colour. These colours are derived from a variety of anthraquinones and flavanoids contained in various parts of the plant.

In 1860, the Chamber of Commerce 6000 FF prize was awarded to Félix Charvin of Lyon. The recipe was summarised by Hippolyte Dussauce (1829-1869) (2)

In a kettle containing boiling water he puts 2 pounds of *Rhamnus catharticus* bark; a few minutes after a pink skim is produced. He then puts the whole into an earthen jar, well covered, and then allows it to rest till the next day. The liquid is yellowish; it is decanted and lime water added to it, which produces a change of color; it turns reddish-brown, the liquid is put in jars – very little in each one – and the whole exposed to air and light. The reddish-yellow color is modified and takes a green shade; little by little the green color becomes more general, and is then deposited in plates. All the liquids are mixed together and carbonate of potash added; a green precipitate is produced; he leaves it to deposit, decants the liquid and collects the precipitate and dries it.

Dussauce says that the cost of this green pigment would be $8.90 a pound. Usefully, the news and the price was reported worldwide. The Journal de Toulouse (3) reports 100 FF per kg and the Daily Southern Cross (4) 40 shillings per pound. The new colour did not have the brilliance of the Chinese version, nor the cachet, and never achieved fame.

By 1914, chemists had investigated *Lo-kao* several times and concluded that it was a lake, a metal complex containing calcium and perhaps aluminium, bonded to a 5,7-dihydroxyflavone and containing a 4-methoxyphenyl group. The green colour obtained from *Rhamnus cathartica* was investigated in 1925 and was deemed to contain an unusual anthraquinone derivative. (5) A more recent investigation used a sample of *Lo-kao* from the Leeds collection No. 253. After a brief exposure of the sample to boron trifluoride – methanol to release the organic components of the lake, HPLC revealed six green components with λ_{max} 670–680 nm, but their identity could not be determined. A similar treatment of the green colour obtained from *Rhamnus cathartica* and of sap green showed that they contained different components. (6) Without access to a genuine historic sample of *Lo-kao*, this contribution to the study of the curious material would not have been possible.

Perkin's mauveine marked the beginning of the end of natural dyestuffs. The first to go was not indigo, madder or cochineal, but *Lo-kao*. By 1860 the first aniline green had been discovered, followed shortly after by aldehyde green and iodine green, and even later (1877) by Malachite green which is still with us today.

References

1) The early history is recounted by:

(a) Daniel Hanbury, (1856–1857) Note upon a green dye from China, *Pharmaceutical Journal and Transactions*, **16**, 213–214; Rev. M. Hélot, On the manufacture of the Chinese green dye, called Lo-kao, *ibid*., 517–520, 553–556.
http://books.google.com/books?id=LsQDAAAAYAAJ&dq=%22pharmaceutical+journal%22+1857&source=gbs_navlinks_s (accessed 16 March 2010)

(b) Rondot, N. (1858) *Notice de Vert de Chine et de la teinture en vert chez les Chinois*; Persoz, J. (1858) *D'une étude des propriétés chimiques et tinctoriales du Lo-Kao*; Michel, A.-F. (1858) *Recherches sur la matière colorante des nerpruns indigènes*; In one volume, Imprimé par ordre de la Chambre, Chambre de Commerce de Lyon, Paris: chez Lahure et Co.

2) Dussauce H., (1863), *Treatise on the coloring matters derived from coal tar; their practical application in dyeing cotton, wool, and silk. The principles of the art of dyeing and the distillation of coal tar. With a description of the most important new dyes now in use*, pp. 183–185. H. C. Baird (Philadelphia).
http://openlibrary.org/b/OL6999627M/Treatise_on_the_coloring_matters_derived_from_coal_tar (accessed 16 March 2010)

(3) *Journal de Toulouse*, 12 September 1860.
http://images.jdt.bibliotheque.toulouse.fr/1860/B315556101_JOUTOU_1860_09_12.pdf (accessed 16 March 2010)

4) *Daily Southern Cross*, 25 December 1860, Volume XVII, Issue 1361, p. 6, http://paperspast.natlib.govt.nz/cgi-bin/paperspast?a=d&d=DSC18601225.2.24&l=mi&e=-------10--1----0-all (accessed 16 March 2010)

5) The early chemical investigations are described in Cooksey, C.J., Dronsfield, A.T. and Kirby, J., (2005) Chinese green, an enduring mystery, *Dyes in History and Archaeology* 20, pp. 155–164

6) Cooksey, C.J., Dronsfield, A.T. and Kirby, J., (2008) Chinese green: Experimental Investigations, *Dyes in History and Archaeology* 21, pp. 167–179

Chris Cooksey
Watford

What happened in Thomsen's kiln? – a detective story

Julius Thomsen, the Danish chemist (1826-1909) was recently commemorated in a *Chemistry World* article by Mike Sutton (1). After the discovery of the noble gases helium and argon, Thomsen correctly located them in the Periodic Table and thereby predicted the existence and relative atomic masses of neon, krypton, xenon, and radon. He made 3500 meticulous thermochemical measurements. In addition, without giving up his academic career, Thomsen made a fortune in the chemical industry with the help of Carl Frederik Tietgen, who, according to Helge Kragh (2), was then 'on his way to becoming the leading [Danish] industrialist, banker, and entrepreneur'. Thomsen retired as professor of chemistry at Copenhagen University in 1901.

Working mostly from primary sources in Danish, Kragh gives a detailed description (in English) of the keystone of Thomsen's commercial success, namely the use of cryolite (Na_3AlF_6) as the source of sodium for the manufacture of washing soda ($Na_2CO_3.10\ H_2O$). The cryolite was mined at Ivigtut in Greenland, a Danish possession. Thomsen's 'cryolite soda process' began commercially in 1857, and factories were built in Denmark, at five sites elsewhere in Europe, and in Pennysylvania, USA. It competed for a long time with the established Leblanc process and later with the Solvay process, both of which used common salt as their source of sodium. Its end came in 1900 when the Pennysylvania factory was last to stop using the process. Over forty-three years, an estimated 100 000 tons of washing

soda had been made from cryolite. By this time, the use of molten cryolite as the solvent for alumina in the electrolytic commercial production of aluminium metal had become established, and the Ivigtut mine continued to be worked until 1962.

The present essay examines the chemistry of Thomsen's cryolite soda process by the use of modern thermodynamic data. It also raises the intriguing possibility that one or more compounds believed to have been first discovered in the 1980s were in fact produced a century before, on an industrial scale, as an intermediate in Thomsen's process. Echoing Henry Rzepa (3), one can hope that somewhere there is a sample tube containing the intermediate so that this possibility can be checked archaeologically.

Thomsen's process consisted of four steps, which, if the cryolite was pure, gave, overall, 96.5 % of the theoretical yield of washing soda based on the cryolite used (though in normal practice, crude cryolite was used). The steps were as follows, beginning with the kilning of a mixture of limestone and cryolite:-

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kiln, care taken to avoid melting

$6\ CaCO_3\ (s) \rightarrow 6\ CaO\ (s) + 6\ CO_2(g)$ (step I, reaction i)

$2\ Na_3AlF_6\ (s) + 6\ CaO\ (s) \rightarrow$ new solid phases (step I, reaction ii)

boiling, probably

new solid phases + water (l) $\rightarrow$ 2 "Na_3AlO_3" (aq) + 6 CaF_2 (s) (step II)

2 "Na_3AlO_3" (aq) + 3 CO_2 (g) $\rightarrow$ 3 Na_2CO_3 (aq) + 2 $Al(OH)_3$ (s) (step III)

evaporate

3 Na_2CO_3 (aq) $\rightarrow$ 3 $Na_2CO_3.10\ H_2O$ (s) + water (g) (step IV)

Together, steps I to IV amount to -

$2\ Na_3AlF_6\ (s) + 6\ CaCO_3\ (s) + \text{water (l)} \rightarrow$

$3\ Na_2CO_3.10\ H_2O\ (s) + 2\ Al(OH)_3\ (s) + 6\ CaF_2\ (s) + 3\ CO_2\ (g) + \text{water (g)}$

We can infer the occurrence of step I, reaction ii because, without it, the above scheme would not differ significantly from an earlier, abandoned scheme in which CaO and Na_3AlF_6 were boiled up with water. According to this earlier scheme, large amounts of water were needed to enable a reaction between the only slightly soluble $Ca(OH)_2$ and the insoluble Na_3AlF_6 (4); the excess water had to be removed later, at a high cost in fuel. It is reasonable

to suppose that step I, reaction ii transferred at least the sodium content of Na_3AlF_6 into one or more relatively water-soluble phases. This would explain why Thomsen found he needed to use less water than according to the earlier scheme, saving on fuel.

The question posed in this paper is *'What happened in Thomsen's kiln, and in particular what were the new solid phases produced in step I, reaction ii and constituting the key intermediate in Thomsen's successful industrial process?'*

As Kragh points out, Thomsen, despite his academic devotion to thermochemistry, did not apply thermochemistry to his own process. However, considering initially only those potential products for which thermodynamic data are available today (5, 6), we can now calculate that the plausible candidates for step I, reaction ii are the following, all of which transfer the sodium content of the Na_3AlF_6 into NaF, or else NaF and $NaAlO_2$, both of these compounds being, as desired, water-soluble (7).

$2\ Na_3AlF_6(s) + 6CaO\ (s) \rightarrow 6\ NaF\ (s) + Al_2O_3\ (s) + 3\ CaF_2\ (s) + 3\ CaO^*\ (s)$

ΔG = -260 kJ/mol at 298 K and 1 bar (a)

$2\ Na_3AlF_6\ (s) + 6\ CaO\ (s) \rightarrow 6\ NaF\ (s) + Ca_3Al_2O_6\ (s) + 3\ CaF_2\ (s)$

ΔG = -280 kJ/mol at 298 K and 1 bar (b)

$2\ Na_3AlF_6\ (s) + 6\ CaO\ (s) \rightarrow 6\ NaF(s) + CaAl_2O_4\ (s) + 3\ CaF_2\ (s) + 2\ CaO^*\ (s)$

ΔG = -283 kJ/mol at 298 K and 1 bar (c)

$2\ Na_3AlF_6(s) + 6\ CaO(s) \rightarrow 6\ NaF(s) + 0.5\ CaAl_4O_7(s) + 3\ CaF_2(s) + 2.5\ CaO^*\ (s)$

ΔG = -272 kJ/mol at 298 K and 1 bar (d)

$2\ Na_3AlF_6(s) + 6\ CaO(s) \rightarrow 4\ NaF(s) + 2NaAlO_2(s) + 4\ CaF_2(s) + 2CaO^*\ (s)$

ΔG = -295 kJ/mol at 298 K and 1 bar (e)

*The inclusion of unused CaO on the right-hand side (instead of cancelling out the two sides) preserves the same left-hand side throughout (a) to (e), for consistency with step I, reaction ii above and to facilitate comparison among (a) to (e).

All of these reactions are highly favourable at 298 K as indicated by the ΔGs, and there can be no doubt that they would be highly favourable also at Thomsen's kilning temperature, perhaps 1200 K. The last reaction, (e), in which NaF and $NaAlO_2$ are formed, has the most negative DG and is therefore the most favourable at 298 K. However, because we lack high-temperature heat capacity data on several of the compounds, and because the range of ΔGs across (a) to (e) is small, we cannot predict for certain that (e) would be the most likely to occur also at the kilning temperature.

A further possibility is that water-soluble sodium aluminates were formed, but more sodium-rich than the $NaAlO_2$ produced according to (e) above, as follows:

$2\ Na_3AlF_6\,(s) + 6\ CaO\ (s) \rightarrow 2\ `Na_3AlO_3'\ (s) + 6\ CaF_2\,(s)$ (f)

In (f), 'Na_3AlO_3' (s) represents a mixture of sodium aluminate phases of the formula $x\ Na_2O$, Al_2O_3 ($x > 1$) in such proportions as to achieve the overall stoichiometry $x = 3$. Such phases were obtained in the 1980s by Barker *et al* (8) by heating mixtures of Na_2O and Al_2O_3 in argon at 700 to 800 ºC; the products were phases with $x = 2.33$, 3.40, and 5.00, plus one other which they did not fully characterise. Unfortunately, no one seems to have followed up their work with thermodynamic measurements that would allow us to judge whether they were in fact produced in Thomsen's kiln among his 'new solid phases' of step I, reaction ii.

Barker *et al* believed that they were the first to obtain sodium aluminates

$x\ Na_2O$, Al_2O_3 in which x exceeded 1. If a sample of the 'new solid phases' produced in Thomsen's step I still exists, despite their being an intermediate consumed in step II and despite their water-sensitivity, then X-ray powder diffraction, which gives 'lines' for each phase present independently of the others, would show which of (a) to (f) was in fact Thomsen's step I, reaction ii. If (f), then Thomsen anticipated Barker *et al* on a vast scale, his 100 000 tons of washing soda involving the production and consumption of over 30 000 tons of 'Na_3AlO_3' (s).

The author acknowledges gratefully correspondence with Dr Mike Sutton and Professor Helge Kragh.

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2) Helge Kragh, *Annal. Sci.*, 1995, 52, 285.

3) Henry S Rzepa, *Newsletter*, February 2010, 8.

4) *CRC Handbook of Chemistry and Physics*, ed. D. R. Lide, CRC Press, Boca Raton FL, 2008, 89th edition, page 4-55, entry 590 and page 4-90, entry 2578.

5) *CRC Handbook of Chemistry and Physics*, pages 5-5 (AlF_3, Al_2O_3), 5-8 (CaF_2, CaO), 5-11 ("FNa"), and 5-16 (Na_2O).

6) O Kubachewski and C B Alcock, *Metallurgical thermochemistry*, Pergamon, 5th edition (1979), 298 (Na_3AlF_6, $NaAlO_2$) and 276 ($Ca_3Al_2O_6$, $CaAl_2O_4$, $CaAl_4O_7$).

7) *CRC Handbook of Chemistry and Physics*, page 4-89, entry 2531 and page 4-90, entry 2568.

8) Martin G Barker, Paul G Gadd, and Michael J Begley, *J. Chem. Soc. Dalton Trans.*, 1984, 1139, together with earlier shorter communications referenced therein.

The spreadsheet containing the author's calculations is available online.

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Charles Darwin and Raphael Meldola

Bill Griffiths' item on "Darwin, chemistry and the age of the earth" in the February 2010 *Newsletter* is a timely reminder of the way in which early studies on evolution involved a variety of scientific activities and, in particular, attracted the interests of a number of prominent chemists. Perhaps there was no greater a devotee to the theory of evolution based on natural selection among chemists than Raphael Meldola (1849-1915), from 1885 professor of chemistry at Finsbury Technical College. Though his name often appears in historical accounts of the pioneers of evolutionary studies, it is invariably without explanation of his role, apart from as a correspondent of Charles Darwin, and supporter of natural selection. This aspect of the scientific career of Meldola emerged from his love of entomology during his teenage years, when he spent days, and sometimes nights, in Epping Forest, observing insects, particularly moths and butterflies. Encouraged to place his interest on more scientific lines, he quickly appreciated the role of similar studies made on Lepidoptera in the 1860s as providing the first concrete evidence for the theory of natural selection.

Relevant to his role as an evolutionary selectionist is the fact that Meldola had made his early reputation from engagement with an industry, the

manufacture of synthetic dyes, that relied on the most advanced and sophisticated theoretical concepts in chemistry. This was particularly so following the tremendous success of artificial alizarin during 1870. From early 1871, the year he became an industrial chemist, Meldola was a keen correspondent of Charles Darwin, who introduced him to the theories of the Germans Fritz Müller, the naturalist who discovered what became known as Müllerian mimicry among butterflies, and August Weismann, the experimental biologist whose *Studien zur Descendenz-Theorie* (1875) was translated by Meldola.

After the death in 1882 of the renowned author of *The Origin of Species*, Meldola grew close to Alfred Russel Wallace and, at Oxford, Edward Bagnall Poulton. It was to demonstrate Darwin's encouragement of his young followers that in 1896, Poulton, then professor of zoology, devoted an entire chapter in his book on natural selection to the Darwin-Meldola correspondence. Meldola's appreciation of theory-led science, the result of his exposure to its success with chemistry, it should be emphasised, was something that not all biologists appreciated.

However, Meldola's role in evolutionary studies is in part forgotten no doubt as a result of his becoming a staunch follower of "neo-Darwinism." While this term is most often associated with a refinement of Darwinian theory starting in the 1930s, it is not always appreciated that a grouping of significant individuals in evolutionary studies with the same designation emerged during the 1880s. The first stirrings took place in the summer of 1883, when August Weismann publicly rejected Lamarckian influences (that even Darwin had accepted) and soon positioned himself as leader of the pure selectionists. Meldola's close friend Alfred Russel Wallace adopted this stance after reviewing proof sheets of Weismann's 1889 book published in English (and co-edited by Poulton). By the time that Weismann's fully developed ideas were published in 1893, the first generation of neo-Darwinians had been joined by Raphael Meldola.

Together, Meldola, Wallace and Poulton promoted neo-Darwinism in the English-speaking world, and remained faithful adherents even when it fell into decline around 1900 due to the rejection of its notions of gradual change by the Mendelians and of natural selection by the neo-Lamarckians. After the deaths of Wallace and Meldola, Poulton was to be the last torchbearer. By living into the fourth decade of the 20th century, his loyalty to the cause was vindicated with the emergence from the late 1930s of the new synthesis (called "evolutionary synthesis" by Julian Huxley in 1942) and the new neo-Darwinians. By then, Meldola's contribution had been relegated to a passing reference.

It is not without interest to note that Meldola applied evolutionary thought effectively in other areas. Thus drawing on the work of Herbert Spencer, and natural selection, he used social Darwinist terms in 1886 to warn the British that their chemical industry would enter into terminal decline unless scientific and technical education were improved to match the levels found in Germany. This reflected his own industrial experience that no doubt encouraged him to be more ready to accept theories of selection than the many biologists who did not, because it was considered materialistic and anti-organicist. In the mid-1890s, Meldola encouraged entomologists to adopt the ways of systematists among naturalists, inspired by the example of Charles Darwin, and the success of chemistry, with greater use of the philosophic faculty. The systematic thinker, armed with his data, and working from an armchair at the fireside, was to be admired and emulated. It was far better to conjure up theories, and discard them, their purposes achieved when new and more appropriate theories appeared, than to concentrate on cabinet collections and wall displays of butterflies and insects. Again, the strong emphasis on theory-led science was a result of Meldola's exposure to its tremendous success with chemistry, and to his own wide ranging scientific endeavours.

The involvement in natural history and chemistry brought about other alliances. Through Meldola's vocation as an entomologist, and his reputation as an industrial chemist (in 1879 he invented Meldola's blue), he became in 1880 a co-founder and first president of the Essex Field Club. At Meldola's instigation, Charles Darwin and Alfred Russel Wallace were appointed honorary members. Early members of the club were industrial chemists and managers associated with the two dye-making firms that employed Meldola. They included Charles Hanson Greville Williams, formerly of Williams, Thomas & Dower, where Meldola worked until 1873. From his second employer in the dye industry (until 1885), Brooke, Simpson & Spiller, of Hackney Wick, conveniently close to Epping Forest, were Richard J. Friswell, Edward Brooke, John Spiller, William Spiller, and Frank Evershed. John Spiller was a major contributor to the Essex Field Club, and retained a close relationship with Meldola. In their correspondence, they discussed butterflies, photography and investments in Eastman Photographic (Meldola lectured on the chemistry of photography and discovered a photographic developer). Other early members included William Charles Barnes (of W.C. Barnes & Co., Phoenix Works, Hackney Wick, and associated with Brooke, Simpson & Spiller), the Barnes family, Lord Rayleigh, a later president, and Lord Lieutenant of Essex, and Henry Roscoe.

Meldola's commitment to Darwinisim is well demonstrated in his Presidential Address at the club's annual meeting held in January 1883.

Under the heading "Darwin and Modern Evolution" it was a heartfelt tribute to his late friend. It is also a valuable contemporary record of Meldola's own commitment to natural selection. As he explained, "Because of widespread ignorance…I think I cannot do better than occupy your time by recapitulating the main points in the theory of the origin of species."

> ….it is clear that every species must have in itself the potentiality of unlimited extension, and must constantly be endeavouring to extend itself at the expense of others; every species must be waiting to fill any vacancy in the polity of nature; there must be a perpetual competition going on—a continual 'struggle for existence,' which keeps in check the undue increase of any particular species. Thus the animals and plants of any region are in a state of nicely balanced equilibrium, the result of long ages of adjustment to their surroundings both organic and inorganic….it is somewhat difficult for those who, like ourselves, have, so to speak, been brought up in the school of evolution to realize the state of mind of pre-Darwinian naturalists with respect to this question of species…. It was Darwin's 'Origin of Species' that first caused a rattling among the dry bones of the venerable dogmas that had so long usurped the place of scientific thought; with the appearance of this work superstition was driven from its last stronghold in the realm of natural science….for my own part, acknowledging that, as a youth, I fell into the ranks of Darwinism, I cannot but own that a recent perusal of some of these attacks has afforded me considerable satisfaction…some criticisms of real importance,…led Darwin, with that splendid candour which was his nature, to modify certain details of his theory in the later editions of the 'Origin'.

In Britain, Meldola reminded his audience, Sir Charles Lyell, the founder of Uniformitarian Geology, Joseph Dalton Hooker, Herbert Spencer, Thomas Henry Huxley, and John Lubbock were among the first to give the weight of their support to the Darwinian hypothesis (Spencer later became a Lamarckian). "While the battle for truth was going on here, on the Continent, and more especially in Germany, the new doctrines were received and discussed with even greater warmth and enthusiasm. A school of the most ablest naturalists rallied round the Darwinian standard, their zeal often carrying them beyond the bounds of that prudence and caution displayed by their leader." As for the modest Darwin, "On the very last occasion that I had the pleasure of an interview with Mr Darwin, he had said that he looked upon the 'Origin' as a book of the past; it had done its work, and might now be shelved."

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RSC NATIONAL HISTORICAL CHEMICAL LANDMARKS

Elsie Widdowson National Chemical Landmark

The presentation of an RSC National Chemical Landmark plaque took place on 1st December 2009 to mark the lifelong dedication and work of Dr Elsie Widdowson (1906-2000), a pioneer in nutrition science. See http://www.rsc.org/Chemsoc/Activities/ChemicalLandmarks/UK/MRCCambridge.asp

A graduate of Imperial College, she obtained a PhD in 1931 for research into the carbohydrate content of apples. In 1933 Dr Widdowson decided to spend some time in the King's College kitchens to learn about large-scale catering, prior to undertaking formal study in dietetics. Whilst there she met Prof

Robert McCrance who at the time was analysing plant foods for carbohydrates as part of his study of optimal diabetic diets. Their collaboration lasted 60 years and included the epoch-making publication *The Composition of Food* first published in 1940. The sixth edition of this text is still in print, 70 years later. Her researches informed the Government on aspects of wartime rationing, especially in connection with the addition of vitamins and mineral supplements to basic foodstuffs. For instance, she suggested that wartime bread should be enriched with calcium salts to compensate for the anticipated reduction of dairy products in the diet. The calcium fortification of white flour used for bread-making remains a legal requirement today. For the seven years prior to her death on 14th June 2000, she was the most highly honoured UK female scientist, having been appointed both CBE and Companion of Honour, the latter in 1993.

Elsie Widdowson spent most of her working life in Cambridge so it was highly appropriate that the Landmark ceremony took place at the laboratory named after her, at the Medical Research Council's Human Nutrition Research Unit, Fulbourn, Cambridge. The Director of the Unit, Dr Ann Prentice, gave an in-depth account of Elsie's life, and the Landmark plaque was presented to Dr Prentice by Professor David Phillips, at the time President-elect of the RSC.

Pictures of Elsie W. herself are available at
http://www.imperial.ac.uk/publications/reporterarchive/images/photos/0094/e_widdowson.jpg

and http://trailblazing.royalsociety.org/photos/1991WiddowsonSA-t.jpg

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RSC National Chemical Landmark Award to Sanofi-Aventis (formerly May & Baker)

The RSC presented a National Chemical Landmark plaque to Sanofi-Aventis (formerly May & Baker) to commemorate its research and manufacturing activities at Dagenham, East London, site which started there in 1934. The presentation was made on 2nd July 2010 by RSC President Elect Professor David Phillips to Jim Moretta, Site Director Sanofi-Aventis, and the plaque itself was unveiled by Councillor Nirmal Singh Gill, Mayor of Barking and Dagenham. The Historical Group was represented by David Leaback, Peter Morris and Alan Dronsfield.

The citation on the plaque reads:

'....in recognition of the pioneering research and manufacturing work
carried out at the May & Baker (sanofi-aventis)
Dagenham site in a wide range of chemical
and pharmaceutical fields since 1934.
These products continue to benefit patients
and their quality of life
around the world'

Colin Ward, Ex Head of Analytical Development & Compliance, Quality Operations, Dagenham, has kindly supplied the following background to the Award:

'*The Dagenham site was bought by May & Baker then based in Wandsworth, for £11,000 in 1919 but was not opened for business until 1934. It was to become the headquarters of the multinational, May & Baker Group, a wholly owned subsidiary of Rhône-Poulenc S.A., and in its heyday the site employed some 4,000 people.*

The Dagenham site was diverse in terms of chemical manufacture with active pharmaceutical ingredients, pharmaceutical products, veterinary medicines, aromatic chemicals, agrochemicals, photographic chemicals, plastics, industrial and fine chemicals being manufactured there over the last 75 years.

In addition to chemical and pharmaceutical manufacture, Dagenham had a strong R&D base and some significant molecules were synthesised here. Perhaps the most notable are the bacteriostatic sulphonamides, with M&B 693, Sulphapyridine, synthesised in 1937 and M&B 760, Sulphathiazole, a year later. Both were very active against cocci infections and were the forerunner of the antibiotics. During WW2, it was noted that M&B 693 had saved many thousands of lives. Indeed Sir Winston Churchill extolled the virtues of M&B 693 having been treated with it for pneumonia infections twice during the war.

Research on sulphonamides stopped after these two products but continued with other therapeutic agents and agrochemicals. Dagenham was instrumental in developing the diamidine group of bacteriostats, including Pentamidine, Propamidine and Dibromopropamidine, the beta-blocker Acebutolol hydrochloride, the HBN herbicides, Ioxynil and Bromoxynil, the phenoxybutyric acid herbicides and the carbamate herbicide, Asulam. In addition it developed and manufactured the veterinary compounds, Dimetridazole, Sulphaquinoxaline and Isometamidium chloride and

marketed many improved products in the field of photographic chemicals, developers and fixers.

The site has won the Queens Award for Industry three times for technological innovation and in 1974 was granted a royal warrant as suppliers of agricultural herbicides to HM Queen Elizabeth II.

From its May & Baker beginnings. Dagenham has had several name changes and as the Company expanded and merged the site became consecutively Rhône-Poulenc Ltd., Rhône-Poulene Rorer, Aventis and latterly Sanofi-Aventis. However, although the sign on the gates is now Sanofi-Aventis, the site is still very much "May and Bakers" to the local community.'

However, in recent years many of the plant's activities have either been discontinued or transferred to other Sanofi-Aventis locations. At present it is only manufacturing sterile oncology products and a couple of other anti-cancer drugs. The work force has shrunk to 450 employees and in December 2009 it was announced that the whole Dagenham operation would close by 2013. The site will be redeveloped as an industrial park and sadly an era of London's chemical industry will become history.

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BOOK REVIEWS

Colin A. Russell, *From Atoms to Molecules: Studies in the History of Chemistry from the 19th Century* (Farnham, Surrey: Variorum Collected Studies, Ashgate Publishing Ltd., 2010) £70.00, but available from Internet sources from £56.00. ISBN 978-0-7546-6855-8, Pp 342.

Professor Colin Russell will need no introduction to *Newsletter* readers. Longstanding Historical Group members will know him as the Chairman who invigorated the Group in the early days and got it off to a good start. Others will remember him as the author of *A History of Valency** (Leicester University Press, 1971) a book which influenced so many of us beginners in the history of chemistry. Latterly, in 2009, he was a recipient of the Group's *Wheeler Award* for his eminence in the history of our subject.

The book under review if a compilation of some of Colin's key papers in aspects of the history of chemistry published from 1959 to 2005. Some of these publications, such as those in *Ambix*, are readily accessible, but several were published in sources that readers might find more difficult to get hold

of, and so we must be grateful to Ashgate Publishing Ltd for making them available (by photo-reproduction) to a wider audience.

We start with three chapters on Humphry Davy. Although he was unconvinced as to the existence of Dalton's atoms, he developed an electrical theory of matter whereby compounds were formed by a coming together of species of opposite electrical polarity. Moreover, the application of electricity could reverse the process and turn compounds into their constituents. Jöns Jacob Berzelius, the great Swedish chemist, combined Davy's approach with Dalton's atoms. Compounds more complicated than binary ones could be explained in terms of multiple combinations of atoms of opposite polarity. But his "'combinations of opposites' led to problems. Diatomic molecules of the elements, e.g. Cl-Cl, presented him with difficulties, as did the burgeoning number of products being synthesized by the 19th century organic chemists. Berzelius's work led on to the radical theory of molecules: a 'negative' atom such as chlorine could be linked to a 'positive' radical like methyl. Russell describes this suggestion as 'fertile' and indeed it was. Edward Frankland's search for radicals, especially the elusive 'ethyl', led him to open up the field of organometallic chemistry and to found the notion of valency. The contributions of this still under-appreciated 19th century chemist occupy the central part of this book. We have chapters, too, on August Hofmann and Friedrich Kekulé, the latter in connection with his disputes with Frankland as to who exactly originated the concept of valency. Later in the book we have chapters on the vexing puzzle posed by the orientation of substituents into benzene rings that were already mono- or di-substituted, and one essentially on the history of the non-planar representation of the cyclohexane ring. The latter is in the form of a lecture, reproduced here in the original typescript. Of all the contributions to the history of our subject in this volume, this was the one I appreciated the most. I urge Professor Russell to consider publishing it for a wider audience: perhaps in *Chemistry World*, *Education in Chemistry* or *Ambix*.

This compilation is an important resource in the history of chemistry and I urge Newsletter readers to purchase a copy. For those not prepared to lay out £56-£70 to this end, however, a copy of the text will shortly be available in the RSC's Library, both for reference and loan.

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*At present copies are available from Amazon, from £5.75 + postage. A bargain, if ever there was.

Leslie S. Ettre and John V. Hinshaw (eds), *Chapters in the Evolution of Chromatography*. London: Imperial College Press, 2008. £63 (but available from Amazon at £46.37). Pp 473, illus; ISBN: 978-1-86094-943-2.

In the late 1960s I was a PhD student in one of the UK's largest chemistry departments. There, chromatography was almost unheard of. True, a few researchers had primitive home-built GLC set-ups at the ends of their benches, but as far as I could see they were nothing more than adornments, largely gathering dust. Fast forward now to the 1990s and the end of my laboratory career. Chromatography was in use in many of its forms. Involatile products were being located by TLC and then leached out, pure, from silica gel columns. More volatile species were detected by GLC (and, if optically active, their enantiomers quantified using chiral columns). Gas chromatograph machines were coupled to mass spectrometers with large on-board libraries, and a speculative reaction could be initiated in the morning and the product outcome cleared up by the late afternoon.

The history of this powerful technique goes back more than 100 years to the pioneering work of Mikhail Tswett, however some half a century before (in 1850) Friedlieb Runge was spotting various chemical mixtures on blotting paper and noticing the colour changes as elution took place. But he approached the subject from an artistic viewpoint, rather than an analytical one and he cannot really be regarded as the first chromatographer. A comprehensive history of this technique has not hitherto been attempted until this present work, which has resulted, in part, from a compilation (and a rewriting) of articles that had appeared over 20 years by Leslie Ettre in *LCGC Magazine*, *Chromatographia* and other journals. A co-author of two of the chapters is Historical Committee member Peter Morris who writes with Ettre firstly on Katharine Hope Coward who, in the 1920s, applied Tswett's methods to the extraction of carotenoids. Secondly, they collaborate on an account of the evolution of James Lovelock's electron capture detector.

The first 190 pages deal comprehensively with Tswett-type chromatography. Then we have a section on early partition chromatography, including the beginning of the epoch-making gas-liquid variant. In the chapter dealing with ion-exchange methods I was particularly fascinated by the photograph of the 10ft x 4 inch columns used to separate rare earths as part of the Manhattan Project! From page 242 until almost the end of the book the concentration is on what might be called the history of instrumental chromatography. Tswett's bands of coloured pigments, manually pushed out of a column and then sliced up into sections, were replaced by peaks on a strip of graph paper. Mixtures were encouraged to separate sometimes on

columns of just a few cm in length (as in the case of HPLC work) and sometimes on columns of many tens of metres in length, as in the cases of open tubular (capillary) columns. Detectors were improved in terms of reliability and sensitivity, and Ettre gives deserved prominence to the evolution of the ubiquitous flame ionisation device. Smaller and smaller samples of complex mixtures were injected into more and more efficient columns and split into more and more sharply defined components.

Leslie Ettre has been active in the field of chromatography, both in industry and academia, for over 50 years. A regular attendee at conferences on this subject, he has known many of the later pioneers personally. Some 50 pages cover symposia 1946-1973 and it is from this last one (at Interlaken) that I spotted the following touch of humour. Ettre writes: '*There was debate prior to the meeting whether papers can also be presented in languages other than English and those in favour of multi-lingual presentation argued that not everybody has a good command of English. However the controversy was solved by Willy Simon, the principal organiser of the symposium, who in his opening address, declared that the official language of the conference is….. broken English*'.

This is a really excellent book, fulfilling an important need. If it proceeds to a second edition can I make a plea that we might have a chapter or two on the development of mass spectrometric detectors in GC/HPLC work? They have revolutionised current practice and deserve some consideration.

Strongly recommended, and available for loan from the RSC's Libary.

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MEETING AND CONFERENCE REPORTS

The Rise and Fall of ICI. Friday 19 March, 2010

This meeting, organised by Jack Betteridge and Bill Griffith, was held at the Chemistry Centre, Burlington House. There were five speakers, and an audience of 120; a record attendance for any recent RSCHG meeting.

Alan Dronsfield welcomed the audience, and particularly the many former employees of ICI, to our first meeting in the new Chemistry Centre. The morning session was chaired by Dr. Adrian Parkins, who had earlier suggested the title which gave rise to the meeting.

Abstracts

Frank James (Professor of History of Science, Royal Institution) spoke on *Ludwig Mond and other Monds (Science and the Arts)*.

This centred on a discussion of the work of Ludwig Mond (1839-1909) concentrating mainly on his philanthropic work. Mond's early studies of chemistry at Marburg under Kolbe and at Heidelberg under Bunsen were outlined before describing Mond's rather unsettled period of the 1850s and 1860s moving between various German states, the Netherlands and England before finally settling there in the mid 1860s. In partnership with John Brunner, Mond obtained the British licence for the Solvay process and at Winnington (near Northwich) constructed a factory for the manufacture of soda, as well as a home and laboratory.

As a result Mond became spectacularly wealthy and while he did not retire from the chemical industry, from 1883 he lived mostly in London (and in Rome during the winter) and concentrated on his philanthropic activities. These took two main forms: the support of science and the support of art. In the former he contributed about £66,000 to the Royal Society including support for its catalogue of nineteenth century scientific papers. For the Royal Institution he purchased its neighbouring building, 20 Albemarle Street, paid for its merger with the RI which he then endowed with an initial £62,000 to found the Davy-Faraday Research Laboratory. In terms of art James discussed Mond's large collection of Italian Renaissance paintings and this problems generated by his leaving them to the National Gallery. James concluded with a brief discussion of the relationship of the Mond family and ICI with the Royal Institution during the twentieth century.

Further reading:

J. M. Cohen, *The life of Ludwig Mond* (London, 1956).

J. Goodman, *The Mond legacy: a family saga* (London, 1982).

Katherine D. Watson, '"Temporary Hotel Accommodation?" The Early History of the Davy-Faraday Research Laboratory, 1894-1923', in Frank A.J.L. James (ed.), *'The Common Purposes of Life': Science and society at the Royal Institution of Great Britain* (Aldershot, 2002), pp.191-223.

Charles Saumarez Smith (with Georgia Mancini), *Ludwig Mond's Bequest: A Gift to the Nation* (London, 2006).

David Edgerton (Hans Rausing Professor of History of Science and Technology, Imperial College London); *Imperial Chemical Industries in the Second World War*.

In the late 1930s the British Empire, and its allies, were confident of victory in a possible war against Germany. Strength in chemicals played its part in this. Imperial Chemical Industries was much more powerful compared to IG Farben than its predecessors had been to BASF, etc, and played a major role in rearmament and in war production. It was the main poison gas producer, was key to the imperial atomic bomb programme, an ambitious aviation-spirit programme, as well as spigot mortar production (and much else besides, not touched on in this paper). The entry of the USA effectively scaled back the British bomb and aviation spirit programmes, thus reducing ICI's overall role in the war, perhaps fortunately for its future development. ICI's links with the state were strong and multifaceted. It saw itself as a leader of British science, and took a particular right-wing stance supporting the movement for 'freedom in science' against the wartime scientific left. Therein lay a great irony – Britain's greatest planner of research stood for freedom in research, while the scientific left, who downplayed the contribution of British industrial research, argued for planning. The story of ICI points to the need to take into account not only industry, but Oxford chemistry and Cambridge engineering, and the right as well as the left, in the history of twentieth-century British science.

After lunch and the AGM of the Group, the first afternoon session was chaired by Dr. Bernard Langley, ex-ICI Pharmaceuticals Division.

Dr. Viviane Quirke, Oxford Brookes University; *From Dyestuffs to Pharmaceuticals: ICI and the British drug industry, ca 1940s-1970s*

In this historical overview of ICI's Pharmaceutical Division, its emergence within Dyestuffs in the 1930s, and its subsequent development into one of Britain's leading drug companies were described. Drawing links with David Edgerton's presentation, Quirke showed how ICI's participation in major collaborative programmes to develop synthetic anti-malarials, penicillin, and nitrogen mustards as anti-cancer agents during World War Two, helped to establish the Pharmaceutical Division. She then went on to analyse ICI's transformation into one of Britain's most successful drug companies, which was innovative not only by the drugs it developed: from anaesthetics, to beta-blockers and anti-cancer drugs, but also by its organisation of R&D and its use of cutting-edge approaches and techniques for drug design. Another factor accounting for the leadership role ICI acquired in pharmaceuticals was its confident, meritocratic and open corporate culture, which encouraged the exchange of best practices with other firms and academic institutions, and helped to place ICI at the centre of major international research networks.

However, there were also some significant missed opportunities, for instance when ICI turned down offers to join collaborative schemes to develop the steroid hormone cortisone and the antibiotic cephalosporin. These were due to its tradition of 'going it alone' as a chemical company, as well as its continuing commitment to the chemical paradigm in pharmaceutical R&D. Therefore, despite some early successes, such as the development of genetically engineered α-interferon, achieved in collaboration with Corporate Laboratories, ICI's Pharmaceutical Division was relatively slow to adapt to the revolution in molecular biology and biotechnology. Hence, like many other firms affected by the slowing of pharmaceutical innovation and the drying-up of drug pipelines in the 1980s, it seemed to lose its sense of purpose and direction.

In keeping with the theme of the day: 'The Rise and Fall of ICI', Quirke therefore ended by asking: when it spun off its Pharmaceutical Division in 1993 (to form Zeneca, later merged with the Swedish company Astra into AstraZeneca), whether ICI ultimately failed, and by opening up the question to the audience.

Dr Martyn Twigg (Chief Scientist, Johnson Matthey) and **Dr Pelham Hawker** (Chairman, Metalysis); *Catalysis at ICI.*

'Human Catalysts' steer the way companies operate. Alfred Mond, one of Ludwig's sons, was one. He joined his father's firm Brunner Mond and was instrumental in the amalgamation of four British companies to form ICI in 1926. Unlike Alfred Mond, who had advantages of an eminent father, an outstanding education, legal training, and who later became an MP with a cabinet position in Lloyd George's Government, Harry McGowan had humble origins. Born in Glasgow the son of a brass fitter, he attended local schools and joined Nobel's Explosives Company as an office boy. But he became a senior executive consolidating the British Explosives Industry before seeking further diversification through the formation of ICI. Then McGowan was 'The Catalyst' for many of ICI's successes, especially during his time as chairman from 1930 to 1950.

The development of chemical catalysts and catalytic processes were central in many ICI successes, including, for example, hydrocarbon steam reforming to synthesis gas for hydrogen, ammonia and methanol production. The ICI low pressure catalytic methanol process continues to be world-leading under the wing of Johnson Matthey who in 2003 bought the Billingham-based ICI catalyst business. Interestingly it was this site, as a coal-based ammonia manufacturing complex, that inspired Aldous Huxley's vision of *Brave New World* in 1932.

ICI were incredibly benevolent in providing funds that catalysed the scientific careers of many individuals; one example was the ICI Fellowship scheme, originally due to Mond, which started in 1944, when there were 80 Fellowships with a value of £600/year, with the holders being in no way tied to ICI. The scheme grew, and prestigious ICI Fellowships were much sought after. A very high proportion of ICI Fellows went on to senior academic positions and developed much of the UK's science base of today.

After tea the last session of the day was chaired by Professor Jack Betteridge.

Julian Phillips *(ex-ICI Agricultural Division); Things fall apart.*

Julian Phillips traced the beginnings of ICI's fall to the strategic failure in the early 1960's to take over Courtaulds. He queried the received wisdom that companies should always put strategy before tactics.

From 1965-1975 ICI lost out to its German competitors. There was no increase in share value in this period which saw the cancellation of major projects, and a slew of investment with much spent integrating backwards into North Sea oil. Then, in 1980, ICI made its first loss in a quarter since the War. By 1984 the fight back ensured that it was the first British Industrial Company to post a £1bn annual profit. The price was 50,000 redundancies, a major reorganisation, and a cut back in R&D and investment.

In 1991 Hanson made a failed bid for ICI which spurred the company into changing its mission statement from *'…World's leading chemical Company…"* to *'…maximize value for our shareholders…'*, and then into demerging 'biosciences' into Zeneca. Zeneca, however, divested all their non-pharmaceutical assets which could have benefited the new ICI in pursuing its strategic aim of specialties. In 1997 ICI in purchased the chemicals arm of Unilever for £4.9 billion, but the leverage proved to be too great. Not only were ICI base chemicals sold to assuage the debt, but also 'jewels' such as the new polyurethanes plant and Synetix. Eventually, three of the newly bought companies were also sold, and finally on 2 January 2008 the remaining rump of ICI was bought by Akzo Nobel.

Discussion and Conclusions.

The meeting concluded at 1715 after much lively, well-informed discussion, much of this generated by the last talk. Sir Ronnie Hampel, one of the last ICI Chairmen, participated in this. He commented that however much the Board may have wished to adopt the sort of proposals suggested by various

speakers to prevent the break-up, there were several factors, especially financial ,which made these non viable. The period of the restructuring was testing and unpleasant for all involved. It took place at a time when British manufacturing industry –coal mining, steel, shipbuilding, automobiles as well as chemicals- was in decline – and he thought it remarkable that the whole process had been conducted without causing mass unemployment or social unrest. His overriding concern about the restructuring of ICI was the disappearance of a significant *tranche* of chemical research activity and hence the long-term damage to British science.

Jack Betteridge concluded the meeting by thanking the audience and all the speakers. He said that the speakers had given well-illustrated, well-presented and well-timed talks that were also witty. These had been admirably complemented by a display of historic pictures by Diana Leitch and many contributions from the floor from 'those who were there'. The detailed knowledge and passion of the speakers illustrated how much the Company meant to them as individuals and the huge contribution it had made to the well-being of the nation. Those who were not from ICI had attested that, through the early encouragement of the PhD, ICI Fellowships and sponsorship of academic research and conferences, the Company had made a huge contribution to the science base of the UK. It had been a memorable day's meeting.

Further Reading on the History of ICI recommended by Adrian Parkins:

Imperial Chemical Industries. A History. W.J. Reader Vol.1, 1970, Vol. 2,1975, Oxford University Press.

ICI, The Company That Changed Our Lives. by Carol Kennedy. 2nd Edn. Paul Chapman Publishing, 1993

International Directory of Company Histories, Gale, Farmington Hills, Michigan. Ongoing, some entries are available online.

The Awakening Giant: Continuity and Change in Imperial Chemical Industries. A.M. Pettigrew, Basil Blackwell 1985.

From Empire to Europe: the decline and revival of British industry since the second World War. Chapter 12. Geoffrey Owen, HarperCollins, London 2000.

Making it Happen: Reflections on Leadership by John Harvey Jones. Updated edn. Profile books, London 2003.

Jack Betteridge and Bill Griffith

Society for the History of Alchemy and Chemistry

The Partington Prize 2011

The Society for the History of Alchemy and Chemistry has established the Partington Prize in memory of Professor James Riddick Partington, the Society's first Chairman. It is awarded every three years for an original and unpublished essay on any aspect of the history of alchemy or chemistry. The prize consists of five hundred pounds (£500).

The competition is open to anyone with a scholarly interest in the history of alchemy or chemistry who, by the closing date of 31 December 2010 has not reached 35 years of age, or if older has completed a doctoral thesis in the history of science within the previous three years. Scholars from any country may enter the competition, but entries must be submitted in English and must not have been previously submitted to another journal. The prize-winning essay will be published in the Society's journal, *Ambix*. One hard copy of the entry, word processed on one side of the paper, should be submitted, along with a copy of the entry on disc. We prefer files to be in Microsoft Word XP, if possible. Essays must be fully documented using the conventions used in the current issue of *Ambix*. Essays must not exceed 10,000 words in length, including references and footnotes. All entries must be submitted with a word count.

All entries should be sent to John Perkins, Hon Treasurer, Centre for Health, Medicine and Society, Oxford Brookes University, Gipsy Lane, Headington, Oxford OX3 0BP, with the words "Partington Prize" written clearly on the envelope. Each entry should contain a **separate** title page giving the author's name, institution, postal address, email address and date of birth (and if relevant the date of completion of their thesis). The author's name and contact details **must not** appear on the pages of the essay as the identity of the author will not be made available to the judges. Essays (no more than one from each competitor) must be received no later than 31 December 2010.

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

The name of the winner will be announced by 30 April 2011, and all essays will be returned to competitors soon after that date.

Forthcoming RSC Historical Group Meetings

Autumn meeting: Monday 29 November, 2010.

This whole-day meeting, *Celebrating the History of Chemical Information*, will be held at Burlington House in association with the Chemical Information and Computer Applications Group (CICAG) and the CSA Trust. It includes talks from renowned experts in the field (e.g. Alexander Lawson, Bill Town and Peter Willett) and there will exhibitions of equipment used in the past to retrieve chemical information (see:

http://www.rsc.org/Membership/Networking/InterestGroups/CICAG/index.asp

A flyer with the registration form accompanies this Newsletter. Because registration and payment is being done by CICAG and as large numbers are expected the meeting will cost everyone £30; this includes the meeting fee referred to above, morning and afternoon coffee tea and coffee, a hot fork buffet lunch and VAT. If you would like to attend the meeting *please register as soon as possible*.

Spring meeting: Friday March 18, 2011

The Group is planning, in conjunction with the Radiochemical Group, a whole day conference on Marie Curie and the history of radioactivity. This will be on Friday 18th March 2011 and will be a high profile event for the RSC.

We have lined up a distinguished list of speakers, including the nuclear scientist Dr Serge Plattard (presently Counsellor for Science and Technology at the French Embassy) to give the keynote lecture on *Marie Curie – her life and work*. The French Ambassador has been invited to open the conference, the first session of which will be chaired by the RSC's Chief Executive, Dr Richard Pike and the last session by the President of the RSC Prof. David Phillips. We hope that the RSC will fund an early-evening wine and cheese reception at Burlington House after the conference.

The event will be open to RSC members generally, including members of the Radiochemical Group, and there will be a limited number of bursaries for attendance (not travel costs) for students.

Members will recall that I had to open a waiting list for our last meeting, *The Rise and Fall of ICI*. It is likely that we will have to do the same for this meeting. To be assured of a place I suggest Historical Group members who are likely to want to attend send me their names (with no commitment to attend) which will prioritise their applications. Further details, such as the mechanism for booking, and making advance payment, will be published in our next Newsletter.

Bill Griffith
Imperial College

Society for the History of Alchemy and Chemistry

The Society for the History of Alchemy and Chemistry Anniversary Meeting

75th ANNIVERSARY MEETING

'The History of the History of Chemistry'

19th November 2010

Royal Institution, Albemarle Street, London

The provisional programme includes:

1230 A **tour** of Royal Institution by Professor Frank James

1330 Lectures will include:

Prof. Bill Brock *Exploring Early Modern Chymistry: The first decade of the Society for the History of Alchemy and Chemistry*

Prof. Frank James *The Two Cultures and the History of Chemistry*

(**Speaker to be Confirmed** Recent Developments in the History of Alchemy

Prof. Marco Beretta *History of Chemistry in Europe*

The Good Old Days - Panel Discussion **Profs. Maurice Crosland, Colin Russell** and **David Knight**

1815 Drinks Reception in the Royal Institution Museum

1900 Public Lecture: **Prof.Simon Schaffer** *The Unfortunate Chemist - Tribulations of Chemical Philosophy in an Age of Revolution*

2000 Dinner at the Royal Institution's Restaurant**, Time and Space** (8.00pm)

Registration fee for Meeting, Reception and Public Lecture::

£15 for SHAC members and **£20** for non members; Accompanying Persons: (Reception and Public Lecture) **£10** (Lecture only) **£5**

Dinner £35 per person (including wine).

For registration and further details, including membership – contact g.taylor@ucl.ac.uk .

American Chemical Society – Division of the History of Chemistry

Upcoming National Meetings and Deadlines

BOSTON, August 22-26, 2010

Check the call for papers in Chemical and Engineering News or the ACS website for changes in the abstract deadlines. Submit your abstract via the ACS Program and Abstract Creation System (PACS) by March 29, 2010. If you do not have access to a computer for use in the submission, contact the program chair by prior to the indicated date.

General Papers. (Seeking contributors) Seth C. Rasmussen, Department of Chemistry and Molecular Biology, North Dakota State University, Fargo, ND 58105, Phone: 701-231-8747, seth.rasmussen@ndsu.edu.

Anna Jane Harrison: ACS President, Her Science and Her Legacy (Invited and seeking contributors) Janan M. Hayes, Merced College (retired), 6829 Barbara Lee Circle, Sacramento, CA 95842; Phone: (916) 331-6886; Email: jmhayes@earthlink.net.

Global Perspectives on Continued Education for Seniors (Invited and seeking contributors) Mary Virginia Orna, Department of Chemistry, College of New Rochelle, New Rochelle, NY 10805, Phone: (914) 654-5302, Email: mvorna@cnr.edu.

ANAHEIM, March 27-31, 2010

Check the call for papers in Chemical and Engineering News or the ACS website for changes in the abstract deadlines. Submit your abstract via the ACS Meetings Page to the ACS Program and Abstract Creation System (PACS) by the indicated date. If you do not have access to a computer for use in the submission, contact the program chair by prior to the indicated date.

General Papers. (Seeking contributors) Seth C. Rasmussen, Department of Chemistry and Molecular Biology, North Dakota State University, Fargo, ND 58105, Phone: 701-231-8747, seth.rasmussen@ndsu.edu.

Pioneers of Quantum Chemistry (Invited and seeking contributors) [Cosponsorship is being sought with COMP] E. Thomas Strom, Department of Chemistry and Biochemistry, University of Texas at Arlington, P. O. Box 19065, Arlington, TX 76019-0065, Phone: (817) 272-5441, Email: tomstrom@juno.com

History of Units and Constants (Invited and seeking contributors) Carmen Giunta, Le Moyne College, 1419 Salt Springs Rd., Syracuse, NY 13214-1399, Phone: (315) 445-4128, Fax: (315) 445-4540, Email: giunta@lemoyne.edu

OBITUARIES

Sir James W. Black (1924-2010)

Sir James Black was a British pharmacologist who in 1988 was awarded jointly with George Hitchings and Gertrude Elion the Nobel Prize for Physiology or Medicine. Although it was unusual for industrial pharmacologists to receive it, the Prize was an acknowledgement of the important contributions they had made to medicine.

In contrast to the mass-screening methods then widely used in the pharmaceutical industry, Black's approach was based on a fundamental understanding of physiological processes, on drugs that mimicked naturally occurring substances, and on bioassays to study their action *in vitro*. This novel approach enabled him to develop two new drug classes, the beta-blockers to treat heart disease and hypertension, and the H_2-antagonists to treat gastric ulcers. Black's contribution has been recognised by several honours and awards. He was elected Fellow of the Royal Society in 1976, knighted in 1981, before winning the Nobel Prize in 1988.

Black was born in Lanarkshire, Scotland, the son of a coal miner who later became an engineer. Educated at Beath High School, he was awarded a scholarship to study medicine at St Andrew's University. After gaining his degree in 1946, money concerns led him to accept a post as senior lecturer in physiology at the University of Malaya. In 1950, having returned to Britain, a chance encounter with one of his former university professors gave him the opportunity to set up a new physiology department at the University of Glasgow's Veterinary School. It was there that he began his research on the increase of gastric secretions caused by histamine, and first read about the beta-adrenoceptors of the heart. These had been described in 1948 by the American pharmacologist Raymond Ahlquist, who showed that adrenaline and noradrenaline stimulated the heart via these receptors. In 1958, Black conceived the idea of a beta-adrenoceptor antagonist to treat angina pectoris. This is a painful condition, caused by an increased heart rate, which leads to insufficient oxygenation of the heart. Black reasoned that an effective treatment might be found by reducing the demand for oxygen, and that this might be achieved by blocking the receptors responsible for the increased heart rate.

Black approached ICI with his project. Following his visit, he was offered a post in ICI's new Pharmaceutical Research Centre at Alderley Park, in Cheshire. He would later describe his experience there as 'an educational tour de force'. With the help of ICI's multidisciplinary team of researchers, he developed pronethalol, the first clinically useful beta-adrenoceptor

antagonist. However, it was later found to cause tumours in mice, and Black turned his attention to a different compound, propranolol, which had also been synthesised at Alderley Park. Investigations carried out at University College Hospital by the clinical pharmacologist Brian Prichard suggested that the compound could be used for treating not only angina, but also hypertension. Marketed under the name 'Inderal', propranolol, and the other 'beta-blockers' that followed, were to transform the treatment of angina, heart attacks and high blood pressure.

Then, in 1964, Black moved to the British subsidiary of the American firm Smith, Kline & French, where by analogy with the beta-blockers he sought a chemical that would block the H_2–histamine receptors, which he showed to be involved in excessive gastric secretion. This research led him to develop the H_2-antagonist, cimetidine (Tagamet), the first in a long line of effective treatments for gastric ulcers.

In 1973, Black was appointed Professor of Pharmacology at University College, London, where he remained four years, before accepting the post of Director of Therapeutic Research at the Wellcome Research Laboratories. In 1984, lured back into academia, he became Professor of Analytical Pharmacology at King's College Hospital. After retirement, in 1992-2006, he served as Chancellor of the University of Dundee, where a Centre was established bearing his name.

Sir James died on 22 March 2010 and is survived by his second wife, Rona McLeod MacKie, and a daughter from his first marriage.

Viviane Quirke
Oxford Brookes University

Dr J.H.S. Green (1929-2010)

Dr John Green, former committee member and Secretary (1991-95) of the Historical Group died on 20th March this year. John was a notable character whose involvement with the group was striking. He was convenor of our Group symposium at the 150th Anniversary Annual Congress at Imperial College in April 1991, and a few years later, contributed a thoughtful paper on 'Chemists at London Medical Colleges in the 19th Century' to an afternoon symposium. He had a profound knowledge of the history of chemistry, and was also deeply interested in the philosophy of chemistry, the relative neglect of which concerned him deeply.

John was a distinguished chemist in his own right. He studied for his BSc (Special Chemistry) at University College London, graduating in 1950. He followed this with a PhD under the supervision of Allan Maccoll , entitled

The gas phase pyrolysis of some organic bromides, which he completed in 1953. He remained a dedicated UCL man all his life, writing articles on the early history of the UCL Chemistry Department that appeared in the *Journal of the Chemical and Physical Society* in 1956 and 1957 and in retirement becoming an Honorary Senior Research Fellow there. He spoke warmly of studying under Ingold and Hughes, and was also very positive about Nyholm, for whom he had a memorably obscene nickname.

Following his PhD, John did his National Service, in the education branch of the RAF, after which he joined the Chemical Research Laboratory, Teddington. He remained there as this organisation transmuted in 1958 to the National Chemical Laboratory, then again to the Division of Chemical Standards, National Physical Laboratory in 1965. Towards the end of his career, John moved to the Tropical Products Institute, Gray's Inn Road, as Senior Principal Scientific Officer, retiring in 1989. His work was mainly on vibrational spectroscopy, infrared and Raman, and he published much important work on this topic, particularly in the early 1960s. In addition, he was visiting lecturer in molecular spectroscopy at the former Kingston Polytechnic in the early 1970s.

John lived for over 50 years in Hampton Hill with his wife Norma, who survives him. In addition, he had one son, who sadly died at the age of 12.

John Nicholson
University of Greenwich

STOP PRESS

Royal Society Publishing has just published a special issue from *Notes and Records* on The Royal Society and science in the 20th century: Papers from a conference for the Royal Society's 350th anniversary, guest edited by Dr Peter Collins, Director of the Royal Society Centre for History of Science. It is FREELY available online from
http://rsnr.royalsocietypublishing.org/seefurther