ISSN 1360-6891

THE HISTORY OF ANAESTHESIA SOCIETY PROCEEDINGS

Volume 28

Proceedings of the joint meeting with the Royal Society of Chemistry in London
4th November 2000

Includes membership and Montreal supplement

HAS COUNCIL AND OFFICERS - NOVEMBER 2000

President	Dr Ian McLellan, Leicester
Past President	Dr Jean Horton, Cambridge
Honorary Secretary	Dr Neil Adams, Bury St Edmunds
Honorary Treasurer and Membership Secretary	Dr John Pring, Penzance
Honorary Editor of Proceedings	Dr Marshall Barr, Reading
Assistant Honorary Secretary	Dr Geoff Hall-Davies, CBE TD, Birmingham
Assistant Honorary Editor	Dr Peter Drury, Liverpool

Council Members

Dr Colin Birt, Southend
Dr John Blizzard, East Grinstead
Dr Alistair McKenzie, Edinburgh
Dr Colin McLaren, Wiltshire
Dr Adrian Padfield, Sheffield
Dr Yash Pole, Manchester
Dr Miles Ruckledge, Lancaster
Mrs Sally Garner, Leicester

Honorary Members UK and Ireland

Dr Aileen Adams CBE
Dr T B Boulton OBE TD
Dr F F Cartwright
Dr Barbara Duncum
Dr D D C Howat
Dr H R Marrett
Dr W D A Smith OBE
Dr C S Ward
Dr D Zuck

Honorary Members Overseas

Professor J Lassner, Paris, France
Dr Lucien Morris, Washington, USA
Prof J Severinghaus, San Francisco, USA

ORGANISING COMMITTEE

History of Anaesthesia Society and Royal Society of Chemistry –Historical Group

Joint Autumn Meeting, London, 4 November 2000

Dr N G Coley (RSC)

Dr C A B McLaren (HAS)

Dr N Adams (HAS)

Dr Jean Horton (HAS)

Proceedings of the History of Anaesthesia Society

Hon Editor: Dr A Marshall Barr
Norscot, Rosebery Road
Tokers Green, Reading RG4 9EL
Tel/fax: 01189 479646
E-mail: Marshall Barr@btinternet.com

Hon Assistant Editor: Dr Peter Drury
80 Green Lane
Liverpool L18 2ER
Tel/fax: 0151 722 4941
E-mail: PMEDrury@aol.com

Publication Coordinator: Dr F E Bennetts

The Society acknowledges with thanks the Meeting photographs from Dr Geoff Hall-Davies of Birmingham.

Editorial

These *Proceedings* record another first - a combined meeting with the Royal Society of Chemistry, Historical Group. Thanks to Air Commodore (retired) Colin Maclaren, we met at the Royal Air Force Club in Piccadilly, itself steeped in history and richly decorated with classics of aviation art. The delegates enjoyed both the venue and the programme and our Society gained some distinguished new members.

This volume seemed an appropriate opportunity to publish John Birtwhistle's note on William Russell Notcutt, 'formerly lecturer in chemistry at Hackney'. Married to a consultant anaesthetist in Sheffield, John is a literary academic whose paper on Humphry Davy's nitrous oxide subjects was well received by the scientific audience at the Davy bicentenary meeting (Vol 25). Later he chanced to see a television programme on medical errors with comments by Dr Willy Notcutt, Consultant Anaesthetist at Great Yarmouth. Since William Notcutt was one of the nitrous oxide subjects, he got in touch and learned that William Russell Notcutt was indeed an ancestor of Willy's, that he had lectured in Chemistry at Hackney, was a Fellow of the Linnean Society and had died in Surinam. These facts appeared in a family history written by Martin Notcutt and Marian Sartin (whose mother was a Notcutt). Willy did not know about the Davy connection, which is not mentioned in Davy's book but only in a rare pamphlet by Thomas Beddoes. He commented: 'To learn that one of my ancestors was involved in the original nitrous oxide experiments adds to my credentials!'.

John Birtwhistle's follow-up of this new information must be of interest to both our chemistry and anaesthesia readers. We still do not know why Notcutt went to Bristol, let alone Surinam. 'Perhaps', John wrote, 'One day his name will show up in a travelogue, or admiralty or Bristol shipping record, or in an account of some commercial, missionary, scientific or even military expedition - I shall just have to keep watching telly.'

Another opportunity and another first is the inclusion of a Supplement: on the History Satellite Meeting held in conjunction with the 12th World Congress in Montreal. That programme included new information from Europe, North America, China and Nepal. When the HAS was founded in 1986, some sceptics gave us just a few meetings before everything would have been said about the history of anaesthesia. Instead, the *Proceedings* continue to document exploration of new, enticing paths. Now is a good time for me to retire from the Honorary Editorship and do a bit of my own exploring. Peter Drury, who has shouldered an increasing load as Honorary Assistant Editor, is the logical successor. He will bring new ideas and new energy to a task that is time-consuming but utterly rewarding.

AMB

Meeting of the History of Anaesthesia Society with the Royal Society of Chemistry Historical Group at the RAF Club, Piccadilly, London, on 4 November 2000

Participants

History of Anaesthesia Society

Dr Aileen Adams	Cambridge
Dr Neil Adams	Bury St Edmunds
Dr Marshall Barr	Reading
Dr Frank Bennetts	Christchurch
Dr Colin Birt	Southend
Mr J Birtwhistle	Sheffield
Dr John Blizzard	Chelmsford
Dr Tom Boulton	Reading
Dr J Chamberlain-Webber	Brighton
Dr Ian Corall	London
Dr Peter Drury	Liverpool
Dr Ann Ferguson	Broadstairs
Dr Anne Florence	Liverpool
Dr Alan Gilston	London
Dr Ronald Griffin	Colchester
Dr Geoff Hall-Davies	Birmingham
Dr Helen Hannah	Chippenham
Dr Eric Holmes	Tenterden
Dr Jean Horton	Cambridge
Brig Ivan Houghton	Haslar
Dr Douglas Howat	London
Mrs Joan Howat	London
Dr Simon Krige	Ramsgate
Dr Adrian Kuipers	Shrewsbury
Prof Roger Maltby	Calgary, Canada
Dr Alastair McKenzie	Edinburgh
Dr Colin McLaren	Wootton Bassett
Dr Ken Macleod	Huntingdon
Dr Ann Naylor	Ingatestone
Dr Adrian Padfield	Sheffield
Prof J P Payne	London
Dr Yash Pole	Manchester
Dr John Pring	Penzance
Dr Anna-Maria Rollin	Epsom
Dr Nigel Rose	Ledbury
Dr Miles Rucklidge	Lancaster
Dr Geoffrey Rushman	Thame
Dr Alistair Trench	Dunblane
Dr Maureen Van Ryssen	West Sussex
Dr David Walmsley	Chelmsford
Dr David White	Beaconsfield
Dr David Wilkinson	London
Mrs Pat Willis	AAGBI
Dr David Zuck	London

Royal Society of Chemistry

Dr N G Coley	Surrey
Prof Alan Dronsfield	Derby
Dr R J Flanagan	London
Mr N O Minns	Isle of Wight
Dr H Payne	West Lothian
Mr J D Ramsey	London
Prof C A Russell	Bedford

President of the History of Anaesthesia Society Dr Ian McLellan

Dr N G Coley (RSC)

Dr C A B McLaren (HAS)

Prof C A Russell (RSC)

Dr H A S Payne (RSC)

Dr D Zuck (HAS)

Dr F E Bennetts(HAS)

Proceedings of the History of Anaesthesia Society –Volume 28

Meeting of the History of Anaesthesia Society
and
The Royal Society of Chemistry Historical Group

Papers presented on Saturday 4 November 2000
at the Royal Air Force Club, Piccadilly, London

EARLY EXPERIMENTS WITH INHALATION ANAESTHESIA*

Dr N G Coley
Hon Senior Research Fellow, The Open University, Milton Keynes, MK7 6AA

Introduction

Attempts to alleviate pain in medicine have a very long history. The use of the ancient soporific sponge died out in the seventeenth century, but surgeons up to the early nineteenth century often gave patients a stiff whisky - or an opium draught, when muscular relaxation was essential. Hypnotism was also employed, but it was only when chemists and surgeons turned their attention to the anaesthetic properties of certain gases and vapours that the prospect of true anaesthesia became possible. In England, Henry Hill Hickman tried carbon dioxide as a means of producing insensibility, but it was Humphry Davy's discovery of the effects of nitrous oxide (laughing gas) about 1800, whilst he was working at Thomas Beddoes's Pneumatic Institution in Bristol, which would provide the key to anaesthesia. This Institution had been established to exploit the medical benefits of the new gases that had been discovered during the 18th century, especially the life-enhancing properties of oxygen. Davy investigated many gases in this respect, usually breathing them himself to observe their effects and it was in this way that he discovered the special character of nitrous oxide as a mild anaesthetic. Breathing laughing gas for pleasure soon became a new experience in early 19th century England. Davy even wrote some of his poetry under its influence. He suggested its possible use in minor surgical operations, but this was not taken up at that time. In America, itinerant lecturers and travelling showmen at country fairs would often invite members of the audience to inhale laughing gas for amusement. Later, when it was realised that ether vapour produced a similar state, 'ether frolics' became popular among students and young people.

Surgical anaesthesia was introduced in America in the 1840s by four pioneers. Among them were three dentists, Crawford Long, Horace Wells and William Morton, and Charles Jackson, a physician, geologist and chemist.[1,2] Each played a part in the development of ether anaesthesia and each later claimed priority in the discovery. In this paper we briefly review their work and the controversy which followed.

Crawford Long

Crawford Long (1815-1878) was born at Danielsville, Georgia on 1 November 1815. He graduated from Franklin College, University of Georgia in 1835. He then studied medicine in Lexington, Kentucky and at the University of Pennsylvania, where he graduated MD in 1839. He went first to New York to work in the hospitals, then returned to the small town of Jefferson, Georgia, where he acquired an extensive practice. Having observed that injuries were sustained without pain during ether frolics, Long thought of using ether as an anaesthetic. He persuaded James Venable, one of his patients, to have a cyst in his neck removed under ether. The operation was carried out successfully on 30 March 1842, and a week later he performed a second operation on another patient. This was more complicated; the patient began to regain consciousness before it was complete and Long suggested that the ether ought to have been

* This paper is a slightly revised one with the same title published in: Smith EB and Daniels S (eds). *Gases in Medicine*. The Royal Society of Chemistry 1998:163-172. We are grateful to the Royal Society of Chemistry for permission to reproduce this material.

administered throughout the operation. These are the earliest known examples of ether anaesthesia in surgery and there is evidence to confirm Long's claim to priority as his purchase order for the ether still exists. Yet he published no reports of his results.

Long later said that he had 'performed one or more surgical operations annually, on patients in a state of etherisation' since 1842, but he wanted to make sure that 'anaesthesia was produced by the ether and was not the effect of the imagination' before publicising the fact.[3] Indeed, he did not report his use of anaesthesia until 1849,[4] though there is no doubt that he was the first to use ether in surgery and dentistry.

In fact, on all the evidence, Long emerges as the discoverer of ether anaesthesia; he pre-dated Wells by two years and Morton by four. He remained aloof from the disputes over priority, yet without the publicity engendered by the ether controversy, Long's work might have remained unknown outside his private practice. His work had no direct influence on the development of surgical anaesthesia and the question inevitably arises, what kind of a discovery is it if no one knows about it?

Horace Wells

Horace Wells (1815-48) was born at Hartford, Vermont on 21 January 1815. He studied dentistry at Boston and began practice in Hartford, Connecticut about 1834. In 1840 he first suggested the possibility of painless dental extractions under nitrous oxide. Four years later, on 10 December 1844 he was present at a public lecture at which some members of the audience breathed nitrous oxide.

In the capers which followed one of the volunteers severely 'barked his shins'. Later, this man declared that he had felt nothing and this confirmed Wells's idea of using nitrous oxide as an anaesthetic. On the following day, Wells asked the lecturer to administer the gas to him whilst John Riggs, a former pupil, extracted one of his molars. The extraction was painless and, having tested his idea successfully on himself, Wells wanted to make it available to his patients. But pure nitrous oxide was not readily obtainable and he first had to master the art of preparing the gas himself.

However, by mid-January 1845, he had performed painless dental extractions on about fifteen patients.[5] He informed his colleagues and some also tried the procedure with success.

Wells then sought an opportunity to demonstrate the procedure at the Massachusetts General Hospital (Figure1) in Boston and towards the end of January 1845 the experiment was set up. Wells had to make his own pure nitrous oxide, administer it and carry out the extraction before a highly sceptical audience of medical men and students.

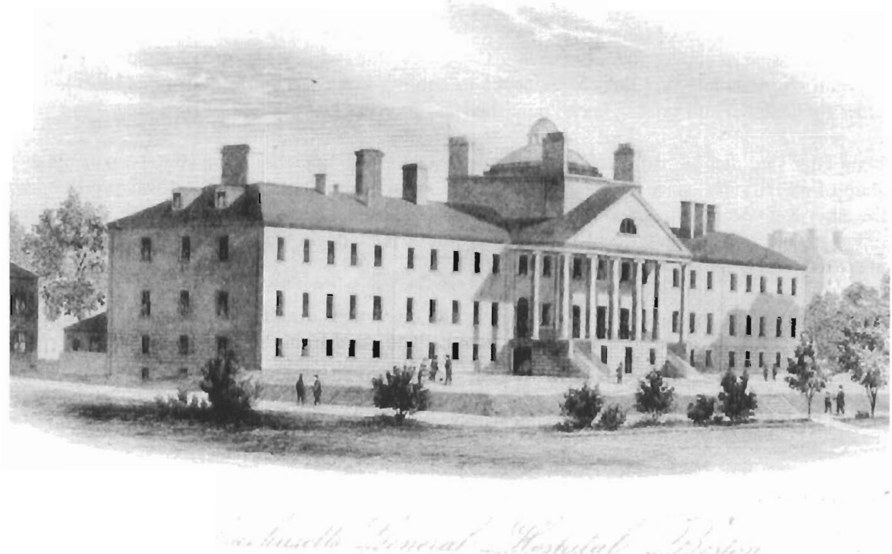


Figure 1

He administered the nitrous oxide from a rubber bag and when he judged that the patient was sufficiently anaesthetised he began the operation. All went well at first, but then the patient groaned and this was seized upon as a sign of failure by the audience. Wells was branded an impostor even though the patient said he had felt no pain.

Wells blamed himself for removing the gas bag too soon, though it is not surprising that he should be worried. The patient was receiving no air or oxygen with the anaesthetic and there was no way of measuring how much nitrous oxide was being inhaled. Moreover, in the hostile atmosphere of the operating room Wells was anxious not to overplay his hand. However, it is now well-known that patients under nitrous oxide anaesthesia often groan or moan involuntarily, but this does not mean that the anaesthetic is no longer working. So, by hindsight, it seems likely that Wells probably had demonstrated nitrous oxide anaesthesia successfully. Later he experimented with ether as an external local anaesthetic, but due to failing health he withdrew from practice in 1845, having already revealed what he knew of anaesthesia to two others who would later challenge his priority in the discovery.

One of these was his former pupil William Morton, a dentist in Boston, who was present at the demonstration and was impressed by the mild reactions of the patient. Wells and Morton had already set up a partnership to sell a dental solder invented by John Riggs for use in making dentures. In the course of their experiments they had consulted Charles T Jackson, a prominent chemist in Boston. Jackson, like Morton, would later become a contestant in the controversy over the discovery of anaesthesia, but in January 1845 neither Morton nor Jackson showed much enthusiasm for Wells's claims.

Charles T Jackson

Charles T Jackson (1805-80) was born on 21 June 1805 at Plymouth, Massachusetts. He graduated MD at Harvard in 1829, then travelled to Europe where he spent three years studying medicine in various places including Vienna and Paris. He also attended geology lectures at the Royal School of Mines in London. Returning to Boston in 1832 he started a private medical practice, but he abandoned medicine in 1836 to establish a laboratory for teaching analytical chemistry. One of his pupils, William T G Morton, when he learned of Wells's use of ether, began his own experiments.

Jackson too, tried the effects of ether on himself in February 1842, but he neither publicised the fact at the time, nor did he use ether in any surgical operation. Yet, on the basis of these personal experiments he later made a vigorous claim for priority in the discovery over both Morton and Wells, in the course of which he denounced Morton as a swindler and a forger.

Besides his chemical work Jackson became a prominent geologist, completing numerous important geological surveys in New England. After studying the geology of several parts of America, Jackson was assigned by the US Geological Survey to report on the Lake Superior Region. He published more than four hundred papers on geological subjects and gained a worldwide reputation. He was undoubtedly very able, but sadly, with an over-reaching ambition he was quite unscrupulous in claiming priority over the discoveries and inventions of others. For example, he met Samuel Morse on a voyage in 1832 and later claimed that he had given Morse the idea of the electric telegraph.

Litigation over the priority of this invention continued for years. Jackson also claimed priority over Schönbein for the invention of gun cotton. In 1873 Jackson was admitted to an asylum for the mentally ill, where he spent the remainder of his life. But, in the 1840s, Crawford Long respected him, and both Wells and Morton brought their work on anaesthesia to his notice.

William Thomas Green Morton

William T G Morton (1819-68) was born at Charlton, Massachusetts on 9 August 1819. He began dental practice in Boston in 1844 and after witnessing Wells's demonstration he discussed the possibilities of surgical anaesthesia with Jackson in September 1846. Jackson told him that pure nitrous oxide was unavailable, but suggested that Morton should try ether. Morton took up this suggestion and began to use ether in his dental practice, his first patients inhaling it from the corner of a towel.[6] Then, having carried out a number of painless extractions, Morton, like Wells, requested an opportunity to demonstrate surgical anaesthesia at the Massachussetts General Hospital. He was fortunate in persuading John Collins Warren (Figure 2), an eminent Boston surgeon, to carry out a surgical procedure using a new anaesthetic, the precise nature of which he did not at first reveal.

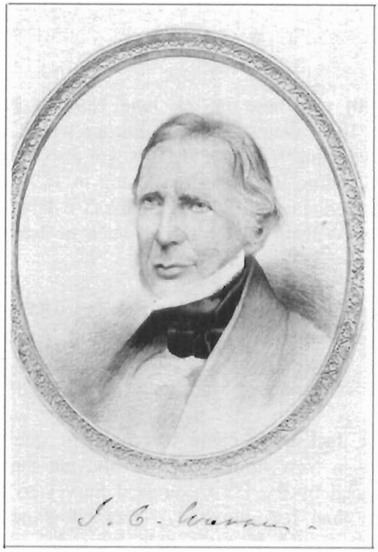


Figure 2

Warren agreed, even though Morton would not tell him the name of the anaesthetic, but no opportunity arose until October when it became necessary to excise a tumour in the neck of a young printer named Gilbert Abbott. This tumour was superficial, though large and Warren decided that it was a proper case for the trial. On 16 October 1846, with Morton administering ether vapour from a glass flask, Warren excised the tumour in five minutes without pain. On the day of the operation the patient was prepared and the audience were in their places, but Morton was late and Warren was about to perform the operation without anaesthetic when Morton arrived. He had been to obtain his apparatus which he had ordered from a surgical instrument maker. It consisted of a glass flask with two necks, filled with gauze soaked in ether and it ensured that the patient would breathe a mixture of air saturated with ether vapour. After applying the apparatus for 4 or 5 minutes the patient appeared to be asleep and the operation was performed.

To Warren's surprise the patient did not shrink, nor cry out, but later he began to move his limbs and utter strange expressions which seemed to indicate pain though after he regained consciousness Abbott said that he had felt no pain. An eyewitness account of this operation was given by a student.[7] The next day a large fatty tumour was successfully removed from the shoulder of another patient by George Hayward, another Boston surgeon, again with Morton as anaesthetist. The discovery was then described in a paper by Henry Jacob Bigelow, Professor of Materia Medica, published on 18 November,1846. Bigelow's report[8] seemed to suggest that Wells's demonstration two years before may well also have been successful. Support by two such reputable doctors as Warren and Bigelow led to ether anaesthesia being taken up by others,

Figure 3

and Morton's pioneering operation was made famous by the well-known painting by Robert Hinckley, based on descriptions and an earlier engraving. (Figure 3)

Methods of administering ether

In 1847 Morton described his methods of administering ether in a letter to the *Lancet*. At first he had used a simple sponge, then he placed it under a conical glass tube (like an inverted glass funnel) and afterwards in a glass flask, but he remained dissatisfied with the results. He suspected that anaesthesia in Abbott's case had been only partial and he wanted to improve his method. On 17 October, the day following Abbott's operation, he used a new apparatus with valves to control the amount of ether given during his second demonstration of etherisation. Before this surgeons and physicians, with few exceptions, were incredulous, but the success of the second operation confirmed the discovery.[9] After this, ether was used in other cases and within a short time it began to be used in every considerable surgical operation in Boston.

Seeds of discord

Less than two weeks after Morton's successful demonstrations he and Jackson jointly sought a patent for the anaesthetic agent. Morton tried to disguise the smell of the ether with aromatic essences and he called the mixture 'Letheon'. They tried to profit from the discovery by granting licences to restrict its use, but it soon became clear that it would be impossible to sustain any hold over the use of such a readily available substance as sulphuric ether. When Jackson saw that the likely profits from the patent would be far less valuable than the prestige of being designated the discoverer of anaesthesia, he assigned his patent rights to Morton and set out to establish himself as the discoverer.

On 21 December 1846 he wrote to his friend Élie de Beaumont at the Académie des Sciences in Paris, where he was already known, announcing himself as the sole discoverer of surgical anaesthesia. On 2 March 1847 he read a paper at the American Academy of Arts and Sciences which he had already published in the *Boston Daily Advertiser* the day before. This gave the impression that the Academy had endorsed Jackson's claim[10] and on 31 January 1849 the Institut Français awarded Jackson the Cross of the Légion d'Honneur as the discoverer of etherization.

The ether controversy

As soon as he heard this Morton wrote to the Institut Français, sending a separate package of papers supporting his own claim to the discovery. His letter arrived, but for some unknown reason the papers did not and, as the documents backing his claim failed to arrive, his case was weakened. The French Committee had only his own statement and he was unknown in France, whereas Jackson was supported by his friend, Élie de Beaumont. Morton suspected that his papers and collection of pamphlets were never received due to the intervention of someone who had become prejudiced against him. The French Académie de Médecine offered a prize jointly to Morton and Jackson, but Morton refused to accept it, insisting that the credit for the discovery belonged solely to him.

On 6 December 1852 Morton petitioned the United States Senate for public recognition as the discoverer of ether anaesthesia. His petition was signed by seven surgeons and five physicians of the Massachusetts General Hospital, headed by Warren and including Oliver Wendell Holmes, who had suggested the terms 'anaesthesia' and 'anaesthetic'. Four consultants and three physicians of the Charitable Eye and Ear Hospital and 104 members of the Massachusetts Medical Society also signed Morton's petition. A Select Committee of the Senate was set up and the evidence was heard beginning on 21 January 1853.[11]

Morton began by stating that although Reports by the trustees of the Massachusetts General Hospital and the House of Representatives had awarded the discovery to him, he had suffered malicious attacks. He said that it was his idea to use ether as an anaesthetic and he was wholly engrossed in testing it for some months prior to 30 September 1846 when Jackson claimed to have given him the first hint of the possibility. Furthermore Jackson had ridiculed the idea of anaesthesia, even while it was being tested and washed his hands of all responsibility. He remarked that even if Jackson's statements about trying out ether on himself were literally true, he was not entitled to claim the discovery on that basis alone. The Boston surgeons insisted that Jackson had no connection with any of the experiments either at the hospital or in private practice and that neither Dr Warren, nor anyone else connected with the hospital knew or suspected that Jackson had anything to do with the discovery.

Morton also challenged the claims made on behalf of Horace Wells who had died in 1848. He went to Hartford, Connecticut where he arranged to have every witness within reach who was mentioned in support of Wells's claim, called before a United States Commissioner, to have them examined in full. The results were laid before the Select Committee. After nearly a month neither Jackson nor Long had submitted their claims and notice was given to them to present their evidence to the Select Committee.

Time still passed and so Morton himself presented printed copies of two minority reports in favour of Jackson and two pamphlets favouring Wells, one of which ran to 132 pages. He also submitted a translation of the report of the French Committee which had made the award to Jackson. He pointed out that this report agreed that he, Morton, having had the original idea, had 'completed' the discovery which, without his 'audacity' would probably have remained 'fruitless and without effect' in Dr Jackson's mind. Yet the French named Jackson as the discoverer rather than Morton because: 'Mr Jackson had observed that *some persons* on being exposed for a certain period of time to the action of ethereal vapours were momentarily deprived of all sensibility'.[11] Morton pointed out that Jackson had tested the effects of ether on himself alone. Morton also reminded the Select Committee that the authorities of the Massachusetts General Hospital had formally attributed to him the honour of the discovery in their report for 1848.[11]

Repeated solicitations to the US Congress from the physicians and surgeons of the Massachusetts General Hospital as well as others, and from Morton himself, had led to the appropriation of $100,000 to him for the discovery of practical anaesthesia, but this was voted down at three separate sessions of the legislature. Besides Jackson's efforts, congressional supporters of Crawford Long and vigorous polemics from Truman Smith, Senator for Connecticut, on behalf of Wells's widow and infant son, ensured the defeat of the appropriation in Morton's favour. In a debate at the Senate on 28 August 1848, Truman Smith had said: 'I pledge whatever reputation I may have that .... I will make out a case for the family of Dr Horace Wells, deceased ...I believe that this Morton is a rank imposter - that there is no justice or truth in his pretended claim.'[11] He maintained this position throughout the protracted arguments which dragged on until the Civil War broke out in 1861. The issue was then shelved and was never reopened. Interestingly, ether was used widely by surgeons of both sides on the battlefields.

The first surgical operation under ether in Britain was carried out by Robert Liston who amputated a thigh at University College Hospital on 2 December 1846,[12] James Syme, Liston's cousin, adopted ether anaesthesia at Edinburgh from 1847 and in the same year Nikolai Pirogoff began to use it in his surgical practice at St Petersburg. Thus the use of ether anaesthesia quickly spread, but unfortunately in the hands of untrained surgeons there were some fatalities and doubts about its safety began to arise.[13]

Conclusion

The dilemma of the Senate Committee arose in part from the fact that it was not made clear what the proposed award was for. Each of the contestants had a claim to part of the discovery, but none had an outright claim. Long had used ether four years before Morton and was therefore first in time, though he did not publicise his work. Wells had a strong claim to the discovery of general anaesthesia,[5,14,15] and had brought the technique to public notice, but he used nitrous oxide. Jackson's claim, though shaky, was yet strong enough to deny Morton the award which, in the end, was never made. Morton felt badly let-down. He wore himself out with bitter disappointment, resentment and enmity towards Jackson and died of a stroke on 15 July 1868, at the age of 48.

Francis Darwin (1848-1925), the Cambridge botanist once said: 'In science the credit goes to the man who convinces the world, not to the man to whom the idea first occurred'. In the case of anaesthesia, despite all the evidence and arguments, neither the man who first had the idea, nor the man who most clearly demonstrated its utility, was able to convince the Select Committee of the United States Senate and, indeed, the argument continues. New books and articles still appear, setting out again the claims of one or other of these four men. There are also monuments to each of them claiming the honour of discovery. In Bushnell Park, Hartford, Connecticut there is a statue of Horace Wells, labelled 'discoverer of anaesthesia'. In the Smithsonian Institution in Washington, a bust of Morton declares him to be the 'discoverer of surgical anaesthesia'. On the public square at Jefferson, Georgia an obelisk is inscribed: 'Dr Crawford Long, the first discoverer of anaesthesia' and in Pilgrim Hall, Plymouth, Massachusetts, an old rocking chair on display is labelled with a brass plate, 'Seated in this chair Dr Charles T Jackson discovered etherization, February, 1842'. The ether controversy lives on, perpetuating the problem of what really counts as a discovery in science. But when all is said and done, it is the value of the discovery itself which matters - by comparison, the question of who made it pales into insignificance.

References

1. Robinson V. *Victory over Pain; a History of Anesthesia.* New York, Henry Schuman,1946; 83-137.
2. Duncum B. *The Development of Inhalation Anaesthesia.* London, Royal Society of Medicine Ltd, 1994; 99-129.
3. Boland FK. *The First Anesthetic; the Story of Crawford Long.* Athens, Georgia, University of Georgia Press, 1950.
4. Sykes WS. *Essays on the First Hundred Years of Anaesthesia.* London and Edinburgh, Churchill Livingstone.1982; **3**:1-24.
5. Wolfe RJ and Menczer LF (eds). *I Awaken to Glory; Essays celebrating the Sesquicentennial of the Discovery of Anesthesia by Horace Wells, 11 December 1844 - 11 December 1994.* Boston Medical Library.
6. *McQuitty B. The Battle for Oblivion: The Discovery of Anaesthesia.* London Harrop,1969.
7. Ayer W. Account of an eye-witness. In: Cole F (ed). *Milestones in Anesthesia; Readings in the Development of Surgical Anesthesia 1665-1940.* Lincoln, University of Nebraska Press, 1965; 30-32.
8. Bigelow HJ. *Boston Medical and Surgical Journal* 1846; **35**:32-42.
9. Morton WTG. *Remarks on the Proper Mode of Administering Sulphuric Ether by Inhalation.* Boston, Dutton and Wentworth, 1847.
10. Robinson V. Op. Cit: 134-137.
11. Morton WTG. *Statements supported by evidence of WTG Morton, MD, on his claim to the discovery of the anaesthetic properties of ether, submitted to the Select Committee appointed by the Senate of the United States.* Washington,1853.
12. Ludovici LJ. *Cone of Oblivion: a Vendetta in Science.* London,1961.
13. Ball JM. The ether tragedies. *Annals of Medical History* 1925; **7**:264-266.
14. Gunderman RB. Dr Horace Wells and the conquest of surgical pain: a Promethean tale. *Perspectives in Biology and Medicine* 1991-1992; **35**:531-548.
15. Jacobsohn PH. Dentistry's answer to the 'humiliating spectacle'. *Journal of the American Dental* Association 1994; **125**:1576-1584.

THE THIRD MAN – CARL WILHELM SCHEELE

Dr C A B McLaren
Wootton Bassett, Wiltshire

Introduction

Combustion, fire and flames have been observed and speculated upon from the earliest times, and every civilisation has had its own explanation. The Greeks interpreted it in philosophical doctrines, one of which was that: 'a certain inflammable principle escaped when the body was burned to react with air'. A generalisation of the concept was provided by the phlogiston theory which was formulated in the 17th century. At the start of the 17th century, chemistry was in its infancy. Alchemy and the search for the philosopher's stone were still paramount, but by the end of the century qualitative chemistry was beginning. The advance was not due to the phlogiston theory but rather despite it; the phlogistonites had undoubtedly been leading in the wrong direction.

FIG. 1. C. W. SCHEELE, 1742–1786.
(From a posthumous portrait by Falander.)

The Theory

All materials are composed of water and three earthly principles, salt, sulphur and mercury - the theories of Paracelsus and the Alchemists. It was around these ideas that Julius Becher (1635-1682), born in Speyer, Germany, developed his strange theory. In today's world he would have been classed as an entrepreneur, his ideas ranging from converting sand and silver into gold to setting up German colonies in South America along the Orinoco river. All were doomed to failure. He considered that minerals, as well as plants and animals, have a sort of life and grow in the earth from seeds.

This theory did not answer three important questions:

- what is the nature of combustion and combustible bodies?
- why do certain metals when heated gain in weight as the calxes (oxides) are formed?
- what is the true nature of fire, heat and flames?

The phlogistonites could provide answers for questions one and three, but question two posed problems as the theorists stressed the negative weight of phlogiston. To explain the gain in weight, it was suggested that phlogiston was a true element which could be transferred from one body to another, but could never be obtained in isolation. Phlogiston separated from bodies with or without heat and united with air; this considerably diminished the volume of the air.

Stahl

It was Georg Ernst Stahl (1660-1734), born in Ansbach, Franconia, who bridged the gap with his version of the phlogiston theory. He did not agree with Becher's vague ideas. Instead he considered that phlogiston was the property of being combustible that is lost in the process of combustion, but may be regained by contact with material especially rich in phlogiston, such as coal. Stahl built his practical theory on to the ancient philosophical foundation, that clarified the fundamental chemical concepts.[1]

The Third Man

Carl Wilhelm Scheele was born in Stralsund, a small town on the Baltic coast of Swedish Pomerania (now Mecklenburg, North Germany), on 9 December 1742, at 23 Fahrstrasse. His biographers show a slight disagreement as to the birth date, suggesting that the correct date was 19 December; but the entry in the Parish Register giving notice of his baptism on 21 December 1742 makes the second date very unlikely. He was one of eleven children, six boys and five girls. His elder brother became an apothecary, whilst his youngest brother, Paul Joachim, qualified in medicine in 1773 at the University of Halle in Germany. He had a good elementary education, during which time he showed an early interest in chemistry and pharmacy. The family doctor gave him instructions in how to read prescriptions. Although his father was a merchant in the town, Carl did not attend the local Gymnasium (High School). Instead, at the age of 14 he left Stralsund, never to return.

Apprenticeship

He was apprenticed, like his elder brother, to the Unicorn Apothetik in Gothenburg, Sweden. The business of 63-year old Martin Anders Bauch had had a good reputation for competence and being aware of recent developments in his profession. In this environment Scheele was given the opportunity to study and carry out his earliest experiments. During his apprenticeship he had access to the two most important chemical textbooks of his time. He noted that there were many experiments with the results of which he could not agree. Scheele remained with Bauch from the end of his apprenticeship until the business was sold in 1765.[2]

Malmo

For the next ten years he travelled as a journeyman. In 1765 he found work in Malmo, in the pharmacy run by Peter Magnus Kjellstrom. He fully appreciated Scheele's preference for experimental work and so allowed him to work in the pharmacy laboratory. Kjellstrom states that Scheele read textbooks saying: 'that may be - that is wrong - I will try it'. His stay in Malmo was of great importance because of the proximity of the University in nearby Lund. This gave Scheele his first contacts with the academic world through his friendship with Anders Retzius, who was Lecturer in Chemistry at the University. Retzius was the same age as Scheele, and the two remained friends for the rest of Scheele's life. Retzius, who later became Professor of Chemistry at the University, was probably one of the last phlogistonists. He notes that: 'Scheele used to read a book only once or twice when, so good was his memory, he never needed to refer to it again'.[3]

Stockholm

After three years in Malmo, Scheele moved on to Stockholm to work in the pharmacy owned by Johan Scharenberg, but he was not allowed to carry on with his experiments, being responsible for making up the prescriptions. However, he carried out some research with Retzius, who by this time had also moved to Stockholm. Scheele's name appeared for the first time in a paper published by Retzius in 1770, on the preparation of tartaric acid from cream of tartar, which acknowledged him as a co-worker.

Preparing prescriptions was not to his liking, so after only two years in Stockholm he moved to the University town of Uppsala. He obtained a post in the pharmacy of Christian Ludwig Lock, where he had a workbench in the laboratory. He was given one day a week for research, and soon established himself as an able chemist.

Uppsala

Whilst working in Uppsala Scheele met Johan Gottlieb Gahn, a mineralogist who discovered manganese. Despite this discovery Gahn failed to win fame and fortune, probably because he published little. However he does have a claim since he saved for posterity all the notes, papers and letters of his friend Scheele.[4] At the time of their meeting Gahn was assistant to the Professor of Chemistry, T Bergman, and introduced Scheele to Bergman, who was soon impressed with the young man's knowledge. It is likely that the feeling was not exactly mutual. After one of Scheele's papers on acid potassium oxalate had been presented to the Swedish Academy it was not published, due to the negligence of Bergman, so that initially he was not inclined to follow up the introduction. Scheele seems to have had further difficulties with Bergman following the non-publication of a badly written paper which, however, contained the important observation that hydrogen (phlogiston elasticum) was produced by the action of organic acids on iron filings. Retzius commented that: 'he could not understand why Bergman had suppressed the paper'. In 1781 Bergman published the research but did not mention Scheele's paper.

Discoveries

Scheele made many important discoveries (Appendix). He repeated many of the earlier experiments, but his most important discovery was that of oxygen, which was first mentioned in his notes from 1771 and 1772. He conducted a series of 97 experiments, in the first eight of which he set out to discover the composition of common air. He exposed a known volume of air to various substances known to be rich in phlogiston. A given quantity of ordinary air can unite with only a certain quantity of the inflammable principle, and there is a contraction in volume of between one third and one quarter. If this residual air contained the inflammable substance it should have been heavier than the original weight, but this was not true. Initially, Scheele had been a supporter of the phlogiston theory, but his experiments showed that phlogiston was not contained in the residual gas, which when weighed was lighter than the original common air.

In all his early experiments he was unable to separate the lost air from the materials employed. He therefore suggested that the air contains two fluids differing from each other, one of which does not show any properties in attracting phlogiston whilst the other, the third or fourth part of the whole mass of air, is peculiarly disposed to such attraction. He called the two elastic fluids verdorbene luft (foul air), and feuer luft (fire air), the latter because it is required for the origination of fire. Scheele obtained his new gas by heating mercuric oxide and collecting the gas which was given off. He found the gas to be odourless, colourless and tasteless. It supported the combustion of a candle much better than common air.

Feuer Luft

In other experiments he showed that 'feuer luft' was essential to maintain fire and burning, and also essential to sustain life. In one experiment two bees were placed in a flask of common air, care being taken to supply the bees with their appropriate food. At the end of eight days the bees were dead. Aerial acid (carbon dioxide) was found on testing, and the residual gas would not support combustion. He conducted on himself several experiments breathing 'feuer luft' but was wrong in his conclusions, that insects and plants converted fire air into carbon dioxide, whilst respiration in animals converted fire air into foul air.

All the experiments were completed in Uppsala before 1775. Scheele, being confident about his results, sent full details of his experiments and the discovery of fire gas to Lavoisier, the letter being written in September 1774. This letter is the earliest known description of the discovery and the properties of the new gas, which was later named 'Oxygen' by Lavoisier. In an earlier letter dated 2 August 1774, Scheele informed the Secretary of the Stockholm Academy (Per Wargentin) that until recently, he had thought that he was the only scientist to know of 'certain phenomena', but that he had recently heard that some Englishman (Priestley) had also gone far in his researches. It is therefore likely that the knowledge that other researchers were going along a similar path led to the early publication of his manuscript *Chemische Abhandlung von der Luft und dem Feuer*.

The first recognition of Scheele's work was made in February 1775 when, in the presence of the Swedish King, and on the proposal of Professor Bergius, he was elected a member of the Royal Academy of Sciences of Sweden - an unprecedented honour for an apothecary's assistant.

Koping

It was now thirteen years after the end of his apprenticeship, but Scheele was still working in a subordinate position with limited possibilities for experimental research. In the summer of 1775 an opportunity for advancement occurred following the death of the apothecary in the town of Koping, 100 kilometres to the west of Stockholm. In 1772 Sara Margaretha Sonneman had married the pharmacist Herman Pohl. He died in 1775, leaving his widow to search for someone to carry on the pharmacy privilege in Koping, which she had inherited.[5] Scheele reached agreement with Mrs Pohl to manage the shop for one year, and then he would have the opportunity to negotiate to buy the business. Despite one or two problems during the year, he became so popular with the inhabitants of Koping that they insisted he should stay, and continue to be the town's pharmacist. By this time one of his younger sisters had come across from Stralsund to help with the running of the house. Except for one brief visit to Stockholm he remained until his death in the small town, despite receiving many more lucrative offers to move to other locations.

Publication

His manuscript *Chemische Abhandlung von der Luft und dem Feuer*, which detailed the experimental work carried out in Uppsala, was completed in Koping and sent to the printer (Sweredus) in Uppsala on 22 December 1775. The printer passed it on to Bergman, who had offered to write the introduction, early in 1776. A summary of the book, dated November 1775, was also found among Gahn's papers.

Unfortunately Bergman did not pen his introduction until 17 July 1777. The book was published between 13 July and 22 August 1777. In the introduction Bergman says that he had repeated and confirmed many of the experiments, and confirms that Scheele's discovery preceded Priestley's publications. Scheele blamed the delay in publication, and so his claim to be the first person to discover 'oxygen', on Bergman, although he had written to Gahn to advise him of his discovery. It is possible that if Bergman had not been involved, the book might well have been published in 1776.

Further Developments

Scheele's visit to Stockholm took place during October and November 1777. He took his seat in the Royal Academy of Sciences on 28 October of that year, after being elected in 1775. Two weeks later he took his long postponed Pharmacy examinations, and swore the Pharmacist's oath on 11 November. He returned to Koping on 23 November. Although his manuscript had been published he still continued with his development work, initially repeating all the experiments noted in the manuscript. This was despite the poor facilities in Mrs Pohl's home, the only available space being in a damp dark shed in the yard. His work was also handicapped by the debts that had been incurred by the business prior to his takeover. Scheele had agreed to pay off all the debts, so that after a few years it was possible to build and move into a larger house on the main square of Koping. Unfortunately the house was destroyed by fire 100 years ago.

The much improved facilities enabled him to continue his scientific investigations. Between 1775 and his early death in 1788 he discovered several metals, inorganic and organic acids. His self-experimentation with hydrocyanic acid, isolated in 1782, almost led to his accidental death.

Last Years

Up to the age of 35 Scheele had been in good health, but then he started to suffer attacks of rheumatism, perhaps due to working in poor conditions during his first years in Koping. In the autumn of 1785 he began suffer severe attacks of gout, which Scheele in a letter to a friend described as 'the trouble of all apothecaries'. He still worked on despite the pain he was suffering. In March 1786 he was recording his observations on the decomposition of nitric acid in sunlight: 'I shall repeat these experiments in the summer, and then we shall see how they turn out'. [6] He never saw the summer. His illness was accelerated by complications of the disorders and he died on 26 May 1786, before he reached his 44th year. It is possible that Scheele knew that he was dying. He was anxious to provide for the widow Pohl who was still his housekeeper, his sister having died in 1780. He not only prepared his will, leaving her as his heiress, but two days before died he made her his wife.

Summary

Scheele was a man of great modesty. Working with very simple apparatus, in a cold and uncomfortable laboratory, he made a great number of important chemical discoveries. His work on combustion and the discovery of 'feuerluft' were chronicled in his book, *Chemische Anhandlung von der Luft und dem Feuer*, which although despatched to the printer in 1775 did not see the light of day until 1777, by which time similar discoveries had been made and published by Priestley. It was over 100 years before Scheele's prior claims to the discovery of oxygen were confirmed from translation of his original laboratory notes.

Appendix Scheele's discoveries (selected)

1770	-	tartaric acid (co-worker with Retzius)
1772-1773	-	oxygen
1774	-	chlorine, manganese and baryta. Phosphorus from bone (previously extracted from urine)
1771-1780	-	silicon fluoride
1775	-	arsenic acid
1777	-	hydrogen sulphide
1777-1783	-	several organic acids: mucic, lactic, uric, oxalic, citric
1783	-	hydrocyanic acid

References

1. Beck CW. Stahl, Georg Ernst. *Journal of Chemical Education* 1960; **37**:506-510.
2. Tilden WA. *Famous Chemists: the Men and their Work*. London: G Routledge & Son Ltd, 1961; **5**:53-64.
3. Gillispie CC. Scheele, Carl Wilhelm. *Dictionary of Scientific Biog*raphy. New York: Charles Scribner & Son, **XII**;143-150.
4. Partington JR. *A Short History of Chemistry*. London: McMillan and Co. Ltd, 1948; 104-108.
5. Partington JR. Chemistry in Scandinavia: Sweden. *A History of Chemistry*. London: McMillan and Co. Ltd, 1962; **III**:206-232.
6. Boklund U. Carl Wilhelm Scheele. His Work and Life. *The Brown Book*. Stockholm: Roos Boktrycherier AB.1961; 404-411.

OBJECTIONS TO ANAESTHESIA: THE CASE OF JAMES YOUNG SIMPSON*

Prof C A Russell, Emeritus and Visiting Research Professor,
the History of Science, the Open University

Simpson and the introduction of chloroform anaesthesia

Chloroform is historically important as the first anaesthetic to be used on any considerable scale, and it dominated the field for half a century and more. Yet the circumstances of its introduction have been attended by a mystery so remarkable that only in the last 20 years has a solution begun to appear. In a sense the story began with the man who was to become Sir James Young Simpson, President of the Royal College of Surgeons of Edinburgh, with a bust in Westminster Abbey and a statue on Princes Street, Edinburgh. (Figures 1 and 2)

Early years

James Simpson was born 7 June 1811, at Bathgate, 15 miles west of Edinburgh. He was the seventh son of a baker. His middle name 'Young' was added later (to acknowledge a nickname derived from his youthful appearance, 'Young Simpson').

Figure 1
Sir James Young Simpson

* This paper is a slightly revised version of one with the same title published in EB Smith and S Daniels (eds). *Gases in Medicine: Anaesthesia.* Royal Society of Chemistry, Cambridge, 1998. pp 173-187. We are grateful to the Royal Society of Chemistry for permission to reproduce this material.

Simpson went up to Edinburgh University in 1825 (at the age of 14), and after two years at the classics moved over to medicine. (Figure 3) He nearly left in revulsion at the pain witnessed in a mastectomy conducted with no relief of the agonising pain, but managed to persist, qualifying MD in 1832. The Edinburgh medical school had the best of continental teaching systems and an international reputation, sending men to English universities, Dublin and the USA.[1] It had the Royal College of Surgeons of Edinburgh (founded 1505), the Royal College of Physicians of Edinburgh (founded 1681) and the Royal Medical Society (founded 1737). Simpson was appointed to the City Lying-in Hospital in 1836, and became Professor of Midwifery in 1840, having spent £500 in printing testimonials and advertising his claims in other ways. He was elected by the Town Council with a majority of one.

Simpson found himself much in demand in the area and established a flourishing practice. He devised an 'air tractor', or suction device to be applied to the foetal head to assist in difficult deliveries. What was new about his technique was the use of a brass air-pump to reduce the pressure. Though popular for some years it was long abandoned until returning in another form with the method of ventouse (1954).

Figure 2
Simpson statue in Princes Street

First experiments on pain relief

Simpson was greatly concerned with limitation of pain during operations. He had flirted (unsuccessfully) with mesmerism, and found that many patients were not susceptible to 'suggestion'. The news of ether anaesthesia reached Britain from the USA by late 1846 and it was first used in London at University College Hospital by Robert Liston for a thigh amputation on 21 December, and a few days later by James Miller at the Edinburgh Infirmary. Simpson responded enthusiastically and applied ether on 17 January 1847 for a complicated delivery (the mother but not the child survived). In words attributed to Liston: 'This Yankee dodge beats mesmerism hollow'.

This was the time when organic chemistry was emerging as a science, one result of which was the emergence of many new volatile chemicals. Simpson investigated a range of these in a series of self-experiments, usually at home. He tried the new 1,2-dichloroethane in 1847,[2] and also its analogue 1,2-dibromoethane (supplied by the Professor of Chemistry, Lyon Playfair). This was first administered to rabbits; they were anaesthetised, recovered, - and then died! Had Playfair not insisted on a preliminary trial on animals Simpson would probably have shared the same fate.[3] Several years later he was still experimenting, and wrote to the Manchester chemist Edward Frankland for a supply of 'hydruret of amyl', i.e. pentane.[4] He is known to have experimented with such diverse chemicals as ethyl nitrate, acetaldehyde and even carbon bisulphide.

First use of chloroform

Chloroform had been discovered in 1831 by Liebig and (independently) Souberain. Its formula was established by Dumas in 1835. Its use as an anaesthetic seems to have been suggested to Simpson by Dr David Waldie, a physician from Liverpool and also a chemist, who had used it in dilute ethanolic solution as an anti-spasmodic.[5] It was first tested by Simpson on himself and two medical colleagues at his home 52 Queen Street in the evening of 4 November 1847. (Figure 4) All three experienced 'an unwonted hilarity', followed by inebriation and collapse. A niece present fell asleep crying improbably 'I'm an angel!'.[6]

Simpson immediately ordered chloroform from a local manufacturer. Its successful clinical use was first reported in a paper six days later. It was easier to administer than ether, caused no irritation or excitement, and more readily maintained deep anaesthesia. Also, less of it was needed (as ether is so volatile), a consideration when heavy bottles had to be carried up tenement staircases. And, as Simpson specially stressed, chloroform was non-inflammable. The local manufacturers Duncan and Flockhart were soon retailing it at 3s.0d per ounce.[7]

The news spread like wildfire. By the next September chloroform was being used as far away as India, but it was in Edinburgh that it use first became routine practice. Within 28 months of Simpsons first announcement it had been employed in that city for between 80,000 and 100,000 successful operations.[8] Its final sanction may have come in 1853 with the birth of Prince Leopold to Queen Victoria, though that, as we shall see, is disputable.

However, human fatalities did occur. The first case, in 1848, was Hannah Greener aged 15 of Newcastle-upon-Tyne, in a minor operation (removal of toe-nail). At the post mortem: 'Sir John

Figure 3
Edinburgh University

Figure 4
52 Queen Street, Edinburgh

Fife blamed congestion of the lungs, which he was compelled to ascribe to the inhalation of chloroform'. It seems to have been only the first of many cases. However, Simpson was reluctant to admit dangers of chloroform. He knew nothing of possible damage to renal function, for example. With the benefit of hindsight we can see the propriety of his own rules for administering chloroform:

- absolute quietude and freedom from excitement;
- avoidance of a 'stage of exhilaration';
- waiting until the patient 'is thoroughly and indisputably soporised'.[10]

Nor were its subjects only humans. An early example from veterinary practice came with its successful application to a cantankerous horse at Rothesay.[11] Frankland, then working at Queenswood College, a strange progressive college in Hampshire became 'teetotally drunk' on chloroform in January 1848, and was using it two months later to anaesthetise a cow in difficulties after giving birth to a calf. In lighter mood *Punch* reported 'oysters opened and their beards taken off under the influence of chloroform', and that at Billingsgate eels were skinned under similar sedation![13]

Opposition to anaesthesia

Considerable opposition began to appear, even within one month of Simpson's first use of chloroform. It tended to focus on the use in midwifery rather than general surgery. One of the most familiar features of the traditional picture was the implacable opposition of the church. Many years after the events J W Draper put it like this:

> 'When the great American discovery of anaesthetics was applied to obstetrical cases it was discouraged, not so much for physiological reasons, as under the pretence that it was an impious attempt to escape from the curse denounced against all women in Genesis iii.16 [i.e., 'in sorrow thou shalt bring forth children'].'[14]

Almost 100 years later, another author gave another illustration of the same tendency:

> 'In the opposition to the Darwinian theory we can find a parallel illustrating the ferocity with which anything challenging Victorian ethical or religious beliefs was fought.'[15]

Yet as early as December 1847 Simpson had published a pamphlet.[16] His arguments were, broadly:

- That the primeval curse was not only upon Eve but also on Adam, to child-bearing and agriculture respectively; therefore relieving pain to the one case was comparable to eliminating weeds in the other.

- That under the Christian dispensation the moral necessity of anguish in labour has been terminated, for any such curse was abrogated by the death and sacrifice of Christ.

- That there was even a divine precedent for anaesthesia as when 'the Lord God caused a deep sleep to fall upon Adam' prior to removal of a rib to form Eve!

- That medicine is concerned not only to preserve life but also to alleviate human suffering, and that to do good in that sense was a positive Christian duty.

Whose objections?

So whose were 'the religious objections' to which Simpson refers? Some of the first objections that appealed to the Bible were voiced by colleagues in the medical professions. Thus G T Gream, obstetrician at Queen Charlotte's Lying-in Hospital, quoted an eminent theologian: 'perhaps unequalled in learning' (but unnamed) who regarded pain as 'a blessing of the Gospel'[16]. Robert Barnes (Lecturer in midwifery at the Hunterian School of Medicine) wrote of 'that wise and necessary purpose' associated with labour pains.[17] Robert Lee (Lecturer in midwifery at St. George's Hospital) complained of chloroform anaesthesia as a futile attempt to abrogate an ordinance of the Almighty: 'In sorrow thou shalt bring forth children'.[18]

These are all well-documented cases of 'religious' opposition, though it is noteworthy that all came from medical, not clerical men (and, be it noted, from men and not women). However the great bulk of subsequent commentaries on these events placed the burden of responsibility on aggressive clerics rather than on conservative medics. It stresses the purely religious objections to anaesthesia in midwifery. This is the generally accepted account circulating today.

At this point in my argument a personal note creeps in. Aware of the established view of intense religious opposition to the anaesthetic use of chloroform, I asked one of my research students, Derek Farr, to identify precisely the location of such opposition, looking for evidence in material produced in 1847 and the next few years. He sought first of all records of sermons and of the Acts of the General Assemblies of the two main churches in Scotland. Finding nothing significant he examined the theological press and then contemporary newspapers and journals in Britain and America. Again he largely drew a blank. Finally, letters and papers of Simpson himself and of others close to the controversy were examined.

As a result of an exhaustive enquiry[19] he emerged with the astounding result that *a purely religious criticism of Simpson's use of anaesthetics was virtually non-existent.* Of the seven references in print that were discovered, four were reviews of Simpson's own pamphlet (and favourable ones at that). The others were more general review articles expressing no religious qualms. The evidence, negative though it was, pointed dramatically to the possibility that we have all been led astray by inaccurate analyses and that the legend of persistent religious and clerical opposition to Simpson is just literally that. In reporting these results Dr Farr has challenged and demolished one of the most established myths of recent medical history.[20]

This revisionist view, that religious opposition was minimal, is at least partly confirmed by numerous cases of religious support for chloroform. The only publication on the subject in England was a tract by the obstetrician Protheroe Smith (founder of London's first Hospital for

Women). A staunch evangelical (like Simpson), Smith published a strong defence for anaesthesia based on biblical principles.[21]

A colleague of Simpson was James Miller, Professor of Surgery, and the first in Edinburgh to operate using ether anaesthesia. He explained to the theologian Thomas Chalmers: 'that *some* had been urging opposition to the use of anaesthesia in midwifery on the ground of it so far improperly enabling women to avoid part of the primeval curse'. Chalmers, prominent leader of the Secessionist movement and of the new Free Church, was at first unconvinced that he was serious. He then simply advised Miller and his friends to ignore 'small theologians'.[22] The Anglican minister Charles Kingsley wrote: 'It is a real delight to my faith, as well as my pity, to know that the suffering of child-birth can be avoided'.[23] In the opinion of a recent historian the appeal to Genesis etc: 'contrary to what might be supposed, was not particularly popular with the ministers of the church'.[24] That, if anything, is rather an under-statement.

Origins of a myth

We therefore have a major problem on our hands. How could such a tissue of falsehood and absurdity have become the received 'wisdom' of western culture in the last 125 years? Farr presents a list of 31 books in the century beginning 1873 alleging substantial religious objections to obstetric anaesthesia. Several others since then have perpetuated the same myth. How could they all make the same mistake? Several reasons suggest themselves.

1. *Confusion between theological and technical objections*

Admittedly a very few authors attempted to boost their scientific arguments by appeal to religious prejudice but that is very different from theological objection as such. It may be helpful to consider some of the non-religious but technical arguments put forward against chloroform anaesthesia in midwifery.

First was the view that it was '*unnatural*'. Thus C D Meigs, Professor of Obstetrics at Pennsylvania, opposed the use of chloroform but did not cite scripture. He argued chiefly that labour pains were a natural feature of childbirth, that patient response was supremely important, and that anaesthesia was comparable to alcohol in its dangers.[25] When an Irish lady addressed Simpson with the question: 'How unnatural it is for you doctors in Edinburgh to take away the pains of your patients when in labour', he rejoined: 'How unnatural it is for you to have swum over from Ireland to Scotland in a steam-boat!'.[26]

Then there was some anxiety that it could lead to *retarded delivery* (thus Gream). In the case of chloroform there was a real *danger of contamination* with substances like phosgene which could have lethal effects if inhaled. Finally, though this was more speculative, were concerns about *possible effects on unborn generations*. The chemist Sheridan Muspratt regarded the use of chloroform as 'most reprehensible' for that very reason.[27] Thus in fact 'the loudest and most persistent objections came not from the church, but from the members of Simpson's own profession'.[28]

2. *Confusion between theological and ethical objections*

Most remarkable was a fear that chloroform could induce sexual arousal. Gream quoted the case of a patient who 'drew an attendant to her to kiss as she was in the second state of narcotism'. There were other reports of erotic dreams which Tyler Smith said reduced the patient 'to the level of the brute creation'.[29] Even before Darwin, this phrase touched a raw nerve in Victorian society. The utterance of obscene or disgusting language gave further ammunition to the protesters, none more tellingly than the one who revealed his fear that 'delicate ladies will use language which it would be thought impossible they should ever have had an opportunity of hearing!'.[30]

These objections owed nothing to religion as such but everything to the ethics of prudery that were such a characteristic feature of Victorian society.

3. *Confusion between theological and institutional objections*

It has been pointed out that the argument at times smacked of the known rivalry between obstetricians and surgeons. It was supremely enshrined in the hostility between Simpson and Syme, the Professor of Clinical Surgery at Edinburgh. This spilled over in an incident in which both men disagreed violently after being called to a case by the family doctor: 'for a short time the most distinguished surgeon and the most distinguished obstetrician in Britain stood exchanging insults on the patient's doorstep'.[31]

More obvious was the well-known rivalry between London and Edinburgh. This was rooted in deep antipathies going back a long way, particularly between the English and Scottish Royal Colleges. There was some migration of English students to obtain a Scottish MD with minimal examination and no residence requirements (especially at St Andrew's). Thus on the appointment of Simpson's Edinburgh colleague, James Syme, as Professor of Clinical Surgery at University College, London, in 1847, the *Lancet* asked petulantly: 'When Scotchmen have any good offices to give away in Scotland, do they send to London for persons to occupy the vacant posts? No indeed!'.[32]

Then again Scottish *practice* was different. Thus in London Snow used an inhaler, while in Edinburgh Simpson poured chloroform on to an absorbent material such as a folded handkerchief, placed over nose and mouth. He was careful to check respiration as well as pulse. And in Scotland chloroform was a lot cheaper owing to the lower excise duty on the ethanol from which it was made. This institutional rivalry goes far to explain Simpson's difficulties without resorting to mythical categories of religious opposition.

4. *Confusion between actual and anticipated objections*

Simpson's own pamphlet looks much more like an attempt to head off suspected trouble in the future than a reaction to attacks in the past. It was issued *within one month of his first announcement*. No doubt there were rumblings of dissent among a few pious Scots but nothing remotely like an organised clerical opposition. Simpson's tract indicates not so much a virulent opposition as an over-sensitive worker trying to anticipate problems that might arise in the future. It was actually written in one day while recovering from influenza.

5. *Uncritical acceptance of unsubstantiated data*

To account for over 30 major books perpetuating this legend one needs to examine the detailed documentation and discover the authorities from whom the information was derived. It is a remarkable fact that nearly all statements until quite recently rely on those made by a previous generation of authors, most of whom reproduce the material from even earlier allegations, though without checking primary sources. To give but two examples, one writer of the 1960s reported that Simpson was 'inundated with abusive letters from cranks, from clergymen and from colleagues,[33] but gives not a single reference in corroboration. Most recently, perhaps, is a comment in a *The Daily Telegraph Saturday Supplement*, where we are informed that the use of chloroform 'immediately brought him into conflict with Calvinists who opposed such use in pain relief', and that it was he who 'persuaded the monarch to use chloroform for the birth of Prince Leopold', a move which 'silenced his critics'. Not only is this a tissue of unverified fiction but the obstetrician is simply 'James Young', without even the correct surname![34]

Many authors, if they bothered to identify their sources, could be seen to depend, directly or indirectly, on statements in a book now much discredited as a serious history and recognised as much more a polemical tract against organised religion. This is the notorious *History of the Warfare between Science and Theology* by A D White, first appearing in 1896 and still available in reprint form. White wrote:

> 'Simpson ... was immediately met with a storm of opposition ... From pulpit after pulpit Simpson's use of chloroform was denounced as impious and contrary to Holy Writ; ... he seemed about to be overcome.[35]

Close inspection of his remarks reveals just one reference to the early biography of Simpson of Duns which, though quoting letters between Simpson and various doctors, is silent on specifically clerical opposition (and indeed records the conversation between Miller and Chalmers mentioned above). White makes no distinction between opposition from theological sources and that on other grounds and, indeed, never even mentions Simpson's own pamphlet on the subject. His account is as one-sided and skewed as much of his other examples from 'history'.

6. *The myth of religious opposition fits well with the conflict thesis*

In fact, White's book, like another one by J W Draper,[14] is today acknowledged as a controversial manifesto masquerading as history. These two works are the chief literary manifestations of the now notorious 'conflict thesis' that posited religion and science locked in a state of more or less permanent warfare. Recent historical research has demonstrated not only the untenability of such a thesis but also located its origins in the efforts of the Victorian scientific community to attract public and government support and, in general, to keep its end up by crowing over the supposed triumphs of Darwinism over the church.[36] Towards the end of the nineteenth century there was something perilously near to a conspiracy that failed in most respects but succeeded in establishing an inaccurate view of history that has survived until very recently in the scholarly world and is still the staple diet of ordinary people nourished by the mass media. It is a salutary reminder of how easy it is to repeat uncritically concepts that fit well into an existing framework but are unsupported by empirical data, whether in the laboratory or the library. The real challenges to James Young Simpson, and his responses to them, are as important for our understanding of the complex relationships between science and Christianity as they were for the rise of medical anaesthesia.

Postscript

Of Simpson himself little more needs to be said. He pursued a parallel career as Professor of Antiquities at the Royal Scottish Academy. He received a baronetcy in 1866, and died four years later, full of honours, where his civic funeral in Edinburgh was watched by up to 80,000 citizens. Far from abandoning a Christian faith in old age he pursued it with renewed energy after an experience in the religious revival of 1859. Rarely can medicine and Christianity have been seen more in harmony and less in conflict.[37]

References

1. Shepherd JA. *Simpson and Syme of Edinburgh*. Edinburgh: Livingstone, 1969; 9-13.
2. Duns J. *Memoir of Sir James Y Simpson*. Edinburgh: Edmonston and Douglas, 1873; 231.
3. Simpson M. *Simpson the Obstetrician*. London: Gollancz, 1972; 126.
4. Simpson J to Frankland E, 30 January 1856. *Open University Microfilm 01 02 0230*, Raven Frankland Archives.
5. Shepherd J. *op.cit*; 91-93.
6. Gordon L. *Sir James Young Simpson and Chloroform (1811-1870)*. London: T Fisher Unwin, 1897; 106-108.
7. Duns J. *op.cit*; 215.
8. Simpson M. *op.cit*: 140, 149.
9. Youngson AJ. *The Scientific Revolution in Victorian Medicine*. London: Croom Helm, 1979; 79-82.
10. *Ibid*; 83.
11. Simpson M. *op.cit*; 138-139.
12. Frankland E. Diary, 23 January and 11-12 March 1848. *Open University Microfilm, 02 02 1304 and 1484*, Joan Bucknall Archive.
13. *Punch*. January-June 1848; 78, 87.
14. Draper JW. *History of the Conflict between Religion and Science*. London: HS King and Co. 1875; 318-319.
15. Shepherd J. *op.cit*; 98.
16. Simpson JY. *Answer to the Religious Objections advanced against the Employment of Anaesthetic Agents in Midwifery and Surgery*. Edinburgh: Sutherland and Knox, 1847.
17. Gream GT. Observations on anaesthesia in midwifery. *Lancet* 1848; **1**:228-229.
18. Barnes R. Anaesthesia in natural parturition. *Lancet* 1850; **2**:39-42.
19. Lee R. An account of seventeen cases of parturition in which chloroform was inhaled with pernicious effects. *Lancet* 1853; **2;**608-611.

20. Farr AD. *Medical Developments and Religious Belief.* Ph.D.Thesis, The Open University, 1977.
21. Farr AD. Early opposition to obstetric anaesthesia. *Anaesthesia* 1980; **35**:896-907. Religious opposition to obstetric anaesthesia: a myth? *Annals of Science* 1983; **40**:159-177.
22. Smith P.*Scriptural Authority for the Mitigation of Pains in Labour.* London: Highley,1848.
23. Duns J. *op.cit*; 260.
24. Letter 15 June 1852. Kingsley C to Lord ----. In: *Charles Kingsley, his Letters and Memories of his Life.* London: King 1877; **1**:324.
25. Youngson AJ. *op.cit*; 101.
26. Youngson AJ. *op.cit*; 106-109.
27. Claye AM. The Evolution of Obstetric Analgesia. Oxford University Press, 1939; 17-18.
28. Muspratt JS. *Chemistry, Theoretical, Practical, and Analytical.* Glasgow: W Mackenzie, undated; **1**:471.
29. Simpson M. *op.cit*; 142.
30. Smith JT. The inhalation of ether in obstetric practice. *Lancet* 1856; **2**:321-323.
31. Smith JT. A course of lectures on the theory and practice of obstetrics. *Lancet* 1856; **2**:424.
32. Youngson AJ. *op.cit*; 65.
33. Editorial. New Surgical Appointment at University College Hospital. *Lancet* 1856; **2**:48-49.
34. Shepherd JA. *op.cit*; 99.
35. Anon. History of great inventions. *Daily Telegraph Saturday Supplement* 2000; **4**:12.
36. White AD. *A History of the Warfare of Science with Theology in Christendom.* London: Arco 1956; **2**:62-63.
37. Russell CA. The conflict metaphor and its social origins. *Science and Christian Belief* 1989; **1**:3-26.
38. Gardner R. A Christian physician's greatest discovery. *Journal of the Christian Medical Fellowship* 1992; **38**:5-8.

THE EARLY MANUFACTURE OF CHLOROFORM AND ETHER

Dr H A S Payne
Formerly Drug Registration Manager, Macfarlan Smith, Edinburgh

Introduction

Macfarlan Smith Ltd was formed by the amalgamation of several old Edinburgh pharmaceutical companies including T & H Smith (founded in 1836), Duncan Flockhart & Co (founded in 1820) and J F Macfarlan & Co (dating back to ca 1780 - as Moncrieff's Pharmacy). All three companies independently manufactured ether and chloroform and production only ceased at Macfarlan Smith Ltd itself around 1981.

The archives of the Company provide a useful source of information concerning the early developments of these drugs and the people who developed them, but first of all it is informative to look at the medical scene in Edinburgh at the beginning of the nineteenth century, when the constituent companies of Macfarlan Smith were being founded. The city was a much smaller place then than it is now. Members of the medical profession, who themselves had probably trained in Edinburgh were all acquainted with one another. They were also acquainted with the apothecaries, many of whom had taken the Diploma of the Royal College of Surgeons. This was certainly true of the companies named above.[1] At the meetings of the Royal Medical Society and Edinburgh Medico-Chirurgical Society both groups would meet and almost certainly exchange ideas.

T & H Smith[2]

Thomas Smith, the son of William Smith who owned a weaving business in Paisley, was born in 1807. He was educated at Edinburgh University and took the Licentiate of the Royal College of Surgeons. After qualifying he did not practise medicine but was far more interested in the therapeutic action of drugs, in particular in the active principals derived from plant drugs. He took over a pharmacy from his brother William in 1827 and set about establishing himself as an apothecary.

Henry Smith, who was three years younger than Thomas, followed in his brother's footsteps. He trained as a surgeon and in 1830 opened a pharmacy not far from his brother's premises. In 1836, he and his brother Thomas Smith joined forces and formed what was to be a very successful partnership. Henry dealt with all business matters and Thomas was responsible for all technical matters and for manufacture. Thus it was Thomas who devised a manufacturing process for morphine hydrochloride, based on William Gregory's original process, and later devised chloroform and ether processes.

J F Macfarlan[3]

John Fletcher Macfarlan was born in 1790, the son of Alexander Macfarlan, a teacher. His father apprenticed him to a druggist in Edinburgh, and later he took the Diploma of the Royal College of Surgeons. Like Thomas Smith, he was more interested in drugs than in surgery, and in 1825 he was fortunate to be able to take over John Moncrieff's pharmacy where he had trained. One of his principal products was laudanum and amongst his customers he numbered Thomas de Quincy. In 1830 he took on David Rennie Brown as his assistant.

Brown had been born in 1808 and had trained as a surgeon, eventually becoming a ship's surgeon. After one voyage, he retired from the sea and joined J F Macfarlan. He proved to be an extremely competent chemist and engineer and his practical skills contributed in large measure to the Company's success. He too developed a process for morphine hydrochloride.

In the days before chemical engineering and even large-scale glassware, much skill was needed to design and build equipment for drug manufacture. Both he and Thomas Smith became experts in this field.

Duncan, Flockhart & Co[3]

John Duncan was born in 1780, the only son of a country surgeon. In 1794 he was apprenticed to a druggist in the Lawnmarket of Edinburgh. He alone of those under discussion was not a surgeon. After working in London for a period, he opened a pharmacy in Perth. Later he returned to Edinburgh and fitted out a large shop on the North Bridge of the city in 1820. He had various early partners but William Flockhart was the most long standing and in 1836 the Company became 'Duncan, Flockhart & Co'. He was much involved with the Pharmaceutical Society and was the first chairman of the North British Branch.

William Flockhart was born in Kinross in 1808. He was one of John Duncan's apprentices before going on to study medicine and surgery. At the age of 22, he became a Licentiate of the Royal College of Surgeons. A man of boundless energy, he was well known in the city and maintained his contacts at Surgeons Hall. He was also a leading member of the Pharmaceutical Society and very successfully managed the retail side of the business.

Chloroform - Waldie's involvement

Whilst the events leading up to the evening of 4 November 1847 are well documented.[4,5] some details from the archives can now be added. There is no doubt that on a visit to Edinburgh in October 1847, David Waldie suggested to Simpson that he try chloroform as a substitute for ether.[6] They had been fellow students together and if not close friends they were probably more than acquaintances. David Waldie[7] had been born in Linlithgow in 1813. He had trained as a surgeon and gained his Diploma in November 1831. Although two years younger than Simpson, he had attended several classes with him. After qualifying, he practiced medicine and pharmacy in Linlithgow for some 9 years and carried on his chemical researches. The house in which he was born and later practised medicine is still standing and bears a commemorative plaque erected on the centenary of his birth. Eventually he decided to give up his medical practice and devote himself to pharmacy.

In 1840, he took up an appointment at the Liverpool Company of Apothecaries where he later became the chief chemist. Not long after beginning his new job, he received a prescription for chloric ether from Dr Richard Formby, a physician at Liverpool Royal Infirmary. The preparation was being used as an antispasmodic. The drug was prepared by the method of the US Dispensatory and comprised a solution of chloroform in spirit. The USD of 1889[8] describes this as a 6% solution of chloroform but in a footnote suggests that early chloric ether contained one third of chloroform by volume. The product proved to be inconsistent and often had a disagreeable taste. Waldie succeeded in isolating pure chloroform and dissolved it in the appropriate volume of alcohol to give a greatly improved preparation. During Waldie's meeting with Simpson, he had mentioned chloric ether and its use, but he told Simpson that he felt that chloroform was a more likely candidate. He also agreed to prepare some for Simpson after his return to Liverpool. Unfortunately, during Waldie's absence, his laboratory had been burnt down and he was in no position to fulfil his obligation.

Without advising Simpson, he seems to have let the subject drop. In 1850 Waldie went to India and founded the company which became 'D Waldie & Co'. There he remained until his death in 1889. He is commemorated in Calcutta as a founder of the Indian chemical industry.

The sourcing of chloroform

Simpson continued his search for an ether replacement, in particular for chloroform, and his two assistants - Drs Keith and Duncan - helped in the search. Myrtle Simpson[5] tells us that many of the compounds tested came from Professor William Gregory's laboratories, and reports that Dr Duncan had returned from there one day with many volatile liquids, including chloroform.

The presence of chloroform in Gregory's laboratory comes as no surprise. During 1835, Gregory had worked in the laboratory of Liebig at Giessen. In 1832, Liebig had independently discovered chloroform and called it perchloride of formyl. No doubt Gregory had made some on his return. Dumas later characterised the substance and renamed it chloroform.

Simpson had also received a small sample of chloroform from Mr Hunter of Duncan Flockhart (about 14ml). Simpson had sniffed the sample on arrival and it had then been put aside as unpromising. As the amount available seems to have been inadequate for the various trials which were said to have taken place that evening, I would like to suggest that it was more likely that Gregory's sample was the one found in the wastepaper basket on the night of 4 November 1847 and which was used in the original trial session. This proposal has also been put forward by Ramsey[9] of T & H Smith.

We know that Hunter did make more chloroform for Simpson but the scale remained small and there were problems with quality. Gregory himself later became involved with chloroform quality, publishing a paper on the subject in 1851.[10]

Additional information comes from W F Martin's unpublished *History of T & H Smith*,[2] where Martin relates events told to him by Mr Dey, an assistant to Dr Thomas Smith. Dey stated that Simpson had first asked Thomas Smith to manufacture chloroform. Smith was busy improving his morphine process but reluctantly set about making chloroform. Only a small amount was produced and much less than Simpson had asked for. Smith, however, lacked interest and told Simpson that no more time could be spared and telling him to go back to Duncan Flockhart.

The manufacture of chloroform

Hunter's initial problems may have arisen because of the quality of the spirit or the chloride of lime. At any rate they were overcome sufficiently for Duncan Flockhart to supply the initial demand for chloroform. For a time, pure spirit was used and this seems to have worked successfully. In 1851 Duncan Flockhart exhibited chloroform at the Great Exhibition and for it they received a gold medal.

John Macfarlan had not been asked by Simpson to supply chloroform. The two were well acquainted, however, and Simpson had a grievance with Macfarlan which still rankled. Macfarlan was a member of the City Council that had elected Simpson to the Chair of Midwifery and he had felt that Simpson was too young at 29 for the position, more especially as he was unmarried. Simpson soon remedied the latter failing, but nonetheless Macfarlan voted against him.[11]

Macfarlan, however, recognised a good product and soon David Rennie Brown had converted an existing ether plant to produce chloroform. Brown is also credited with the first addition of ethanol to chloroform as a stabiliser. Later his son (who succeeded him at J F Macfarlan) introduced a method of vacuum distillation.

There is correspondence[12] in the archive between Dr C R A Wright of St Mary's Hospital, Paddington and D B Dott of Macfarlan's. Wright, in reply to Dott, deals with the determination of the level of methanol (derived from methylated spirits) in chloroform using calcium chloride. The correspondence shows the concern of the company to ensure that the chloroform was of high quality. Wright and Dott corresponded on several topics including diamorphine, many years before Bayer's heroin appeared.

Thomas Smith, realising that he had lost out to Duncan Flockhart and to J F Macfarlan, soon turned his attention to chloroform and manufacture began in 1848. T & H Smith manufactured until well into the 20th century and they installed new plant in 1944. In 1890, acetone was introduced by Smith's as a replacement for alcohol; however some chloroform continued to be made from spirit.

The Crimean and Franco-Prussian Wars created a demand for chloroform much of which came from the Edinburgh Companies. Simpson himself paid for a supply of 1000 doses to go to Florence Nightingale.[5]

Ether - The news comes to Britain

News from Boston of the use of ether arrived on board the paddle steamer *Acadia* which docked at Liverpool on 16 December 1846. It carried a letter to Dr Francis Boott, in London, from Dr Bigelow who had been present at the Ether Dome during the famous demonstration. On 19 December 1846 Dr Boott administered ether to one Miss Lonsdale during the successful extraction of a lower molar. In Dumfries on the afternoon of the same day, Dr William Fraser, who had been ship's surgeon on the *Acadia*, assisted Dr William Scott who performed an amputation also under ether anaesthesia. Baillie in his book *From Boston to Dumfries*[13] suggests that Fraser had been present at the Ether Dome but this may not have been the case. The operation was not a success.

More importantly, on 21 December 1846, after receiving a note from Boott, Professor Liston of University College, using ether, carried out the amputation of the lower right limb of a Harley Street butler one Frederick Churchill.[5] Simpson, who was keen to try this new drug, visited Liston just after Christmas. There he received a first hand account of the procedure and he himself used ether on 19 January 1847 to assist childbirth. Its benefits were obvious and a local source of the drug was urgently required.

The manufacture of ether

Records of the early manufacture of ether in Edinburgh are sparse but we know that it was manufactured before chloroform i.e. in 1847. The first description is by D B Dott[14] of the J F Macfarlan process of about 1860:

> The ether house contained a number of lead stills heated by gas rings. These were charged with sulphuric acid and spirit was added to them. The temperature was raised and the ethyl hydrogen sulphate, so formed, reacted in turn with more spirit to give diethyl ether. The product was distilled off through a worm condenser which passed through the wall of the building and the receiver for the crude ether stood outside. Both receiver and condenser were made of copper. At the end of the distillation, the two men who operated the stills would carry the receiver to the still room. For the second distillation a heating jacket was used but there is no description of it. It was likely to have contained hot water or possibly hot sand.

Later Macfarlan's built a second series of stills heated by coke or coal. A spirit store was also erected on the railway embankment which consisted of lead-lined wooden casks.

Macfarlan's high quality ether was vouched for by Dr Thomas Keith at Edinburgh Royal Infirmary and it was soon known as 'Keith's Ether'. This became his anaesthetic of choice; he wrote a paper on its use and promoted it everywhere he went. Curiously enough, it was made from an inexpensive grade of methylated spirits and was quite a profitable product.[15]

The only information we have of Duncan Flockhart's manufacture, is their process of 1946.[16] Lead lined stills were used. During the distillation, the ether was passed through two traps to remove traces of sulphuric acid. Subsequent fractionation separated any ethanol from the ether and after a further purification stage (not described) the ether was dried and redistilled.

Of the T & H Smith process we also know little. It was doubtless similar to the processes described above. We do know, however, that in 1851 Thomas Smith was using a mixture of spirit and ether to prepare cantharidin solutions[2] for the manufacture of blistering papers.

The end of manufacture

Ether and chloroform continued to be produced until 1981. As mentioned earlier, crude ether and chloroform were by that time being bought in from other suppliers. Only the purification was carried out at Macfarlan Smith. Africa was probably the only real market that remained and shipping ether to Africa was always difficult. Since it was explosive it had to travel as deck cargo and by the time it got there, there was often very little left in the bottles.

In conclusion, one may suggest that the early development of inhalation anaesthesia owes much to a group of Scottish doctors, surgeons and surgeon-apothecaries trained in the Royal Colleges and the Medical School of Edinburgh. This is particularly the case with chloroform where Simpson was able to rely on local companies to produce the required drug. The use of these anaesthetics lasted for over 100 years until they were gradually replaced by modern, safer substitutes.

These original companies survive today in the form of Macfarlan Smith Ltd which still manufactures the ancient remedies of morphine and codeine but also more recent drugs such as fentanyl, alfentanyl and sufentanyl. Quality, as always, remains the prime concern.

References

1. Blackden S. *A Tradition of Excellence - A Brief History of Medicine in Edinburgh*. Edinburgh: Duncan, Flockhart & Co. Ltd., 1981.
2. Martin W F. *The History of T & H Smith*. Unpublished manuscript, 1952.
3. Worling P. Personal communication.
4. Simpson E B. *Sir James Y Simpson*. Edinburgh and London: Oliphant, Anderson and Ferrier, 1896.
5. Simpson M. *Simpson the Obstetrician - A biography*. London: Victor Gollancz Ltd., 1972.
6. Waldie D. *The True Story of the Introduction of Chloroform into Anaesthetics: being the original account given of it in 1847; and a re-statement in 1870 with remarks by G Waldie*. Linlithgow: George Waldie and Edinburgh: Oliver & Boyd, 1870.
7. Anon. Waldie Memorial at Linlithgow – A Pioneer in Anaesthetics Research – Tablet to be erected. *The Scotsman* 1913; 28 February (?).
8. Wood H C, Remington J.P, Stadtler S.P, eds. 17th ed. *The Dispensatory of the United States of America*. London: Charles William Deacon & Co. 1889.
9. Ramsey J H. *An Edinburgh Enterprise – Fine Chemicals and Pharmaceuticals*. Presentation to Edinburgh Chamber of Commerce and Manufacture. Unpublished. January 1953.
10. Gregory W. Notes on the purification and preparation of chloroform. *Proc Royal Soc.* Edinburgh 1851: 2: 316.
11. Reid K C. *The Macfarlan Smith Company. A brief review of its origins*. Unpublished manuscript. 1988.
12. Wright C R A. Correspondence with D B Dott. Unpublished letter 5 March 1875.
13. Baillie T W. *From Boston to Dumfries - The First Surgical Use of Anaesthetic Ether in the Old World*. Dumfries. 1966.

14. Dott D B. *J F Macfarlan & Co.* Edinburgh & London. Manuscript. 1935.
15. Gray J. Memo to D R Brown dated 6 September 1941.Unpublished.
16. Anon. *The History of Duncan, Flockhart & Co. Commemorating the Centenaries of Ether and Chloroform.* Duncan, Flockhart & Co, London and Edinburgh. 1946.

Archival material

Much of the archive takes the form of internal letters and memoranda, few of which are dated. Authors can be frequently identified only by their handwriting. Two of my predecessors, W F Martin and K C Reid, have collated much of the information and have dated items where possible. It is the dates assigned by Reid which I have used when no other date was available.

THE HISTORY OF IMPURITIES IN INHALATIONAL ANAESTHETIC AGENTS

Dr D Zuck, Past President, History of Anaesthesia Society

The first general anaesthetic administered in England for a surgical operation was on Monday, 21 December 1846, at University College Hospital, in Gower Street. The surgeon was Robert Liston, the anaesthetic diethyl ether, and fortunately all went smoothly. Liston, as the reports have it, was very enthusiastic about what he called 'this Yankee dodge'. But, as the late Richard Ellis, an outstanding historian of the period, pointed out, within a short time there had been a sufficient number of failures to anaesthetise patients, or for the induction to take such an interminably long time, for Liston to consider abandoning general anaesthesia.[1] Since he could amputate a leg in 30 seconds, why should he have to wait perhaps for as long as half an hour, before he could start this brief operation? In his case this reaction is understandable, but unwittingly he was the prototype of the sort of impatient surgeon that the older anaesthetists among us will remember from the days when inhalational inductions were routine - devoid of any knowledge of physiology, and completely unable to understand that it took time to induce general anaesthesia to the required depth, to get the patient to breathe the highly irritant ether, and to build up an adequate partial pressure in the blood and the brain.

Dick Ellis credited John Robinson, the dentist who administered the first ether anaesthetic, with persisting until general anaesthesia became accepted, but surely the credit really belongs to the man who became the first specialist anaesthetist and laid the scientific foundations of the specialty, John Snow. Snow directed attention to the inadequacy of the vaporizers in general use, being made of glass, a poor conductor of heat,[2] and to the narrowness of the bore of the tubing the patient was required to breathe through. Also he pointed out the importance of using ether of the highest purity. In many cases failure to anaesthetise could be attributed to the use of ether contaminated with alcohol, and in his monograph published in September 1847 he devoted two pages to this subject.[3] He pointed out that the presence of alcohol would alter both the boiling point and the specific gravity of the liquid, and also what he called the elastic force of its vapour at all temperatures, by which he meant what we call today its saturated vapour pressure. He described how the alcohol could be removed by shaking the ether with twice its volume of water, letting it stand for a few minutes to allow the ether to separate as a layer at the top, then decanting this, and leaving the alcohol in the water below. Some ether would be lost in the water, and some water would remain in the ether, but he thought this latter an advantage, because it made the vapour more bland and less irritating.

Tests for purity: the Government Chemist

So very early on, the importance of purity, and some physical tests for contamination, were being set out. These physical tests went back a long way. Towards the end of the 17th century the French physicist Guillaume Amontons showed, using his improved version of Galileo's thermometer, that the boiling point of water was constant, and Fahrenheit, a little later, using his mercury in glass thermometer, extended this observation to other liquids. Specific gravity, of course, goes back to Archimedes, in the 3rd century BC, and the hydrometer possibly to the 5th century AD. By the second half of the 1840s the hydrometer was being used intensively in the newly established Department of the Government Chemist.[4]

When I first came to know about this Department, which was established in 1842, and accommodated for some years in Somerset House, and with John Snow's work on cholera at the back of my mind, I naively assumed that it had been set up to monitor the cleanliness of drinking water and the purity and safety of foods, but I was soon disabused. In the words of the authors of the most excellent history of this Department, cheating the public, by the adulteration of foods, is one thing, but defrauding the Revenue is quite another. The real purpose of the Department was to detect various scams, relating, among other things, to what was called 'drawback,' whereby duty paid on imports such as tobacco or spirits was refunded on export. Since the drawback was calculated on bulk, handsome profits could be made by dilution or adulteration. The Department, or Laboratory of the Government Chemist as it became, is mentioned because of one or two tangential contacts with the history of anaesthesia.

Before 1855, all spirits of any kind, home-distilled or imported, and used for whatever purpose, were liable to duty. This made certain British alcohol-based products uncompetitive as against those manufactured abroad then imported duty-free, and in 1853 a British manufacturer applied for permission to use spirit for industrial purposes, free of tax. The Government Chemist, George Phillips, a remarkable man, an excise officer who became a self-taught chemist and grew with the job, was asked to look into the possibility of rendering alcohol undrinkable yet suitable for manufacturing use, and, to cut a long story short, he came up with methylated spirits. The significance of this for anaesthesia we shall see shortly.

The other involvement of the Government Chemist, around the late 1880s, even more tangential, was to advise on the widespread practice of ether drinking in Ireland.[5] This practice had originated among those who had signed an abstinence pledge and wished, since ether was not an alcohol, to get drunk with a clear conscience. Also, with a government clamp-down on illicit distilleries, it provided the best substitute for poteen. It is reported that a member of the Laboratory's staff consumed some ether and confirmed that it did cause intoxication. As a result, in 1890 ether was classified as a poison under the Sale of Poisons (Ireland) Act of 1870.

Returning to John Snow, consistency in the physical properties of the ether he was using had for him another importance. Within three weeks of witnessing his first anaesthetic, which was on 28 December 1846, he published a paper in the *London Medical Gazette* asserting that it was as important for the administrator to know how much anaesthetic the patient was getting as it was with the dosage of any other medicament, and he offered a method of determining this. He produced a table showing the uptake of ether at different temperatures into a constant volume of air, and his idea was to peg the maximum concentration by fixing the vaporisation temperature, then to lower the concentration of the inhaled mixture as necessary by admitting additional air. Within one more week he produced his first vaporiser, a small metal chamber, with a breathing tube, non-return valve, and mouthpiece. The ether chamber was immersed in a basin of water at the chosen temperature, and the vapour could be diluted by rotating the collar on the ferrule near the mouthpiece, to open or close an air hole. Close reading of Snow's paper shows that initially he derived his table from a paper by Andrew Ure of 1819, which itself was derived from one produced by John Dalton. Dalton, from his meteorological studies, originated the idea of saturated vapour pressure, and it is surprising to find that he had published a table that included the SVP of ether as early as 1808.[6] He also went to great lengths to specify the physical properties of pure ether, and suppliers from whom it could reliably be obtained.

So John Snow's modus operandi depended on the purity of his ether, and at first he described only physical tests. Later, when writing about chloroform, which within a year almost completely displaced ether until the 1870s, and amylene, which he used for a short while in the mid-1850s until he had a death, he described chemical tests also for what he called adulterations. Litmus paper would demonstrate the presence of hydrochloric acid, and barium nitrate that of sulphuric acid by the precipitation of barium sulphate. Such chemical tests were not new to him. It has recently been discovered from some writings of one of his brothers, that from the age of nineteen John Snow distilled, and tested chemically for impurities, every drop of water that he drank during the rest of his life. Obsessed may be a strong word, but it seems likely that his later work on the role of water in the communication of cholera, was influenced by this practice.

Preparation of ether

Diethyl ether was prepared by reacting ethyl alcohol with sulphuric acid. In effect a molecule of water was removed from two molecules of alcohol, which combined to produce the ether. So among those disadvantaged by the duty on alcohol were the pharmaceutical houses that manufactured ether. But ether could also be prepared, by the same reaction, from industrial alcohol, or methylated spirits, though of course it would contain derivatives of the methyl alcohol in the 5% wood naphtha which was added to render it duty free. These derivatives included methyl ether and methyl-ethyl ether. These had a lower boiling point and specific gravity than diethyl ether, so the so-called 'methylated ether', compared with the ether prepared from pure alcohol, was similarly disadvantaged. But ether prepared from meths was one third the price of that prepared from pure alcohol, and the effectiveness and safety of one compared with the other was a large bone of contention among anaesthetists for many years.

It was recognised that what was called ether-meths might contain impurities that would not be present in ether pure, and by the end of the 19th century the anaesthetics textbooks, in succeeding editions, were emphasizing more and more the importance of impurities in both ether and chloroform, and devoting several pages to tests for them. Buxton, of University College Hospital, in his textbook, devoted three pages, and Hewitt, the other principal figure, who anaesthetised Edward VII for drainage of his appendix abscess, in his, spent four pages on ether impurities alone. Buxton listed seven different pharmacopoeal preparations of ether, two prepared from rectified spirit and five from methylated,[7] which were distinguished within each group by their specific gravity. Hewitt specified ether purificatus, prepared from pure rectified spirit, specific gravity between 0.72 and 0.722, and rectified ether, manufactured from meths, specific gravity 0.72, as suitable for inhalational anaesthesia.[8] In anaesthetic ether it should not be possible to smell any foreign odour, it should evaporate without leaving either a smell or a residue, and it should be tested for, and be free from, water, free acid, aldehydes, notably formaldehyde and acetaldehyde, and peroxides.

Hewitt himself used methylated ether. He circularised all the London anaesthetists, and got 53 replies, which must have been a very high percentage, as there were probably not many more than 100 specialist anaesthetists in the whole country at the time. Of the 53, 14 used ether purificatus only, 28 used methylated ether, and 11 used both. Hewitt was convinced that with proper preparation methylated ether was indistinguishable in its action and after-effects from that prepared from dutiable spirit. He went on to say, with what has a very contemporary ring, that representations about the inexpediency of taxing such drugs as ether and chloroform to the extent of 200% of their value had been made to the Chancellor of the Exchequer, but in vain. It took nearly another twenty years, the price of ether pure having become prohibitive, before the Board of Customs and Excise allowed the use of duty-free ethyl alcohol for the manufacture of anaesthetic ether.

Storage

Of course it was recognised that impurities could arise during storage as well as during manufacture, and measures to minimise predisposing factors included storage in dark, conventionally brown, bottles for ether, green for chloroform, or in cans plated inside with copper for its anti-catalyst action. Other additives suggested included hydroquinone. The delivery tube and cowl of the Boyle's bottle, the vaporiser on the standard anaesthetic machine until recently, was made of copper, and the reason for the difference between this and the chromium plated one used for chloroform or trichlorethylene was a regular catch question in the examination; and it can be stated from personal experience that the tests for impurities in ether and chloroform were still basic knowledge required from candidates for the specialist qualification, the Diploma in Anaesthetics, at the end of the 1940s.[9] Peroxides were tested for by shaking the ether with a 10% aqueous solution of potassium iodide; even 5 parts per million would turn it yellow. For aldehydes, a yellow colour would be produced immediately with Nessler's solution. Julius Nessler (1827-1905) was a German agricultural chemist. He described his solution, which provides a sensitive test for free or bound ammonia, in 1852. Presumably it worked also for aldehydes, since the information is referenced, and repeated in successive editions.

Nitrous Oxide

We know from his writings that Humphry Davy was alert to the impurities that might be present in the nitrous oxide he was preparing from ammonium nitrate, and that he was also aware of the need to limit the temperature to which he heated it. He identified nitric oxide, which he called nitrous air, as a contaminant, and recommended that it be removed by bubbling through a solution of ferrous sulphate.

When nitrous oxide was introduced into the UK as an anaesthetic agent in the late 1860s it was for several years prepared on the site of administration, using a generator of one sort or another, Sprague's, SS White's, or Ash's.[10] All of these had a train of wash bottles, containing water, ferrous sulphate, and potassium hydroxide, through which the gas was bubbled. When compressed liquefied gas became available in cylinders in the early 1870s, the main anxiety was not about impurities, but that the cylinder might explode. Hewitt, in his textbook, around the turn of the century, drew attention to the danger of impurities, and there were one or two deaths under anaesthesia where the possibility of contamination was invoked.

In the US there were large hospitals where nitrous oxide was generated on site up to about 1920, and occasionally suspicion was expressed that respiratory complications in small clusters of patients were due to impurities, especially ammonia; the importance of using pure ammonium nitrate was stressed. In the UK the British Oxygen Company (BOC) built a new plant in Wembley, opened in 1925, to produce specially pure and dry nitrous oxide for use as an anaesthetic. Until the start of World War 2 every nitrous oxide cylinder bore a guarantee of the purity of its contents. Water had been a problem for many years; it caused cylinder valves to freeze and impede the flow of gas, and it was not unknown for a small lighted spirit lamp to be hung next to the valve to keep it from freezing up, even when ether was the main anaesthetic agent.

Contaminated cylinders

For some forty years BOC supplied cylinders of pure nitrous oxide without mishap. Then one morning in September 1966, at Bristol General Hospital, a woman aged 39 was anaesthetised for a hysterectomy. After a routine induction she was being ventilated with a standard mixture of nitrous oxide and oxygen, the nitrous oxide coming from a previously unused cylinder. Within three minutes it was observed that she was slightly cyanosed, so the oxygen percentage was increased; but her condition continued to deteriorate, and after six minutes the cyanosis had deepened, was not improved by ventilation with 100% oxygen, and she looked very ill. Her blood pressure was 75/60, pulse 90. Coronary thrombosis or pulmonary embolism was suspected, and it was thought advisable not to allow her to regain consciousness, especially since she was fully curarised, but to investigate by ECG and chest X-ray; so she continued to be ventilated with 50% nitrous oxide and oxygen. Some blood was taken, which looked distinctly brown. An hour and three quarters after the start of the anaesthetic she was sent to the X-ray department and ventilated from a different machine.

The next patient on the list was sent for, and after the same routine induction she immediately started to become cyanosed. At this point the anaesthetist realised that he was dealing with poisoning of some sort, so the nitrous oxide was turned off and another machine was sent for, from which she was ventilated with 100% oxygen. Blood was taken, and the laboratory was asked to examine the blood of the first patient also for abnormal haemoglobin. The report came back quickly, that both specimens contained methaemoglobin, a form of haemoglobin in which the iron has been oxidised from the ferrous to the ferric form. This results in a change in colour from red to brown, and of the absorption spectrum, and a marked shift of the oxygen dissociation curve to the left, so that the blood ceases to function as a reversible oxygen carrier. An intravenous injection of 10 ml of 1% methylene blue, a powerful reducing agent, to both patients turned them bright pink within 90 seconds,[11] and the second began to improve, her blood pressure rising to normal. Apart from some hours of mild respiratory distress she made an uneventful recovery. The first lady, who had been ventilated for much longer, was transferred to the Intensive Care Unit, but she developed pulmonary oedema, her lungs became increasingly difficult to inflate, and she suffered an irreversible cardiac arrest. The reporting of these cases led to reassessment of a post-operative death that had occurred at Plymouth two days earlier, a doctor aged 64, in whom the cyanosis and pulmonary complications had been attributed to a medical complication, but were now recognised to be the same in origin as the cases in Bristol.[12]

Investigations

All the drugs that both Bristol patients had received were investigated by the manufacturers, and BOC quickly reported distinct contamination of the nitrous oxide by higher nitrogen oxides, notably nitric oxide. Those in practice at that time will remember that all the nitrous oxide cylinders throughout Southern England were withdrawn, because there was no way of determining at which depot, and during which day and shift, any cylinder had been filled. In all, 16,400 cylinders were removed and tested, and some 250 were found to be contaminated. It was nearly a fortnight before normal supplies were restored, and during that time anaesthetists tried to keep the service going with local, regional, and spinal methods. With admirable speed BOC introduced a labelling system that showed at which depot, and during which day and shift, every cylinder had been filled, so avoiding the need for wholesale withdrawal in the event of a batch failure in the future.

Eight months later the *British Journal of Anaesthesia* devoted a whole issue to the event.[13] This included a detailed account of the two cases, and reports based on a research programme carried out at Leeds. Among these were papers on the chemistry of the higher oxides of nitrogen, and their effects on the dog. Primarily this was the very rapid formation of methaemoglobin, the absorption of only 200 cc of the higher oxides, which come off first when the cylinder is opened, being all that was required to convert 95% of the haemoglobin. A parallel was drawn between the combination of carbon monoxide with haemoglobin. Also there was damage to the mucosa of the tracheo-bronchial tree, and the development of broncho-pneumonia which bore similarities to the acid aspiration syndrome, and was attributed to the formation of nitrous and nitric acids from the solution of the nitrogen oxides. Older anaesthetists will remember that before piped gases became universal it was the practice to open nitrous oxide cylinders and blow them off for a few seconds before connecting to the anaesthetic machine.

BOC traced the source of the impurities to a two-hour period of overheating of the ammonium nitrate. This, because of the combination of system failures that are typical of such catastrophes, failed to be detected. An indicator solution had been incorrectly prepared, and a back-up electronic device was defective.[14] Against the background of this tragedy, the subsequent discovery of the role of nitric oxide as a physiological transmitter, and its growing therapeutic use, was more than a little unexpected.

References

1. Ellis RH. Early Ether Anaesthesia - the Enigma of Robert Liston. In: Barr AM, Boulton TB Wilkinson DJ, eds. *Essays on the History of Anaesthesia*. London: RSM Press, 1996; 23-30.
2. Zuck D. The physics of heat and vaporization - its history and application to the design of anaesthetic vaporizers. *CPD Anaesthesia* 1999; **1**:88-93.
3. Snow J. *On the Inhalation of the Vapour of Ether*. London: Churchill, 1847.
4. Hammond PW, Egan H. *Weighed in the Balance - a History of the Laboratory of the Government Chemist*. London: HMSO, 1992.
5. Strickland RA. Ether drinking in Ireland. *Mayo Clinic Proceedings* 1996; **2**:1015.
6. Dalton J. *A New System of Chemical Philosophy*. 1808 (Reprint) London: Peter Owen, 1965; 11.
7. Buxton DW. *Anaesthetics: Their Uses and Administration*. London: HK Lewis, 4th ed. 1907; 116-118.
8. Hewitt FW. *Anaesthetics and their Administration*. London: Macmillan, 4th ed. 1912; 21-25.

9. Hewer CL. *Recent Advances in Anaesthesia and Analgesia*. London: Churchill, 2nd ed. 1937; 45.
10. Smith WDA. *Under the Influence*. London: Macmillan, 1982; 130-134.
11. Goodman LS, Gilman A. *The Pharmacological Basis of Therapeutics*. New York: Macmillan, 2nd ed. 1958; 1116-1117.
12. Annotation. Impure nitrous oxide. *Lancet* 1966; **2**: 628.
13. Symposium on the higher oxides of nitrogen. *British Journal of Anaesthesia* 1967; **39**.
14. Annotation - Nitrous oxide. *Lancet* 1966; **2**:739.

CHEMICAL AND CLINICAL RESEARCH IN THE EARLY DEVELOPMENT OF INTRAVENOUS ANAESTHETICS

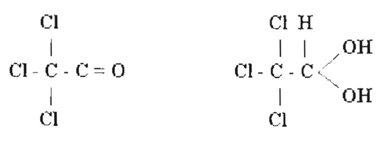
Dr F E Bennetts
Retired Consultant Anaesthetist, Medway District, Kent

This brief review is intended to acknowledge some at least, of the achievements of industrial and academic chemists of the late 19th and early 20th centuries - as well as those of our medical forebears - in bringing new, safe and satisfactory intravenous agents to clinical practice. A vital factor in the early stages of this progress was the parallel development of syringes and other apparatus for its administration - but that is a subject in its own right!

It was quickly realised, even during the very earliest days of anaesthesia - the 1840s - that inhaled drugs had to be carried from the lungs to the brain by the circulation and that it might be advantageous to short-circuit the system by injecting the active agent directly into the bloodstream. This would avoid the obvious difficulty of introducing irritating vapours into the respiratory tract. Effective intravenous anaesthesia, however, took a surprisingly long time to appear, but during the late 1800s and early 1900s attempts were made using the existing agents, opiates, ether and chloroform. Opiates (and opioids), so important to today's anaesthetists, were abandoned due to the prolonged respiratory depression they produce, but trials in continental centres and in Britain, of infusing liquid ether or chloroform by the intravenous route met with limited success.[1-4] The necessity for dilution - down to something of the order of 5% in solution - meant giving very large quantities of fluid during operations of any length, virtually drowning the patient, and the problems of toxicity (possibly often related to drug impurities) also limited their use. I will return later to the use of intravenous ether and chloroform.

Chloral hydrate

The first of the 'new' drugs to be tried out as an intravenous anaesthetic was chloral, or its more soluble derivative chloral hydrate. Chloral had been synthesised by Justus Liebig in Germany in 1832, well before the discovery of anaesthesia, but it was not till the 1860s that the German chemist, pharmacologist and medical practitioner Rudolf Buchheim and his students carried out experiments with chloral in animals and then in patients, finding that it had an hypnotic effect.[5] Strangely enough, their discovery - the first synthetic hypnotic - which one would think would have been really important at that time, was not published until after a rival worker had stolen their thunder.



chloral **chloral hydrate**

This was the Berlin-based chemist, pathologist and pharmacologist Oscar Liebreicht - a former pupil of the great pathologist Virchow. Liebreicht announced his discovery of the hypnotic effects of chloral at a meeting of the Berlin Medical Society on 2 June 1869. A number of European publications immediately followed, including reports by Sir Benjamin Ward Richardson in the London *Medical Times and Gazette* during the same year, and shortly after in the *Pharmaceutical Journal*.[6-8] (Anaesthetic colleagues will have noted the frequency of Richardson's contributions to early anaesthesia). The results of Liebreicht's animal experiments - from subcutaneous, and perhaps intraperitoneal injection as well as oral medication, caused him to describe chloral hydrate not only as a new hypnotic but also as an anaesthetic and it appears that he took out a 'use-patent' for it as an anaesthetic agent.

Chloral was manufactured by prolonged exposure of absolute alcohol to chlorine gas, giving hydrochloric acid and the aldehyde chloral as an oily liquid. This was then distilled from sulphuric acid, water was carefully added and chloral hydrate precipitated as a solid to be recrystallised for the elimination of impurities. The immediate demand for the agent in the 1870s necessitated large-scale commercial production and Liebreicht sought the assistance of Carl Alexander Martius. Martius studied chemistry in Germany under Liebig and in 1862 came to London to work under August Hofmann, then Professor at the Royal College of Chemistry (situated between Oxford Street and Hanover Square).[9] He later returned as Hofmann's assistant to Berlin where he set up a chemical plant with Paul Mendelssohn-Bartholdy, the son of the composer Felix Mendelssohn. In 1873 this firm was renamed Aktiengesellschaft für Anilinfabrikation, better known as its acronym, AGFA, later amalgamating again to form part of IG Farbenindustrie. Martius was one of the founders of the German Chemical Society and was active in promoting the chemical industry in pre-First World war Germany.[5]

Returning to the putative anaesthetic, chloral hydrate, it seems that in spite of, or perhaps because of the German invasion of France during the 1870 Franco-Prussian War, Liebreicht's contemporary Berlin publication, with its claim of anaesthetic activity for chloral, was read by a Bordeaux surgeon, Pierre Cyprien Oré. (Figure 1) After some animal experimentation, Oré, in 1872, is acknowledged to have been the first to attempt intravenous administration of chloral to a human patient, and it is clear that his original purpose was to produce sedation rather than anaesthesia in cases of convulsions from tetanus and strychnine poisoning.[10]

In February 1874 he successfully treated a case of tetanus with intravenous chloral, and by chance found he was able to perform a minor surgical procedure without reaction from the patient. Thus encouraged, three months later he used intravenous chloral hydrate to satisfactorily anaesthetise an 18 year old man for the removal of a sequestrum, and at the end of that year was able to claim the successful use of the agent in 14 surgical operations.[11,12] Oré's pioneering work was widely publicised and attracted disciples in several European countries. The news of chloral's anaesthetic properties also spread to South America. In Lima, Peru, a Dr Alarco claimed that he had been the first, in 1876, to give chloral intravenously to a human patient - again for the treatment of tetanus, but primacy was vigorously disputed by Oré.[12] His detractors in the French and British medical press pointed to the incidence of venous thrombosis and haematuria caused by the new drug but, with hindsight, it may well be that some at least of the apparent toxicity - as with so many agents of the time - was due to impurities. As evidence of this, the Martius plant in

Figure 1.
Pierre Cyprien Oré

Berlin was producing chloral hydrate to a superior and consistent specification compared with that of other European plants.[5] Perhaps due to toxicity reports, enthusiasm for the technique rapidly diminished and even Liebreicht had to acknowledge that chloral had no future as an anaesthetic.

Hedonal

Continental chemists were responsible for the introduction and investigation of a number of other new agents with potential anaesthetic properties during the period between the Franco-Prussian and the First World Wars. In 1885, Oswald Schmiedeberg, a founder-figure of German experimental pharmacology, studied urethane and its derivative ethylurethane which was found to have a weak hypnotic effect. He proposed that the replacement of the ethyl group with a higher molecular weight chain might produce a more active substance.[13] The suggestion was followed up in 1899 by Dresser in Munich who substituted methylpropyl carbinol for the ethyl group.[14] The new substance was called Hedonal and did indeed have a more profound hypnotic effect. Charles Adams, the author of the first standard work on intravenous anaesthesia, described Hedonal as 'the first anesthetic agent for intravenous administration that produced fairly adequate surgical anesthesia with a moderate degree of safety.'[15]

I don't know anything about Russian contributions to chemical research, but in anaesthesia we have seen little or no innovation from that great country since the Revolution. So it is interesting to note that a pupil of Schmiedeberg, Nikolas Krawkow of St Petersburg, was attracted by the hypnotic and sedative properties of Hedonal, and in 1901 prescribed it for oral use by his patients.[16] Meanwhile, during the early 1900s, as mentioned earlier, a Würzburg surgeon, Ludwig Burkhardt, began to administer chloroform, and later ether, intravenously in dilute form as an infusion for clinical anaesthesia, first publishing his results in 1909.[1] International interest in the technique developed and, by 1912 in London for example, Felix Rood, an Assistant Anaesthetist at University College Hospital, was able to report a successful series of 297 ether infusion cases.[4] (Figure 2)

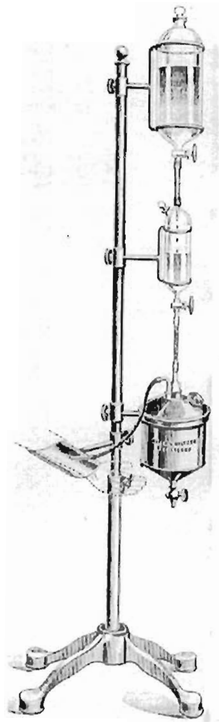


Figure 2
Rood's ether solution infusion apparatus 1911

Hearing of Burkhardt's work, Krawkow realised that Hedonal might also produce anaesthesia if given by intravenous injection and, with colleagues at St Petersburg, carried out successful experiments in dogs using Hedonal in saline.[17] Deep surgical anaesthesia with good recovery was obtained, and in 1909 the first patient, an elderly man with a malignant lesion of the leg, received Hedonal as an intravenous general anaesthetic administered by Krawkow's assistant, Jeremisch.

Three grams of the drug given by mouth 1½ hours preoperatively resulted in sleep, but - in the time-honoured way of anaesthetists (and nurses) - he was awakened for induction which was carried out by the rapid infusion of 275ml of 0.75% Hedonal in saline. Surgical anaesthesia was achieved in four minutes without excitement; heart rate and breathing remained regular, and two further smaller infusions - 75ml and 25ml - were needed to maintain anaesthesia. The patient recovered without nausea or vomiting after six hours of postoperative sleep. This achievement was reported to a Russian Surgical Congress twelve days later and accounts of other satisfactory cases quickly followed.[18] Enthusiasm for the drug and for its use by the intravenous technique spread rapidly back from Russia to Germany and to Britain, where in 1912 Charles Page of St Thomas's Hospital, London was able to present the results from 200 Hedonal cases.[19] He was quickly followed by a number of other UK workers.[20-23] It is interesting to note how many active and innovative British anaesthetists there were at this time; ether and Hedonal by intravenous infusion were being used in practice not only in London but in several other large centres.

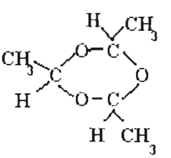
Hedonal was manufactured by the German Bayer Company who probably ensured high quality production, lessening the likelihood of side effects due to impurities. It is probable that a manufacturing plant also existed in Russia as, due to the lack of ether and chloroform, Hedonal anaesthesia was widely used there during the First World War.[24] Non-availability in the Western Allied countries during the war and the arrival of better drugs soon after, probably prevented further interest in the agent. By the standards of the time relatively few problems appeared to arise with careful Hedonal anaesthesia, but post-mortems from the 10-20% of patients who could then be expected to die after surgery and anaesthesia, showed that pulmonary oedema from the excessive quantities of intravenous fluid necessitated by the technique was occasionally the cause of death.

Paraldehyde and Isopral

Other drugs produced before the 1914-18 War were found to have hypnotic and even anaesthetic properties, some proceeding to human trials by a few enthusiasts. Such enterprise would, of course, be quite impossible today, but then, after minimal laboratory and animal experimentation, it was quite possible to try out new preparations in patients, the very old or the very ill being usually selected as the first to experience the new agent. Paraldehyde[25] and Isopral - (trichlorisopropyl alcohol)[2,26] were investigated as potential intravenous anaesthetics with some success but the advent of the First World War inhibited progress. With the exception of a small number of hardy enthusiasts there are few records of intravenous anaesthesia being practised under battlefield conditions.

$C_3H_7CH\ CH_3O\ CONH_2$

Hedonal



paraldehyde

$CCl_3CH\ CH_3\ OH$

Isopral

Barbiturates – Somnifene

And so we turn to the first really important innovation in intravenous anaesthesia, the barbiturates. Barbituric acid was first prepared in 1864 by the great German chemist Adolph von Baeyer, a Nobel Prize-winner for chemistry in 1905. Baeyer and his colleagues were apparently celebrating their discovery in a Berlin tavern frequented by artillery officers who were commemorating the patron saint of gunners - St Barbara. An artilleryman combined the words Barbara and urea and so the name is said to have originated.

Barbituric acid itself has little pharmacological activity and almost 40 years were to elapse after its original synthesis before Emil Fischer (Professor of Chemistry in Berlin and also a Nobel Prize winner) and Dilthey re-examined the properties of a substitution product - diethyl barbituric acid, later known as barbitone, barbital or Veronal - which had been originally prepared in 1882. Fischer, the chemist, and von Mering, a physician from Halle reported in 1903 on the clinical use by mouth, of this 'new class of hypnotics' which, due to their insolubility, were slow in onset of action and had unduly prolonged effects making them unsuitable for intravenous anaesthesia.[27]

Coinciding with the end of the 1914-18 War, the Swiss firm, Hofmann-La Roche of Basle, produced several diethylamine-barbiturate combination compounds which were substantially more soluble than the pre-existing drugs. Pharmacological work by Redonnet at the University of Zurich[28] and by Wiki at Geneva,[29] using dogs, frogs and rabbits, showed that two of these compounds - in terms of rapidity of action, lack of tissue toxicity and uncomplicated recovery - were worth further investigation. An antiemetic affect against morphine was also discovered.

A combination product of two usable compounds, given the name Somnifene, was tried out as oral medication in patients by the Zurich physician, Liebemann, with satisfactory results which he reported in 1920.[30] Later that year, Daniel Bardet, a Parisian physician, gave a preliminary paper describing the intravenous use of Somnifene in 14 patients, as a premedicant, for postoperative sedation and, as an adjuvant to standard anaesthesia. In one case minor surgery was carried out using Somnifene alone.[31] A few months later, in 1921, the Bardets, father and son, gave a more detailed account of the use of these barbiturates intravenously in human patients.[24] As a result of these preliminary studies, a group of Paris workers tried out intravenous Somnifene during the next two or three years as an anaesthetic for obstetric deliveries and for general surgery, and also carried out detailed distribution and elimination studies.[32-34] For surgery, opiate premedication was the rule and chloroform and ether additions were occasionally required at incision and peritoneal closure, but good operative conditions could generally be produced. Pain free delivery in mothers anaesthetised intravenously was easily obtained, but slow recovery over several hours was more of a disadvantage here than in the surgical patients.
Further work showed that better results and somewhat quicker recovery could be obtained by eliminating one component of the Somnifene combination and using only the diethylamine derivative of allylisopropyl barbiturate.[35]

Hexobarbitone, thiopentone

By this time, the mid 1920s, it was evident that solubility and potency - permitting an appropriate dose to be contained in a small, readily injectable volume - plus rapid biometabolism for speedy recovery, were going to be vital characteristics for any clinically and commercially successful intravenous barbiturate anaesthetic. Industrial chemists in Europe and the USA began targeted research resulting in a series of candidates, at least a dozen of which reached clinical use during the inter-war period. Many fell by the wayside, including the German Bayer drug Evipan (hexobarbitone) introduced in 1932 by the chemist Helmuth Weese.[36] Within six months of its availability it is said that 100,000 patients had been anaesthetised with it and by the end of the 2nd World War it had been given to 10 million patients. The German origin of hexobarbitone may have been to some degree responsible for the post-war lack of world-wide acceptance of this otherwise well-liked drug.

In the late 1920s, Volwiller and Tabern, Abbott Laboratories workers in Chicago, produced butobarbitone - methyl butyl barbituric acid (Nembutal was the soluble sodium salt), and while this proved to be a good oral hypnotic, slowness of action limited its value as an intravenous anaesthetic.[37] The introduction of a sulphur atom into the 2 position was a key factor in lessening the duration of action in the body, while, in alkaline conditions, the sodium salt was reasonably soluble.[38] The new agent, thiopentone, began trials in two American centres in 1934, at Madison, Wisconsin - Ralph Waters' headquarters and at the Mayo Clinic with John S Lundy.

Early clinical reports came from both American and British hospitals and although Waters was in fact the first to anaesthetise a patient with thiopentone, Lundy was the first to publish. A substantial proportion of the early clinical experience was provided by British workers - Jarman and Abel in London.[39-41] In spite of unnecessary scaremongering following the use of Pentothal (and Evipan) for some of the casualties from the Japanese attack on Pearl Harbor in 1941, thiopentone became, during the 20 years after its synthesis, an accepted standard induction agent throughout the world.

Barbiturates, of course, are good, short-acting hypnotics but they have little or no analgesic action and often need reinforcement by other agents - inhalational anaesthetics, opioids or local anaesthesia - when used for anaesthesia for anything other than minimally invasive surgery. So, at the end of the period under review - the first 100 years of anaesthesia, 1846-1946, during which an immense amount of work had been carried out towards formulating a practical general purpose intravenous anaesthetic - that dream had yet to be fulfilled and (arguably) this remains so today, partly due to our continuing inability to measure - on-line and in 'real time' - circulating blood levels of intravenous anaesthetic agents, or to reliably quantify what is generally understood as the 'depth' of anaesthesia.

The debt of anaesthesia to chemistry

I would like to end by an appreciation of our chemist colleagues. It is obvious that anaesthetists can do nothing without the drug-tools of their trade. Looking back on the history of intravenous anaesthesia demonstrates, (perhaps more clearly in this area than in many others,) how deeply we and our patients are indebted to the fraternity of chemists and pharmacologists - both in commerce and academia - for the innovations I have discussed (and many more), and particularly for those allowing easy and speedy production of unconsciousness which we now take for granted. While the 50 years following those I have discussed, from the end of the 2nd World War to the present day, have produced further progress, perfection has - in my view - yet to be achieved. We thank you for the advances and new products of the past; and look forward to even greater things.

Acknowledgements

I am much indebted to colleagues and staff members of organisations who have helped with information and illustrations:

Dr Michael Goerig of Hamburg, Dr C R Stephen of the Anesthesia History Association, Dr Philippe Juvin of Paris, Abbott Laboratories, Ms Patricia Willis - Archivist of The Association of Anaesthetists of Great Britain and Ireland, Mrs Terry Clements of Bayer plc, M. H Ferriera-Lopes of the Bibliotheque Interuniversitaire de Médicine, Hoechst Marion Roussel GmbH, Ms Lorraine Jones of the Royal Pharmaceutical Society Museum, Ms Nicola Best of the Royal Society of Chemistry Library, Library staff of the Royal Society of Medicine and of the Wellcome Institute for the History of Medicine.

Selected references

1. Burkhardt L. Die intravenöse Narkose mit Aether und Chloroform. *Münchener medizinische Wochenschrift* 1909; **46**:2365-2369.
2. Burkhardt L. Ueber intravenöse Narkose. *Münchener medizinische Wochenschrift* 1911; **15**:778-782.
3. Goerig M, Ayisi K, Schulte am Esche J. The contribution of Ludwig Burkhardt and Hermann Kummell to the development of intravenous anaesthesia. *Proceedings of the History of Anaesthesia Society* 1991; **9B**:76-81.
4. Rood F. Infusion anaesthesia: the use of normal saline infusion as a means of administering ether. *British Medical Journal* 1911; **2**:974-976.
5. Sourkes TL. The dual discovery of chloral hydrate as a hypnotic. *Anesthesia History Association Newsletter* 1994; **12**:1-5.
6. Liebreicht O. Das Chloral, ein nues Hypnoticum und Anästheticum. *Berliner klinische Wochenschrift* 1869; **6**:325-327.
7. Richardson BW. Report on the physiological action of hydrate of chloral. *Medical Times and Gazette* 1869; **2**:290-291.
8. Richardson BW. On chloral hydrate. *Pharmaceutical Journal* 1870-1871; **1**:650.
9. Abel FA. The history of the Royal College of Chemistry and reminiscences of Hofmann's professorship. *Journal of the Chemical Society* 1896; 580-594.
10. Oré PC. Tétanos traumatique traité par les injections intra-veineuses de chloral. Guérison. *Comptes rendus - Académie des Sciences de Paris* 1876; **82**:1215-1216
11. Oré PC. Anesthésie produite par l'injection intra-veineuse de chloral, dans un cas d'évidement du tibia et d'ovariotomie. *Comptes rendus - Académie des Sciences de Paris* 1874; **79**:1416-1419.
12. Oré PC. Résultats fournis par les opérations chirurgicales, faites sur des malades anesthésiés par l'injection intraveneuse de chloral. *Comptes rendus - Académie des Sciences de Paris* 1874; **79**:1014-1015.
13. Schmiedeberg O. Ueber die pharmakologischen Wirkungen und die therapeutische Anwendung einiger Carbaminsäure-Ester. *Archiv für experimentelle Pathologie und Pharmakologie* 1885-1886; **20**:203-216.
14. Dreser H. Über ein neuartiges Hypnoticum aus der Reihe der Urthane. *Münchener medizinische Wochenschrift* 1899; **40**: 1310.
15. Adams RC. *Intravenous Anesthesia.* New York: Hoeber, 1944; 43.
16. Kissin I. The introduction of hedonal: a Russian contribution to intravenous anaesthesia. *Anesthesiology* 1988; **69**:242-245.
17. Krawkow NP. On intravenous hedonal anaesthesia (tr). *Russ Vrach* 1910; **9**:495-411
18. Jeremitsch AP. Die intravenose Hedonalnarkose. *Deutsche Zeitschrift für Chirurgie* 1911; **108**:551-563.
19. Page CM. Hedonal as a general anaesthetic administered by intravenous infusion. A report on 75 cases. *Lancet* 1912; **1**: 258-1264.
20. Barrington-Ward. Hedonal anaesthesia - its use in children. *Lancet* 1912; **2**: 1298-1299.
21. Dobson JF. Hedonal anaesthesia. *Lancet* 1912; **2**;1299.
22. Mennell Z. Intravenous infusion anaesthesia with special reference to the use of hedonal in intracranial surgery. *Transactions of the International Congress of Medicine,* London 1913; **7, pt 2**:72-84.

23. Veale RA. Complications following the administration of hedonal. *British Medical Journal* 1912; **2**:347-348.
24. Bardet G.& D. Contribution à l'étude des hypnotiques uréiques. Action et utilisation de diéthyl-diallyl-barbiturate de diéthylamine. *Bulletin Générale de Thérapeutique* 1921; **172**:173-205.
25. Noel H. & Souttar H. The anaesthetic effects of the intravenous injection of paraldehyde. *Annals of Surgery* 1913; **57**:64-67.
26. Honan W, Hassler J. Experiences with intravenous anesthesia. *Surgery, Gynecology and Obstetrics* 1913; **16**: 206-209.
27. Fischer E, von Mering J. Ueber eine neue Klasse von Schlafmitteln. *Die Therapie der Gegenwart* 1903; **44** (NF5):97-101.
28. Redonnet TA. Recherches comparatives sur l'action pharmacodynamique de dérives de l'acide barbiturique. *Archives Internationales de Pharmacodynamie et de Thérapie* 1919-1920; **25:**241-253.
29. Wiki B. Recherches pharacodynamiques sur les somnifères de la série barbiturique. *Archives Internationales de Pharmacodynamie et de Thérapie* 1922-1923; **27**: 117-161.
30. Liebmann E. Ueber Somnifen, ein neues Schlaffmittel. *Schweizerische medizinische Wochenschrift* 1920; **48:**1093-1997.
31. Bardet D. Sur l'utilisation, comme anesthésique général, d'un produit nouveau, le diéthyl-diallyl-barbiturique de diéthylamine. *Bulletin Générale de Thérapeutique* 1921; **172**:27-33.
32. Cleisz M, Perlis R. À propos de l'accouchement sans douleur. *Bulletin de la Société d'Obstétrique et de Gynécologie de Paris* 1923; **12:** 527-533.
33. Perlis R. Sur un nouveau mode d'anesthésie par voie intraveineuse en obstétrique et en chirurgie; indications, techniques, résultats. *La Presse Médic*ale 1924; **65**:675-676.
34. Fredet P, Perlis R. Recherches sur un nouveau mode d'anesthésie générale. *Bulletin et Memoires de la Société Nationale de Chirurgie de Paris* 1924; **50**:789-801.
35. Fredet P, Fabre R. Nouvelles recherches sur l'anesthésie générale par les dérives alcoylés de la malonylurée. *Bulletins et Memoires de la Societé Nationale de Chirurgie de Paris* 1925; **51:**263-273.
36. Weese H, Scharpff W. Evipan, ein neuartiges Einschlaffmittel. *Deutsche medizinische Wochenschrift* 1932; **58**:1205-1207.
37. Volwiler EH, Tabern DL. 5,5-substituted barbituric acids. *Journal of the American Chemical Society* 1930; **52**:1676-1679.
38. Tabern DL, Volwiler EH. Sulfur-containing barbiturate hypnotics. *Journal of the American Chemical Society* 1935; **57**:1961-1963.
39. Lundy JS. Intravenous anesthesia: preliminary report of the use of two new thiobarbiturates. *Proceedings of the Staff Meetings of the Mayo Clinic* 1935; **10**: 536-543.
40. Pratt TW, Tatum AL, Hathaway HR, Waters RM. Sodium ethyl (1-methyl butyl) thiobarbiturate. Preliminary experimental and clinical study. *American Journal of Surgery* 1936; **31**:464-466.
41. Jarman R, Abel AL. Intravenous anaesthesia with pentothal sodium. *Lancet* 1936; **1:** 422-423.

AN ARDENT NATURALIST - WILLIAM RUSSELL NOTCUTT (1774? -1800): CHEMIST, BOTANIST AND ONE OF DAVY'S FIRST NITROUS OXIDE SUBJECTS.*

Mr J Birtwhistle
Visiting Lecturer, University of Sheffield

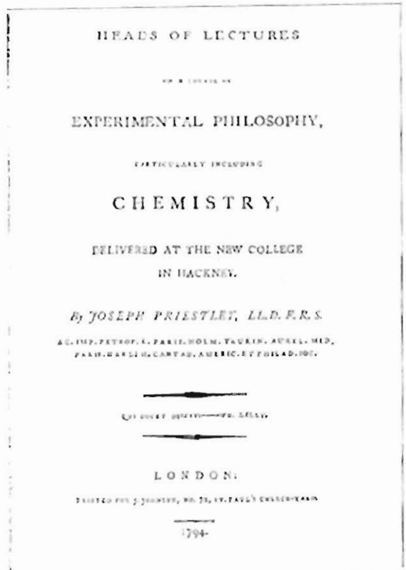
Humphry Davy's nitrous oxide subjects were not a neutral or random group. Rather, they were drawn from his acquaintance, patrons and collaborators - people he wished to impress with his results.[1] In the lives of these subjects we can therefore glimpse the cultural setting of his experiments. It was an illustrious group: out of forty subjects who can be identified, fifteen have entries in the *Dictionary of National Biography* and another nine were offspring or spouses of people with entries. Here is an attempt to shed light on one of the more obscure names.

A non-conformist education

William Russell Notcutt was born in 1774 or 1775,[2] the fourth child and only son amongst the nine children of William Notcutt (1743-1809), a linen draper of Ipswich who possessed[3] many books and 'philosophical instruments' (scientific apparatus). The family bore a tradition of religious dissent[4] going back to the Revd William Notcutt (1672/3-1756).[5] Accordingly, William Russell Notcutt's father ensured in his will of 1795 the continuance of 'the Expence of the Education and Instruction of my son William at the Academy at Hackney'[3] - which would have come to sixty guineas a year, with board and lodging. New College, Hackney, was one of those 'dissenting academies' that provided an excellent equivalent to grammar school and university education for non-conformists excluded by the Test Acts. Opened in 1787, it was threatened with bankruptcy in 1793. War with France in that year, followed by the Treason Trials of 1794,[6] intensified the controversy over anyone who might be accused of sedition or heresy. In 1796, the College disintegrated in a state of political, religious and financial crisis[7] - but not before its students had entertained to dinner the arch-revolutionary Tom Paine.

Like the essayist William Hazlitt whom he would have known at Hackney,[8] Notcutt could have gone to the Academy at the age of fifteen.[9] That he graduated to teaching there in some capacity is shown by his 35-page pamphlet *Heads of Lectures on Philosophical Chemistry, delivered at New College, Hackney* (Ipswich: G Jermyn, 1796).[10] I suggest that this title was modelled on that of the great chemist Joseph Priestley's syllabus, Heads of lectures on a course of experimental philosophy, particularly including chemistry, delivered at the New College in Hackney.[11](Figure 1) The London radical, Joseph Johnson, had published this in 1794, the year Priestley went into political exile in America. In many passages, such as that on 'the general properties of matter', Notcutt exactly summarised Priestley. He followed the same general arrangement of substances into solids, gases and liquids. He continued to regard heat, though not light and electricity, as substances. Where he moved forward, however, was in embracing the chemistry of Lavoisier as opposed to the phlogiston theory that Priestley never renounced. This is particularly evident in his accepting the analysis of water, which Priestley thought simple.[12] There is a corresponding shift towards the reformed chemical nomenclature.[13]

* See Editorial


HEADS OF LECTURES

EXPERIMENTAL PHILOSOPHY,

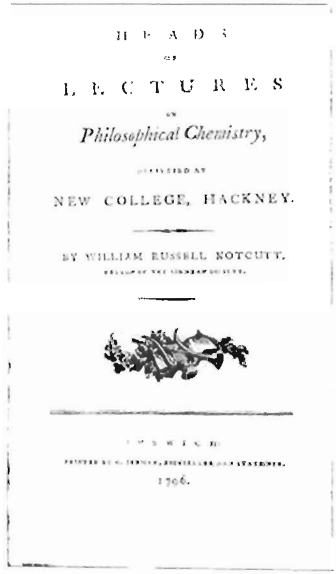
CHEMISTRY,

DELIVERED AT THE NEW COLLEGE
IN HACKNEY.

By JOSEPH PRIESTLEY, LL.D. F.R.S.

LONDON:

1794.


HEADS

LECTURES

Philosophical Chemistry,

NEW COLLEGE, HACKNEY.

BY WILLIAM RUSSELL NOTCUTT.

1796.

Figure 1
Similarity of Priestley and Notcutt titles. Priestley's motto *Qui docet discit* is from William Lilly (astrologer 1602-1681)

There are also political implications in Notcutt's assuming Priestley's title. Priestley, in dedicating his book to the Hackney students, urged them to free thinking and yet confronted the fact that: 'many persons entertain a prejudice against this College, on account of the republican, and, as they call them, the licentious, principles of government, which are supposed to be taught there'. He appealed to his students to show that they pursued 'reformation, in church or state' by rational means only, not those of 'riot and tumult'.[14] It had already been a distinctly political gesture of William Notcutt's to send his son to a College that had to defend itself in such terms, and even more so for William junior to proclaim his allegiance to it at a time when the charges had gained some public credence.

Notcutt now had to try and launch a scientific career after Hackney. Priestley's lectures had been delivered gratis as part of a last effort to keep the College open,[15] so it is unlikely that Notcutt was paid for any attempt to follow them. His *Heads of Lectures* look like a prospectus for teaching he hoped to offer elsewhere. He was also developing other possibilities, for the title page identifies him as a Fellow of the Linnean Society.[16] Two distinguished botanists, Thomas Jenkinson Woodward and Jonas Carl Dryander, had signed his certificate of recommendation for fellowship, dated 24 May 1796. Without mentioning his young age, they described him as: 'a practical naturalist... well versed in several branches of Natural History, particularly botany & entomology'.[17]

Nothing is known about Notcutt in the next two years. His death notice was to say that 'Blest with good natural abilities, he was careful to improve them by assiduous application and study.'[2] Presumably, he now continued his studies independently. We have seen that his father was prepared to finance him at Hackney, and may have continued his support during these exploratory years.

Notcutt at Bristol

Not later than January 1799,[18] Notcutt was at work in Bristol where he was known as 'formerly lecturer on chemistry at Hackney'.[19] This suggests that Notcutt was accepted by doctors and scientists who admired Priestley and the ideals of his College, and also that no significant employment had intervened. By April, Dr Thomas Beddoes, Davy's superior at the Pneumatic Medical Institution, could describe Notcutt as 'a friend of mine'.[18] He used the phrase in the course of a minor scientific priority dispute in which Notcutt played a crucial role. The facts appeared in various numbers of a journal[20] edited by William Nicholson (from whose textbook, together with Lavoisier's, Davy had learned his chemistry). William Clayfield - who was soon to design Davy's apparatus for the nitrous oxide experiments[21] - had long been investigating deposits of strontian ore near Bristol.[22] In March 1799, it was announced that the mineral had also been discovered near Sodbury,[23] but the author failed to mention that his specimen had been identified by Notcutt, who recognised its similarity to one he had seen in Clayfield's collection. Notcutt's role was asserted by Beddoes in April,[18] calling in evidence[24] letters from Davy and Notcutt himself.

This is an example of the early roles of scientific journals in establishing priority and enforcing what Nicholson called 'the general cause of morality and science'.[25] It also shows how firmly Beddoes had established a group of young chemists around his experiments and speculations in Bristol. Of course, the triumphant fruition was to come in 1808 when Davy announced[26] that he had decomposed such ores by electrolysis, and so isolated and named the element strontium.

Another trace of Notcutt in Bristol shows him assisting Davy's research. Having learnt from the strontian dispute, Davy was quick to publish his discovery of silica in various plants.[27] The next month (June 1799) he added[28] that Clayfield had suggested it be sought in the Dutch rush and: 'a short time after, Mr Notcutt informed me that he had succeeded in obtaining a globule of glass from it by the blow-pipe'.

A further Bristol investigation involving Notcutt was to have an influence on Davy's methodology. This was a primitive clinical trial[29] of an alleged therapy, the so-called 'tractors' of Elisha Perkins who claimed to cure a variety of diseases by stroking with his patent metal rods. The surgeon Charles Cunningham Langworthy had set up a Perkinean practice[30] in the Bristol suburb of Clifton where Beddoes and Davy were also at work. Langworthy's claims were refuted[31] by the Bath physician (and early statistician of mortality) John Haygarth (1740-1827). Haygarth simply showed that wooden 'tractors', carved and painted to look like the patent ones, were just as effective. The placebo effect of the dummy rods he attributed to the power of 'imagination'. Haygarth quoted supportive trials by Mr Smith, a surgeon at the Bristol (not yet 'Royal') Infirmary, who cited Notcutt and Clayfield amongst his witnesses. Since Beddoes too had been involved in the investigation,[32] it seems that these trials influenced Beddoes and Davy in controlling for what they called 'imagination' when they gave atmospheric air to some of their nitrous oxide subjects.

Notcutt became one of the first of these subjects, as reported in Beddoes' pamphlet of October 1799. Under the gas, he 'was twice thrown into an extatic pleasurable trance – the first time his spirits were better for the day – after the second, he was languid, but is inclined to impute this to exercise in oppressively hot weather. Perhaps, however, the second dose was too strong for his constitution.'[19] It was probably the ambivalence of this report, when others had been so enthusiastic, that led Davy to make no mention of Notcutt in his fuller book on the subject in 1800.[33] Davy had not learned, as he might have done from *An Account of the Foxglove* (1785) by Beddoes' correspondent William Withering, the importance of reporting adverse as well as favourable cases.

A mysterious expedition

The next fact we have about Notcutt is that of his death, on 25th April 1800, in Surinam, one of the Guianas of South America. When the news reached home after three months, it was reported[2] that he had been only six days in the country when he had succumbed to yellow fever and died four days later. These details are consistent with the usual course of the disease, and at that time an epidemic was moving south through the Americas. We do not even know why Notcutt was in Surinam. Several kinds of opportunity could have been presented to a young man in the port city of Bristol, in a period of colonial expansion. He may have intended to play some part in the development of coffee, sugar and cotton plantations that took place under British rule in Surinam. It is more likely that as a promising Fellow of the Linnean Society who had recently supplied a specimen to be illustrated in a flora,[34] he was on a botanical expedition.[35] Since the English and Dutch settlements of the seventeenth century, the country had been known for its rich natural history.[36] Most recently, in October and November 1798, *Nicholson's Journal* had reprinted two articles[37] reporting 'a botanical excursion' to the neighbouring Dutch colony of Demerara, then so largely 'hid from science'. The possibilities are evident to us from the discoveries of the great naturalist, Alexander von Humboldt, on his Central and South American expedition of 1799-1804.

With his political background, Notcutt must also have known he was going to a hotspot. Britain had seized Surinam in the context of the Napoleonic wars and, whether formally or not, he would have been part of an effort to survey the new territory. What is more, Surinam was notoriously a slave economy (figuring as such in Voltaire's *Candide*). In 1796, Joseph Johnson had published John Gabriel Stedman's narrative of a five years' expedition against the revolted negroes of Surinam. As a mercenary soldier, Stedman contributed to the anti-slavery cause by the compassion he showed for the very slaves he was out to quell – a feeling distilled in William Blake's illustrations to the book. 1796 was a year of intense political awareness at Hackney, so it is not improbable that Notcutt had noticed the anti-slavery implications of Stedman's narrative. With so few facts many aspects of his short life can only be conjectured.

With due allowance for conventional phrasing about the dead, it nevertheless appears that Notcutt's scientific collaborations went along with a gift for friendship. His brief death notice called him 'a sincere friend'. He had been 'endowed with a most amiable disposition, which, in conjunction with a highly cultivated mind, gained him many friends, by whom he was greatly beloved'.[2] James Edward Smith wrote of him[34] as 'an ardent naturalist, who has since fallen a victim to the climate of Surinam, and whose loss, however great to science, is most irreparable to his friends.'

References and Acknowledgements

1. Birtwhistle J. The professions of Davy's nitrous oxide subjects. *Proceedings of the History of Anaesthesia Society* 2000; **25**:48-51. Erratum: p. 49, line 7, for 'Kinglake' read 'Blake'.
2. A newspaper gave the date of his death as 25th April 1800, 'in the 26th year of his age'. *The Bury and Norwich Post*, 30 July 1800, p2. Kindly transcribed by M P Sartin.
3. The Will of William Notcutt, proved 19 October 1795; *Suffolk Record Office (Ipswich)*, IC/AA1/229/87. Photocopy kindly supplied by M P Sartin.
4. Notcutt ME, Sartin MP. *The Notcutt Family History: 1515-1989*. Chatham, Kent: Bachman and Turner, 1989. 29; and very helpful communications from Dr Willy Notcutt and Mrs Marian Sartin.
5. The thirteen items by him in the British Library include devotional works and a controversy with the Quakers.
6. The Rev Jeremiah Joyce, who had been a student at the College, was one of the defendants. See Barrell J. *Imagining the King's Death: Figurative Treason, Fantasies of Regicide 1793-1796*. Oxford: O.U.P. 2000.
7. Lincoln A. *Some Political and Social Ideas of English Dissent*. 1763-1800. NY: 1971 (1938). 95-98.
8. Stevenson HW. William Hazlitt and Hackney College. *Transactions of the Unitarian Historical Society* 1930.
9. I am very grateful to Dr David Wykes, Director of Dr Williams's Library, for the information that there is no trace of Notcutt in the Priestley, Lindsey or Belsham correspondence relating to the College, and that its minutes do not survive for the years in question.
10. Unlike Joseph Johnson, of whom more below, the Jermyn of Ipswich imprints represented 'safe' general publishing, with several (Anglican) theological titles and some interest in natural history (a catalogue of Dr William Beeston Coyte's botanical garden at Ipswich - 1796), medicine (*Observations on the Medical Practice of Dr [John] Brown* - 1788) and politics (a pamphlet 'by order of the Association of the town and neighbourhood of Ipswich, against levellers and republicans' – 1793).
11. Even the phrase 'heads of lectures' was rare in scientific titles at the time: for the years 1786-1796, the British Library catalogue shows only Relham 1787, Walker 1792, Priestley 1794 and Notcutt 1796.
12. Priestley J (1794) 44 and his theoretically crucial Lecture XXIX, Of the Doctrine of Phlogiston and the Composition of Water. Compare Notcutt (1796) 8.
13. The *Méthode de Nomenclature Chimique* (1787) of Lavoisier and others had been translated into English by James St John (1788).

14. Priestley J (1794), xxi-xxii.
15. McLachan H. The Old Hackney College 1786-1796. *Transactions of the Unitarian Historical Society* 1925; **3**:185-205, especially 190-191.
16. Hence Notcutt's brief entry in Desmond R. *Dictionary of British and Irish Botanists and Horticulturalists*. London: Taylor and Francis, 1994.
17. Photocopy kindly supplied by Gina Douglas, Librarian of The Linnean Society of London.
18. Beddoes, T. *Contributions to Physical and Medical Knowledge, Principally from the West of England*. Bristol: Biggs and Cottle, 1799. Note to Contents. Reprinted in *Nicholson's Journal* **3**: 41-2.
19. Beddoes T. *Notice of Some Observations made at the Medical Pneumatic Institution*. Bristol: Biggs and Cottle, 1799.12.
20. William Nicholson (ed). *A Journal of Natural Philosophy, Chemistry, and the Arts*. London: imprint varies. Often known as *Nicholson's Journal*, this was a favourite platform for Davy's communications until he went to the Royal Institution.
21. Smith WDA. William Clayfield's mercurial airholder. In: Barr AM et al. (eds). *Essays on the History of Anaesthesia*. London: RSM Press Ltd, 1996.
22. Clayfield W, Beddoes T. An account of several veins of sulphate of strontian or strontites, found in the neighbourhood of Bristol. *Nicholson's Journal* **3**; 36-41.
23. *Nicholson's Journal* **2**;535-6.
24. *Nicholson's Journal* **3**; 95. See also 96, 137-8.
25. *Nicholson's Journal* **3**:95.
26. Davy H. Electro-chemical researches on the decomposition of the earths. *Philosophical Transactions of the Royal Society of London* 1808; **98**:346.
27. *Nicholson's Journal* **3**: 56-59.
28. *Nicholson's Journal* **3**:138.
29. Bull JP. The historical development of clinical therapeutic trials. *Journal of Chronic Diseases* 1959; **10**:218-248, especially 228.
30. Langworthy CC. *A View of the Perkinean Electricity*. Bristol: W. Bulgin, 1798.
31. Haygarth J. *Of the Imagination, as a Cause and as a Cure of Disorders of the Body; exemplified by Fictitious Tractors and Epidemical Convulsions*. Bath: (Richard) Crutwell, 1800.
32. Haygarth J (1800). 13.
33. Davy H. Researches, *Chemical and Philosophical, chiefly concerning Nitrous Oxide, or Dephlogisticated Nitrous Air, and its Respiration*. London: (Joseph) Johnson; Bristol: Biggs and Cottle, 1800.
34. Smith JE and Sowerby J. *English Botany*. London: Wilks and Taylor, 1802. 1049 and facing plate.
35. Notcutt does not, however, appear in the *Index of Plant Collectors in Surinam* compiled by the National Herbarium, Paramaribo. I am grateful to the Director, Dr Marga Werkhoven, for this information.
36. Maria Sibylla Merian's illustrations of its plants and insects were famous, and there had been books by George Warren (1667), Dr Edward Bancroft (1769) and Philippe Fermin (tr.1781).
37. Lochead W. Observations on the Natural History of Guiana. *Transactions of the Royal Society of Edinburgh* 1798; *Nicholson's Journal* **2**; 297-304, 347-353.

BOOK REVIEW

Red Berets and Red Crosses. The Story of the Medical Services in the 1st Airborne Division in World War II. N Cherry, R N Sigmond, Renkum, The Netherlands 1999. ISBN 90-804718-1-X. Price £17.95 plus £4 p&p from N Cherry, 3 Church Road, Warton, Lancs PR4 1BD.

This is a book which should be on the shelves of all those with an interest in military medical history. It describes the organisation, the personnel and the equipment of the Airborne Medical Services including of course the surgical teams. Their activities are documented in the expeditions to France, North Africa, Sicily and Italy, tales of heroism and achievement that led up to the ill-fated Battle of Arnhem. Almost half the book is concerned with the disasters of Operation Market Garden. The personal recollections by doctors and medics of how they tried to deal with the multiple wounded in the middle of a deadly battle have an immediacy unmatched by any fictionalised account. It is remarkable how those episodes, well known from books, films and television, spring to new life when seen from the viewpoint of the medical services. Our profession can be proud of the selfless work done by the anaesthetists including dentists under conditions of the utmost difficulty and danger.

Published in Holland, the book is splendidly presented. Over 100 photographs and maps are spread through its 168 pages; the dust wrapper, hard cover and glossed paper are all of the highest quality. Although the editing and indexing do not match these standards, the defects do not detract from a most important work.

Red Berets and Red Crosses is available from several military museums in England and from The Airborne Museum 'Hartenstein' at Oosterbeek in The Netherlands. For UK readers, purchase is recommended from the author. Niall Cherry who was a Combat Medical Technician in the RAMC is donating all profits to airborne forces charities. He deserves our congratulations and thanks for a thoroughly researched piece of medical history.

AMB

Correspondence

The Editor

'This Yankee dodge .....'

Sir,

The assertion by one of the Royal Society of Chemistry's speakers at the joint meeting held on November 2000, since modified, that the words: 'This Yankee dodge beats mesmerism hollow' were spoken not by Robert Liston but by James Young Simpson, prompted this attempt to pin down the origin of the report.

Although it is not mentioned at all by Dr Duncum, nor in John Snow's historical introduction in his *On Chloroform*, nor in the case notes of the patient, Frederick Churchill, several of the less academic histories of anaesthesia do attribute the sentence to Liston, and none to Simpson.[1] But, of course, one author could have copied from another, and the common source seems to have been a paper by Frederick William Cock[2] published in 1911, and reprinted in 1915.[3] This provides a very detailed account of the events of 21 December 1846, and cites among its references several witnesses who were actually present at the operation. According to Cock, Liston announced to the audience that: 'We are going to try a Yankee dodge today, gentlemen, for making men insensible'. After the conclusion of the operation, 'as he [the patient] goes out, Liston turns again to his audience, so excited that he almost stammers, and hesitates and exclaims: "This Yankee dodge, gentlemen, beats mesmerism hollow".'

From where did Cock, who was a generation removed from the event, get his information? He mentions meetings of old friends at his father's house, during which those present, including William Squire, reminisced at length. But personal evidence is provided by one who, as a medical student, was present in the operating theatre on 21 December 1846.[4] Sir John Russell Reynolds, speaking at a dinner on 1 October 1888, for present and past students of University College Hospital, described Liston's demeanour: 'I can see him now, as he said to the students, with playful eye and doubtful, almost scornful mouth: "Gentlemen, we are going to try a Yankee dodge for making men insensible"'. But after the successful administration: 'As if it were yesterday, I remember the expression on Liston's face as he turned round to us students and said: "This Yankee dodge, gentlemen, beats mesmerism hollow" '.

So we have this personal reminiscence, but to what extent is it to be trusted? There are also two little known accounts of 21 December and the preceding two days, published many years later, by the medical student who administered the ether, William Squire.[5] Squire had been taken under Liston's wing, on account of Liston's friendship with William's uncle, the pharmacist Peter Squire. On the morning of Saturday 19 December Liston had shown Boott's letter to William Squire, and had taken him to Boott's house, where it seems they witnessed Robinson administering ether, not entirely successfully; William's account in this respect is not clear. Boott, in his letter to the *Lancet*, describing the very first case, Miss Lonsdale, on whom the ether worked perfectly, said that the witnesses were his wife, two of his daughters, and himself. Had Liston been there he would surely have been mentioned. Afterward, Robinson used the same apparatus on three or four cases, 'and failed in each case to produce insensibility'.[6] Probably it was these later cases that Liston and William Squire witnessed. Evidently Robinson did not on that occasion use the apparatus he later described, which bore a remarkable resemblance to that devised by Squire.

Liston then suggested to William that they consult his uncle, so they visited Peter Squire's shop in Oxford Street, where one of the assistants was persuaded to inhale ether vapour from a cloth. Again the result was not entirely satisfactory, and Liston specified that he would need one minute of unconsciousness to amputate a thigh. Peter Squire thereon constructed a vaporiser from part of a Nooth's apparatus, and William inhaled from it. He describes that a puncture was made under his thumb nail by Liston, which he did not feel. He inhaled again on the Sunday, and tried it on others too. In the meantime Liston had written to several influential people, John Forbes, editor of the *Medico-Chirurgical Review*, Boott and Robinson and, William thought, Wakley of the *Lancet*, among others, inviting them to witness the attempt.

So Liston did not just breeze into the theatre that Monday afternoon and announce casually that he was going to try a Yankee dodge. According to Squire's account, Liston, before the operation, addressed all those present; he 'spoke of the letter from America, of the advantages to be hoped for from anaesthesia, of the weak condition of the patient, hardly able to sustain the operation without this unexpected aid, and asking the forbearance and quietude of all present'. Evidently he had made very careful preparations for the success of the undertaking, and Squire explains that he had a reason: 'Some of the mesmeric deceptions made by the O'Keys at University College Hospital, which had recently been exposed by Mr Wakley, were likely to cause any new attempts at avoiding pain to be regarded with suspicion.[7] Liston, therefore, looked into every detail himself before arranging for the operation next day under ether'. Squire continues: 'There can be little doubt that the care and precautions taken in private under Liston's observation had much to do with the success of the first public trial of anaesthesia by ether, with the wide use it soon obtained, and the strong conviction Liston formed of its very great importance'. It seems that Liston immediately grasped that an operation could be performed under anaesthesia on a patient hitherto thought to be too weak to undergo it.

So Liston's demeanour would hardly have been as described by Reynolds, although perhaps he did use the words *Yankee dodge*, and *mesmerism*. The mention of mesmerism reminds us that, apart from the deception practised by the O'Keys, Elliotson also, until he was forced off the staff, practised mesmerism at University College Hospital.

With all the above evidence, surely it must be agreed that Simpson does not come into the picture at all. William Squire's paper should be much better known. The absence of an account of Liston's preparations from 19 to 21 December is one of the very few instances where one wishes that the academic historians had provided rather more detail.

Yours sincerely,

D Zuck

References

1. Raper RH. *Man against Pain - the Epic of Anaesthesia*. London: Gollancz, 1947, 49; Thorwald J. *The Century of the Surgeon*. London: Thames and Hudson, 1957, are just two examples.
2. Adams AK. Frederick William Cock (1858-1943), a neglected historian of anaesthesia. *Proceedings of the History of Anaesthesia Society* 1997; **21**:62-67.
3. Cock FW. The first major operation under ether in England. *UCH Magazine* 1911;! 127-144, and *American Journal of Surgery*, Anesthetic Supplement 1915; **29**:98-108.
4. Reynolds JR. *Essays and Addresses*. London: Macmillan, 1896; 273-274. Cited by Massey Dawkins CJ. The first public operation carried out under an anaesthetic in Europe. *Anaesthesia* 1947; **2**:51-61.
5. Squire W. On the introduction of ether inhalation as an anaesthetic in London. *Lancet* 1888; **2**:1220-1221. The first operation under ether in Great Britain. *British Medical Journal* 1896; **2**:1142-1143. Squire's two accounts differ in some details.
6. Robinson J. *A Treatise on the Inhalation of the Vapour of Ether*. London: Webster, 1847:6. (It is of interest, in passing, that the original copy of this book which was reproduced in facsimile by Ballière Tindall in 1983, sponsored by Boots, with a preface by Richard Ellis, belonged at one time, as can be seen from the signature on the original cover, to F William Cock.)
7. Woolley B. *The Bride of Science - Romance, Reason and Byron's Daughter*. Basingstoke: Pan Books, 2000; 226-230.

OBITUARIES

Dr P Astrup

On 1 December 2000, Prof John Severinghaus sent a moving message by e-mail to many of his friends in anaesthesia. At the Hon Editor's request he gave permission for it to be published in the *Proceedings*.

Dear friends,
Elinor and I returned last night from a high altitude research conference in Copenhagen with sad news which we learned as we left our hotel. The distinguished Danish founder of modern acid-base balance, Poul Astrup, died two nights ago, 29 November, after joining Elinor and me and another couple, old friends, at an elegant restaurant in the Copenhagen countryside, Sollerod Kro. We had a very fine dinner and conversation that evening, with no sign of trouble. He suddenly fell dead in his home bathroom about an hour after returning home, presumably ventricular fibrillation. Dr Astrup had had cardiac problems, and several cerebral emboli, and had been resuscitated by CPR and defibrillation almost a year ago, five minutes after arriving on his own at a hospital.

Astrup, and his student Ole Siggaard Andersen, introduced the modern concept of analysis of acid-base balance called base excess, as a quantitative measure, in milliequivalents per litre, of the imbalance in blood, and later, in the body extracellular fluid compartment. He also conceived the then only method for rapid analysis of blood pCO_2 by pH measurement before and after equilibration of the sample with known gas pCO_2 values. I collaborated with Astrup in improving the accuracy of the standard oxygen dissociation curve, the effects on it of pH variation, and the methods of calculating the effects of pH, temperature and affinity (known as P50) on the relationship of pO_2 to saturation. He and I had been friends and collaborators for 41 years since our meeting at a Ciba Symposium on acid-base balance in London in December 1959, published by John Nunn and Ronald Woolmer. Astrup and I wrote several books on the history of acid base balance, my part being only to describe what happened after he became involved in 1951-2 during the Copenhagen polio epidemics. We agreed he would write from the alchemists to Astrup, I taking it from 1950.

Astrup and his wife Bente have 4 children, the eldest, Jens now being Professor and Chairman of Neurosurgery in Aarhus. The Astrups have lived since 1960 on a large and beautiful Danish manor-farm, raising Black Angus cattle, surrounded by a Royal forest, 'Rude Skov'. When our sabbatical in Denmark finished in 1965 our 6 year old son Jeffrey said goodbye to Poul Astrup with the memorable line: 'Thank you for the hay', because for him the most important event was sliding down the hay loft in Astrup's barn. Yours, John and Elinor Severinghaus.

Dr N H Gordon

Dr Nick Gordon of Edinburgh, died in October 2000. He was a Consultant Anaesthetist at the Western General Hospital who became one of the early members of the History of Anaesthesia Society. In 1989, when the Society first met in Edinburgh, he presented a paper (Vol 6a, 7-11) urging greater recognition by anaesthetists of the pioneering work by James Young Simpson, and particularly his masterly responses to the detractors of anaesthesia.

Dr G Jackson-Rees

'Jack' Rees, as he was generally known, died peacefully at home on 8 December 2000. An enthusiastic member of the History of Anaesthesia Society, he gave several papers including the Sims-Portex Lecture in Glasgow in 1993 on: *The introduction of long-term intubation into the UK.* His achievements in the field of paediatric anaesthesia were highlighted by G H Bush in Volume 24 of the *Proceedings* (The Liverpool contribution to the development of paediatric anaesthesia).

Growing up in Shropshire, he qualified in Liverpool in 1942 and did wartime service in the RAF. In 1949 he joined T C Gray in the new Department of Anaesthesia, and quickly assumed responsibility for paediatric anaesthesia services. The outcome was the publication in 1950 of two ground-breaking papers on anaesthesia for neonates and the concept of the triad of anaesthesia which gained him an international reputation. He subsequently received invitations to lecture all over the world, and was awarded numerous honours.

He was the most generous and confidence-inspiring of men and had a priceless ability to convey in conversation that you were the only person that mattered.

A fuller appreciation will appear in Volume 29.

PMED

ABRIDGED CONSTITUTION OF HISTORY OF ANAESTHESIA SOCIETY

(The full constitution is available from the Hon Secretary)

AIMS AND OBJECTS
To promote the study of the history of anaesthesia and related disciplines, and provide a forum and social ambience for discussions amongst members.

MEMBERSHIP
Ordinary Members. Anyone over 18 who is interested in the study of the history of anaesthesia is eligible to be nominated.
Honorary Members are elected from amongst eminent persons.

ELECTION OF MEMBERS
Candidates for election as Ordinary Members shall be approved by Council on receipt of the correctly completed application form and being in good financial standing with the Society. Honorary Members will be elected at the Annual General Meeting on the nomination of Council, and will have voting rights.

ANNUAL GENERAL MEETING
To be held in each financial year. Notice to members at least one month in advance.
Ten ordinary members in addition to any Officers present shall constitute a quorum.
The following business shall be conducted at each AGM:

a. Elect Officers and other members of Council.
b. Receive report of Hon Treasurer.
c. Elect auditors.
d. Receive the report of Council.
e. Choose date and place for next AGM.
f. Such other business as Council may decide.

Decisions shall be taken by a majority of those casting their vote unless the meeting determines otherwise by resolution. The Chairman of the meeting shall have a casting vote.

NOTICE OF BUSINESS
Any member wishing to move a Resolution at the AGM shall give notice thereof in writing (or by e-mail) to reach the Secretary not less than ten days before the date of that meeting.

SPECIAL GENERAL MEETING
Special General Meetings may be called from time to time by Council. Also the Secretary shall call a Special General Meeting within six weeks of receipt of a requisition signed by at least ten members stating the purpose for which the meeting is to be called. At a meeting called by requisition no other business shall be considered beyond that referred to in the requisition.

SUBSCRIPTIONS
The annual subscription shall be payable in advance and become due on 1st July each year. The subscriptions for Members for the next year shall be determined by resolution at each AGM. Honorary members will not pay any subscription.

New members shall pay that year's annual subscription on election and sign a Bankers Order for future payment of subscriptions. The Hon Treasurer may make other arrangements at his discretion for overseas members. The period for which subscriptions should be paid in advance must not exceed five years except at the discretion of the Honorary Treasurer.
An Ordinary Member whose subscription is 12 months in arrears, and who has been duly notified by 'recorded delivery', shall cease to be a member of the Society. He may be reinstated on payment of arrears with the consent of Council.
It shall be the duty of the members to notify the Secretary in writing of any change of address.

OFFICERS
The Officers of the Society shall normally consist of a President, a Vice President who shall normally be President-Elect, an Hon Treasurer and Membership Secretary, an Hon Secretary and an Hon Editor.
An Assistant Hon Treasurer, an Assistant Hon Secretary and Assistant Hon Editor may also be elected.

ELECTION OF OFFICERS
The President shall normally be proposed for election as Vice President from among Ordinary Members of the Society on the nomination of Council, at the AGM next but one (two working years) before the AGM at which he is due to be installed as President. The President shall hold office for two years and sit on the Council for one year after, as Immediate Past President. If the Vice President is unable or unwilling to assume the office of President, Council shall propose a suitable person from amongst the Ordinary Members for election as President.
The Hon Treasurer and Membership Secretary shall be proposed for election from amongst the Ordinary Members on the nomination of Council. He shall hold office for one year and be eligible for re-election, normally for up to six years.
The Hon Secretary shall be proposed for election from amongst the Ordinary Members on the nomination of Council. He shall hold office for one year and be eligible for re-election, normally for up to six years.
The Hon Editor shall be proposed for election from amongst the Ordinary Members by Council. He shall hold office for one year and be eligible for re-election, normally for up to six years.
The Assistant Hon Treasurer and the Assistant Hon Secretary shall be proposed for election from amongst the Ordinary Members by Council as occasion demands. They shall hold office for one year and be eligible for re-election, normally for up to six years.
The names of persons nominated as Officers shall be circulated with the agenda of the AGM.

COUNCIL
The business of the Society shall be conducted by a Council consisting of the President, Vice President, Hon Treasurer, Hon Secretary, and such Officers as may be elected by the AGM, and eight Ordinary Members. Normally there shall be no more than one vacancy.
Candidates for election must be nominated in writing by a Member, including the written agreement of the nominee. A list of nominees shall be circulated with the agenda of the AGM. Election will be by the Members at that meeting either by a show of hands or by ballot.
Ordinary Members of Council shall hold office for three years. Exceptionally such office may be held for up to five years following approval at an AGM. Retiring Members of Council shall not

be eligible for re-election as Ordinary Members of Council, for one year after completing a term of office.
Council shall have the power to co-opt as members, or invite as observers, persons whose advice would be likely to assist the deliberations of Council.
Council may act notwithstanding vacancies on its body.

COUNCIL MEETINGS
Four members of Council including at least one Officer shall constitute a quorum.
Exceptionally, urgent business may be conducted by five such Members by post, telephone, fax or e-mail.
Ordinary meetings of Council shall, unless the President otherwise directs, be held at least twice each year.
Special Meetings may be convened by a requisition in writing from two Council Members.

EXPENSES AND REMUNERATION
Council shall have discretion to reimburse members for expenses incurred in the services of the Society or to remunerate other persons who assist Council from time to time.

AUDIT OF ACCOUNTS
The accounts shall as soon as practicable after the end of each financial year be audited by auditors appointed by the AGM. The audit shall be completed before the AGM.

AMENDMENTS TO THE RULES
These rules may be added to, amended or repealed by Resolution at any AGM, with a majority of at least two-thirds of the members voting thereon. Notice of any such proposal must be sent to the Hon Secretary in writing (or by e-mail) no later than one month before the AGM.

DIRECTORY OF MEMBERS
A Directory of members shall be kept by the Hon Treasurer and Membership Secretary by whatever means shall be most convenient to the Society, not excluding electronic data processing. It is incumbent on each member to ascertain that his name and address and other particulars are correctly entered therein.

June 1995
Abridged by AMB, February 2001

HISTORY OF ANAESTHESIA SOCIETY

Ordinary Members

Dr C K Adam
Dumgoyne, 6 Sillermole Road
Leven
Fife KY8 5NA

Prof A P Adams
64 York Road
Cheam, Sutton
Surrey SM2 6HJ
E-mail: tony.adams@talk21.com

Dr C N Adams
118 Appledown Drive
Bury St Edmunds
Suffolk IP32 7HQ
E-mail: adams118@keme.co.uk

Dr A Adatia
23 Pitch & Pay Park
Bristol BS9 1NL

Dr J D Alderson
36 Stone Delf
Sheffield S10 2QX

Dr Lauren Allan
'Great Poplars', Rasehill Close
Chorleywood Road
Rickmansworth
Herts WD3 4EW

Dr J G Allen
59 Tennyson Avenue
Kings Lynn
Norfolk PE30 2QG

Dr P Amoroso
66 Lullington Garth
Finchley
London N12 7BY

Dr J M Anderton
21 Carlton Road
Hale
Altrincham
Cheshire WA15 8RH

Dr T N Appleyard
78 Chelsea Road
Sheffield S11 9BR
E-mail: NeilTApple@aol.com

Dr G M D Archer
46 Cumberland Street
London SW1V 4LZ

Dr E N Armitage
'Hallett's Barn', Common Lane
Ditchling, Hassocks
West Sussex BN6 8TN
E-mail: EdwardArmitage@aol.com

Dr N H Ashurst
Anaesthetics Department
Bradford Royal Infirmary
Duckworth Lane
Bradford BD9 6RJ
E-mail: harry@ashurstn.fsnet.co.uk

Association of Anaesthetists
(Hon Secretary - for information)
9 Bedford Square
London WC1B 3RA

Dr D F Baigent
5 Wimborne Road
Stoneygate
Leicester LE2 3RQ

Dr C R Bailey
5 Burstock Road
London SW15 2PW

Dr R Bajekal
19 Stanstead Manor
Cheam Road
Sutton, Surrey SM1 2AY
E-mail: bajekal@doctors.org.uk

Dr A N Bamji
'Torphins', 14 Burntwood Road
Sevenoaks
Kent TN13 1PT
E-mail: Andrew_Bamji@compuserve.com

Dr C J Barham
'Spyways'
Hartfield
East Sussex TN7 4DZ

Dr J Barker
2 Kirkhouse Avenue
Blanefield
Glasgow G63 9BT

Dr A M Barr
'Norscot', Rosebery Road
Tokers Green
Reading, Berkshire RG4 9EL
E-mail: Marshall.Barr@btinternet.com

Dr Moyna Barton
3 Grosvenor Road
London W4 4EJ

Dr P J Baskett
'Stanton Court'
Stanton St Quintin,
nr Chippenham
Wiltshire SN14 6DQ

Dr Anna M Batchelor
6 Haddington Road
Whitley Bay
NE25 9UX
E-mail: A.M.Batchelor@ncl.ac.uk

Dr J L Bembridge
8 St Francis Gardens
Fixby
Huddersfield HD2 2EU

Dr M Bembridge
8 St Francis Gardens
Fixby
Huddersfield HD2 2EU

Dr J A Bennett
'Millards'
Itchington, Alveston
South Gloucestershire BS35 3TQ

Dr F E Bennetts
Montrose, 30 Rothesay Drive
Highcliffe-on-Sea
Christchurch
Dorset, BH23 4LB
E-mail: F.E.Bennetts@btinternet.com

Dr D P Bennie
Midpark Lodge
Bankend Road
Dumfries DG1 4TN

Dr D W Bethune
Brook House
5 Newtown
Kimbolton
Huntingdon, Cambridgeshire PE18 0HY

Dr P J Bickford Smith
'Cliffe House'
Cragg Wood Drive
Rawdon, Leeds LS19 6LG

Dr R C Birt
'The Old Worlds End'
Church End
Paglesham, Rochford
Essex SS4 2DN
E-mail: C.Birt@Virginnet.co.uk

Miss Jane Blandford
c/o Midland Bank
114 St Mary Street
Cardiff CF1 1LF

Dr J Blizzard
'Pitt Lodge'
94 Galleywood Road
Great Baddow
Chelmsford
Essex CM2 8DP

Dr Anne Blyth
Kingston Hospital
Galsworthy Road
Kingston-upon-Thames
Surrey KT2 7QB

Prof R I Bodman
2 Riverview Terrace
Glenbrook
Co Cork, Eire

Dr M I Bowden
10 Ascot Road
Moseley
Birmingham B13 9EL

Dr E M Bradford
84 Crawford Road
Milngavie
Glasgow G62 7CF

Dr E G Bradshaw
45 Bishops Road
Hanwell, London W7 2NZ
E-mail: bradshaw@ealingas.demon.co.uk

Dr P J Brock
23 Luckmore Drive
Earley
Reading
Berkshire RG6 2RP

Dr J P M Brookes
Buckton, Llangorwen
Aberystwyth SY23 3DP

Dr S Brosnan
66 Ridgeway Road
Chesham
Bucks HP5 2EW

Dr Doreen Browne
7 Crown Reach
145 Grosvenor Road
London SW1V 3JU

Dr G P Browne
7 Heidegger Crescent
London SW13 8HH

Dr M Bruce
'Beauparcq'
Route de la Trinite
Jersey
Channel Islands JE3 5JP

Dr T Bryson
10 South Drive
Upton, Wirral
Merseyside L49 6LA

Dr P Bull
Kota Tinggi, Mansfield Road
Farnsfield, Newark,
Notts NG22 8HG

Dr S R Burnley
78 Middleton Hall Road
Kings Norton
Birmimgham B30 1DP

Dr R Margaret Burnstein
36 St Andrews Road
Cambridge CB4 1DL

Dr G W Burton
28 Cote Park
Stoke Bishop
Bristol BS9 2AD

Dr J D Burton
'Rusty Stack', Bulkington Road
Wolvey, nr Hinkley
Leicester LE10 3LA

Dr T N Calvey
16 Mill Lane
Goostrey
Cheshire CW4 8PN

Dr C Carey
38 Felix Road
Ealing
London W13 0NT
E-mail: chris@crc2001.freeserve.co.uk

Dr D Carnegie
Long Range
Keyhaven
Lymington, Hamps SO41 0TQ

Dr A J Carter
Little Orchard
21 Church Road
Alsager
Stoke on Trent ST7 2HB

Dr F F Casale
18 The Avenue
Colchester CO3 3PA

Dr J A Chamberlain-Webber
'Deepdene', 47 Falmer Road
Rottingdean
Brighton BN2 7DA

Dr J E Charlton
Department of Anaesthetics
Royal Victoria Infirmary
Newcastle upon Tyne NE1 4LP
E-mail: jecharlton@compuserve.com

Mr J Chespy
102 Castle Road
Chatham
Kent ME4 5HX

Dr G S Clark
49 Castle Rise
Cardiff CF3 9BB

Prof R S J Clarke
78 Kings Road
Belfast BT5 6JN

Dr W B Clarkson
74 Magdalen Road
Exeter
Devon EX2 4TR

Mr A D Clover (Complimentary member)
13 Claremont Hill
Shrewsbury
Shropshire SY1 1RD
E-mail: a.clover@virgin.net

Dr A J P Clover (Complimentary member)
50 Main Street
Ratby
Leics LE6 0CC
E-mail: doctorjim@hotmail.com
E-mail: youngdjm @aol.com

Dr D P Coates
47 Glenavon Park
Bristol BS9 1RN

Dr Barbara B Collier
14d John Spencer Square
London N1 2LZ

Dr I D Conacher
'Aldham House',
Barmoor Lane, Ryton
Tyne and Wear NE40 3AN
E.mail: I.D.Conacher@btinternet.com

Dr H Connor
1 Vineyard Road
Hereford HR1 1TT

Dr M Cook
9 Constitution Hill
Ipswich IP1 3RG

Dr I M Corall
PO Box 3261
London SW1V 3XB

Dr R Cormack
'Rose Cottage', 2 Little Common
Stanmore
Middlesex HA7 3BZ

Dr Belinda Cornforth
5 The Grange
Wombourne
Staffordshire WV5 9HX
E-mail: belinda cornforth@compuserve.com

Dr P D M Costen
La Broderie
Route de la Claire Mare
St Peters
Guernsey GY7 9QA, Channel Islands
E-mail: pcosten@guernsey.net

Dr M J Cowen
'The Manor'
Woughton on the Green
Milton Keynes MK6 3BE

Dr D J Daniel
2 The Spinney
Hartlepool
Cleveland TS26 0AW

Dr H T Davenport
23 Green Lane
Northwood
Middlesex HA6 2UZ

Dr A Davey
160 Woodland Drive
Hove
East Sussex BN3 6DE

Dr J Davies
46 Serpentine Road
Selly Park
Birmingham B29 7HU

Dr N J H Davies
Wood End House
Ridgeway Lane
Lymington
Hampshire SO41 8AA

Dr G R Dickson
71 Moorcroft Road
Moseley
Birmingham B13 8LS

Dr C Dodds
'Orchard House'
25 Doctors Lane
Hutton Rudby, Yarm
Cleveland TS15 0EQ
E-mail: ChrisDodds@ea-cdodds.freeserve.co.uk

Dr L Donaldson
7A Fairfield Road
West Ferry
Dundee DD5 1NX

Prof A Dronsfield
4 Harpole Close
Swanwick
Derbyshire DE55 1EW
E-mail: A.Dronsfield@derby.ac.uk

Dr P Drury
80 Green Lane
Liverpool L18 2ER
E-mail: PMEDrury@aol.com

Dr R Eastley
18 Swinfield Road
Quorn
Leicester LE12 8RJ

Dr Audrey Eccles
39 Beacon Bottom
Park Gate
Southampton
Hampshire SO31 7GQ

Dr R S Edmondson
34 Hall Drive
Bramhope
Leeds LS16 9JE

Dr A Eleri Edwards
Arnon
Abbey Road
Llangollen LL20 8SL

Dr G E H Enderby
'Furzefield'
Dormans Park
East Grinstead
West Sussex RH19 3NU

Dr G Enever
Eland Villa, 2 Berwick Hill Road
Ponteland
Northumberland NE20 9UU
E-mail: G.R.Enever@ncl.ac.uk

Dr M L Evans
25 Glan yr Afon Road
Sketty
Swansea SA2 9JA

Dr S Fenlon
34 Cobden Road
Sevenoaks
Kent TN13 3UB

Dr Ann Ferguson
New Barn, 39a Grange Road
Broadstairs
Kent CT10 3ER
E-mail: annferguson@doctors.org.uk

Dr D J M Ferguson
14 Cromarty Crescent
Bearsden
Glasgow G61 3LU

Dr R Flanagan
79 Durban Road
London SE27 9RW
E-mail: Robert.Flanagan@gstt.sthames.nhs.uk

Dr Ann M Florence
49 Howey Lane, Frodsham
Warrington
Cheshire WA6 6DD

Dr S Forde
Officers' Mess
RAF Wittering
Peterborough PE8 6HB
E-mail: mail@gasco.demon.co.uk

Dr A L Forrest
East Grange Farmhouse
Grange Road
St Andrews
Fife KY16 8LL

Dr C A Foster
Glebe Farm
Sternfield
Saxmundham
Suffolk IP17 1ND

Mr Joe (DG) Foster
12 East End Terrace
Ashburton
Devon TQ13 7LD

Dr R Foster
'Netherwood', 2 Kingsmede
Wigan
Lancashire WN1 2NL
E-mail: rfgas@hotmail.com

Dr Phillida M Frost
Arrow Brook, Bath Road
Devizes
Wiltshire SN10 1QE

Dr C A Fuge
Mayfield House
Claverton Down Road
Combe Road
Bath BA2 7AD

Dr T Gale
1 Cott Road
Lostwithiel
Cornwall PL22 0ET
E-mail: galetm@hotmail.com

Mr M R Garner
70 Latimer Road
Cropstone
Leicester LE7 7GN

Mrs S E Garner
70 Latimer Road
Cropstone
Leicester LE7 7GN

Dr E P Gibbs
83 Church Street
Great Burstead
Billericay
Essex CM11 2TS

Dr E Gibson
1 Silvermere
Cobham
Surrey KT11 1DZ

Dr A A Gilbertson
Winster
Longworth Way
Woolton Park
Liverpool L25 6JJ
E-mail: regional@rsmdean.freeserve.co.uk

Dr Edith Gilchrist
95 Hillway
Highgate
London N6 6AB

Dr A Gilston
20 Hocroft Avenue
London NW2 2EH

Dr D K Girling
19 Oakhurst Drive
Newcastle-upon-Tyne NE3 4JS

Dr N S Gorbutt
2 Norfolk Park
Plains Road
Nottingham

Dr Julienne Goodwin
33 The Village
Haxby, York YO32 3HU
E-mail: olli@ollitwig.fsnet.co.uk

Dr M B Gough
'Quidi Vidi',
Church Lane
North Thoresby
Grimsby, Lincs DN36 5QG

Dr T R Gould
14 Chalgrove Road
Sutton
Surrey SM2 5JT

Dr P Goulden
29 Birkdale Road
Dewsbury
West Yorks WF13 4HG

Prof T C Gray
6 Ravenmeols Lane
Formby,
Liverpool L37 4DF

Dr R Griffin
11 Inglis Road
Colchester, Essex CO3 3HG
E-mail: rongriffin@talk21.com

Dr J Groves
25 Barkers Road
Sheffield S7 1SD

Mr J D L Groves
25a Billing Close
Old Catton
Norwich NR6 7EL

Dr G Hall-Davies
'Park House'
463 Birmingham Road
Bordesley
Redditch B99 6RL
E-mail: ghall_davies@hotmail.com

Dr G W Hamlin
4 Rogersfield
Langho
Blackburn BB6 8HB

Dr Helen B Hannah
42 The Common
Bromham
Chippenham
Wiltshire SN15 2JJ

Dr J G Hannington-Kiff
'Winterstoke'
Calthorpe Road
Fleet
Hants GU13 8LW

Dr C M Harper
29a Hampstead Lane
London N6 4RT
E-mail: wobble7d@hotmail.com

Dr B Hayes
11 The Spinney
Handsworth Wood
Birmingham B20 1NR

Dr S R T Headley TD
'Vine Cottage'
2 Lancaster Gardens
Wimbledon, London SW19 5DG

Prof T E J Healy
Alderley Grange, Chelford Road
Alderley Edge
Cheshire SK9 7TJ

Dr A G Henderson
62 Holywell Road
Dunstable
Beds LU6 2PD

Dr J D Henville
Nuffield Department of Anaesthesia
Radcliffe Infirmary
Oxford OX2 6HE

Dr Penelope B Hewitt
150 Burdon Lane
Belmont, Sutton
Surrey SM2 7DQ

Dr R Hibbert
Boon Cottage, 27 Linthurst Road
Barnt Green
Birmingham B45 8JL

Mr G G P Holden OBE
'Brook Lodge', Westbrook Drive
Chesterfield S40 3PQ

Dr E Holmes
5 The Meadows
Wittersham, Tenterden
Kent TN30 7NZ

Dr J A G Horton
24 Oakfield Road
Gosforth
Newcastle-upon-Tyne NE3 4HS

Dr Jean M Horton
18 Amhurst Court
Grange Road
Cambridge CB3 9BH
E-mail: jeanhorton@tarrel.demon.co.uk

Brigadier I T Houghton
Department of Anaesthesia
Royal Hospital, Haslar
Gosport, Hampshire PO12 2AA

Dr B C Hovell
397 Beverley Road
Anlaby
North Humberside HU10 7BQ

Mr A Humphries
The Librarian
Thackray Medical Museum
131 Beckett Street
Leeds LS9 7LP

Dr C D Hutter
32 Fellows Road
Beeston
Nottingham NG9 1AQ

Dr M T Inman
'Moorholme'
Dousland
Yelverton
Devon PL20 6LY
E-mail: mike@inman.force9.co.uk

Dr Ruth Irvine
116 Banstead Road South
Sutton, Surrey SM2 5LH

Dr R D Jack
108 Palewell Park
London SW14 8JH
E-mail: rjack108palewell@cs.com

Dr A Jackson
'The Weathervane'
22A Moorend Park Road
Leckhampton
Cheltenham GL53 0JY

Dr M Jackson
The Old Vicarage
Ashton Keynes
Swindon
Wiltshire SN6 6PB

Dr R H Jago
'Elms House', The Street
Swallowfield, Reading
Berkshire RG7 1RE

Dr L Jakt
22 Union Place
Truro, Cornwall TR1 1EP
E-mail: Lars.Jakt@RCHT.SWEST.NHS.UK

Dr Nabila Jamali
Department of Anaesthetics
Hinchinbrooke Hospital
Hinchinbrooke Park, Huntingdon
Cambridge PE18 8NT

Dr R L Jayaweera
4 Connaught Drive
London NW11 6BJ

Dr J R E Jenkins
Bullcroft
Michaelston-le-Pit, nr Dinas Powis
South Glamorgan CF6 4HE

Dr A G Jones
74 Bertram Drive
Meols, Wirral CH47 0LJ
E-mail: jonesag@argonet.co.uk

Dr Glenys Jones
Department of Anaesthesia
Eastern General Hospital
Seafield Street
Edinburgh EH6 7LN

Dr M D Jowitt
65 Gainsborough Road
Blackpool
Lancs FY1 4DZ

Dr N S Kaduskar
4 Greenside Close
Nuneaton, Warwickshire CV11 6PB

Dr L Kaufman
7 North End Road
London NW11 7RJ

Dr P Keep
7 Bluebell Crescent
Eaton, Norwich
Norfolk NR4 7LE

Dr A Kitsberg
14 Ambassador Court
Century Close
Hendon, London NW4 2EE
E-mail: kitz@globalnet.co.uk

Dr P A Knappett
'Glenthorne', Lode Pit Lane
Eldwick
Bingley
West Yorkshire BD16 3AN

Dr Mary Knowles
'The Old Bells
Bramley, Basingstoke
Hants RG26 5DB

Dr K L Kong
25 Hampshire Drive
Edgbaston
Birmingham B15 3NY

Dr S Krige
35 Chelsea Gardens
Chelsea Bridge Road
London SW1 W8RG
E-mail: simonkrige@hotmail.com

Dr A Kuipers
The Old School
Nesscliffe, nr Shrewsbury
Shropshire SY4 1DB
E-mail: A.J.K@btinternet.com

Dr R S Laishley
25 Park Hill
Ealing
London W5 2JS

Dr G Lamplugh
Calderhey
45 Calderstones Road
Liverpool L18 3HY

Dr D G Larard
Moreton Lodge
9 Eastnor Grove
Leamington Spa
Warwickshire CV31 1LD

Dr C J Lawrence
Reader in the History of Medicine
The Wellcome Institute for the History of Medicine, 183 Euston Road
London NW1 2BE
E-mail: c.lawrence@wellcome.ac.uk

Dr G M Lawrence Senior Curator
Clinical Medicine, The Science Museum
London SW7 2DD

Dr J I M Lawson
'Bernera', Maryfield Road
Broughty Ferry
Dundee DD5 2JJ

Dr Maire Leahy
2 Greenside Close
Hawkshaw,
Bury
Lancashire BL8 4LE

Dr K G Lee
26 Westwood Avenue
Timperley
Altrincham
Cheshire WA15 6QF

Dr J F Lees
11 Maple Walk
Sutton
Surrey SM2 5NF

Dr J M Leigh
ITU, Royal Surrey County Hospital
Egerton Road
Park Barn
Guildford
Surrey GU2 5XX

Dr Agnes Leslie
5 Pear Tree Drive
Great Barr
Birmingham B43 6HR

Dr Z Lett
23 Glyne Hall
De La Warr Parade
Bexhill on Sea
East Sussex TN40 1LY

Dr I D Levack
Department of Anaesthesia
Ninewells Hospital and Medical School
Dundee DD1 9SY
E-mail: IDLevack@aol.com

Dr D G Lewis
Strangford House
3 Shirley Road
Leicester LE2 3LL

Dr J M Lewis
10 Kingston Road
Sketty
Swansea SA2 0ST

Dr J R Lo
174 Leigh Hunt Drive
London N14 6DQ

Dr A Logan
138 Watergate Road
Newport
Isle of Wight PO30 1YQ

Dr W G Loyn
Llechwedd, 58 Maeshendre
Waunfawr
Aberystwyth Dyfed SY23 3PS

Dr M C Luxton
11 Lenton Road
The Park
Nottingham NG7 1DQ

Dr A G MacDonald
29 Newlands Road
Glasgow G43 2JD

Dr S MacDonnell
Department of Anaesthesia
Colchester General Hospital
Colchester CO4 5JL

Dr D W R MacFarlane
25 St Mary's Road
Harborne
Birmingham B17 0EY

Dr A A Mackenzie
Wayside, Woodfield Lane
Belbroughton
Stourbridge DY9 9UT
E-mail: angus@romsley.demon.co.

Dr K Macleod
36 Green End
Great Stukeley, Huntingdon
Cambridgeshire PE17 5AE
E-mail: kenmacleod@doctors.org.uk

Dr P Magee
18 Woodland Grove
Claverton Down
Bath BA2 7AT
E-mail: Ptmagee00@aol.com

Dr E A Maher
'Grovebury House'
The Street, Horringer
Bury St Edmunds
Suffolk IP29 5SN
E-mail: annmaher@waitrose.com

Dr R Marjot
'The Manor House'
Englishcombe Village
Bath BA2 9DU
E-mail: Bath@marjot.freeserve.co.uk

Dr A Marsh
31 Ouley Road
Ballinaskeagh
Banbridge
BT32 5DD Northern Ireland

Dr R H K Marsh
'New Barns', High Street
Ravensthorpe
Northampton NN6 8EH
E-mail: richard.marsh@doctors.org.uk

Dr C F Marshall
Jubilee Cottage
South Street
Houstom
Renfrewshire PA6 7EN

Dr J S Mather
1 Cedar Court, Upper Hall Estate
Worcester Road
Ledbury, Herefordshire HR8 1JA

Dr E T Mathews
54 Selley Wick Road
Selly Park
Birmingham B29 7JB

Dr Rebecca Mawer
Tinten, 7 Rosemundy
St Agnes
Cornwall TR5 0UE
E-mail: rebecca.mawer@rcht.swest.nhs.uk

Dr T E McEwan
30 Manor Way
South Croydon
Surrey CR2 7BS

Dr A McGlennan
51 Lower Road
Harrow
Middlesex HA2 0DE
E-mail: Alan_McGlennan@hotmail.com

Dr S W McGowan
41 Whitefauld Road
Dundee DD2 1RJ

Dr A C McKay
33 Tweskard Park
Belfast
Northern Ireland BT4 2JZ

Dr A G McKenzie
The Royal Infirmary
Lauriston Place
Edinburgh EH13 9YW
E-mail: anaes@ed.ac.uk

Dr C A B McLaren
12 Broad Acres, Broad Town
Wootton Bassett
Wiltshire SN4 7RP
E-mail: c.mclaren@eidos.co.uk

Dr I McLellan
The Glenfield Hospital NHS Trust
Groby Road
Leicester LE3 9QP
E-mail: ian@imclellan.freeserve.co.uk

Dr Mani Mehta
2 Grange Crescent
Marton
Middlesbrough
Cleveland TS7 8EA

Dr J A K Meldrum
Heath House
1 Millgate
Lisvane, Cardiff CF4 5TY

Dr L M Mendonca
32 Osborne Road
Potters Bar
Herts EN6 1SF

Mrs Gillian Miller
25, Leabrook Close
Bury St Edmunds
Suffolk IP32 7JH

Dr R I Miller
11 Station Road
Elmesthorpe
Leiester LE9 7SG
E-mail: 106221.3702@compuserve.com

Dr G W Minto
c/o Ground Floor Flat
229 Fordwych Road
London NW2 3NH

Dr J A Monro
Mander Hill, Andrew Hill Lane
Hedgerley
Buckinghamshire SL2 3UL

Dr Alison J Moore
Point Quay House
Point, Devoran
Truro
Cornwall TR3 6NL
E-mail: alimoore@btinternet.com

Dr W J Moore
Consultant Anaesthetist
The County Hospital
Hereford HR1 2ER

Dr Caron Moores
Department of Anaesthesia
Royal Liverpool Children's Hospital
Alderhey
Eaton Road
Liverpool L12 2AP

Dr P Morris
Gledholt Cottage, 1 Church Lane
Barsby
Leicester LE1 4RF

Dr M Mowbray
The Old School
Kirklington, Southwell
Nottingham NG25 0AY
E-mail: mike@mowbraym.freeserve.co.uk

Dr A Moye
28 Docklands Avenue
Ingatestone
Essex CM4 9EQ

Dr J T B Moyle
'Oakley Cottage'
9 Main Road
Astwood
Buckinghamshire MK16 9JS
E-mail: john@moyle.demon.co.uk

Dr J T Mulvein
Brook Farm
Tockington
Bristol BS12 4LE

Dr J P Murphy
59 Osmaston Road
Stourbridge
West Midlands DY8 2AN

Dr Angela Murray
12 Brickwall Green
Sefton Village
Merseyside L29 9AF
E-mail: murrayangela@doctors.org.uk

Dr N H Naqui
Department of Anaesthesia
Royal Bolton Hospital
Bolton BL4 0JR

Dr T P Nash
'Danesfield', 21 Stanley Road
Hoylake
Wirrall L47 1HN

Dr Anne Naylor
4 Huskards
Fryerning
Ingatestone
Essex CM4 0HR

Dr N I Newton
Department of Anaesthesia
Guy's Hospital
London SE1 9RT

Dr A M H Nicholls
45 Middle Park Road
Selly Oak
Birmingham B29 4BH

Dr B W Nicholls
5 Islip Road
Sunnymead
Oxford OX2 7SN

Dr R Nickalls
Department of Anaesthesia
City Hospital
Hucknall Road
Nottingham NG5 1PB

Dr A E L Nicol
42 Sutherland Avenue
Cuffley
Hertfordshire EN6 4EQ

Dr D A Nightingale
26 Salisbury Road
Liverpool L19 0PJ
E-mail: danightingale@lineone.net

Dr J F Nunn
'The Stocks'
3 Russell Road
Moor Park, Northwood
Middlesex, HA6 2LJ

Dr P O'Connor
5 Avondale Court
William Street, Nenagh
Co Tipperary, Ireland

Dr M O'Dowd
Mount Pleasant
Ballinasloe
Galway, Eire
E-mail: modowd@iol.ie

Dr B Oliver
96 Dorset House
Gloucester Place
London NW1 5AF

Dr G Oommen
8 Auchenbothie Gardens
Kilmacolm PA13 4SQ

Dr M Otero-Lopez
51 Kelso Close
Worth, Crawley
West Sussex

Dr Buddug Owen OBE
'Bwthyn', Cwm Road
Rhualt, Clwyd LL17 0TP

Dr Ruth Owen
17/9 Devonhurst Place
Heathfield Terrace
Chiswick
London W4 4JB

Dr R N Packham
Department of Anaesthetics
Poole General Hospital
Poole, Dorset

Dr A Padfield
351 Fulwood Road
Sheffield S10 3BQ
E-mail: A.Padfield@Sheffield.ac.uk

Dr W K Pallister
8 Upper Wimpole Street
London W1

Dr M Palmer
13 Burgess Way
Brooke, Norwich NR15 1JY
E-mail: mipalmer@hotmail.com

Dr J A R Parker
Blue Gates
2 Nayland Road
Colchester, Essex CO4 5EG

Dr S M Parr
14 Meadow Hill Road
Kings Norton
Birmingham B38 8DD

Dr M G Parry
Flat 85, 8 Shad Thames
London SE1 2YP

Dr G M C Paterson
Melbourne House
58 Acre End Street
Eynsham
Oxfordshire OX8 1PD
E-mail: gordon.paterson@nda.ox.ac.uk

Prof J P Payne
36 Raymond Road
Wimbledon
London SW19 4AP

Dr C Pegum
69 Eglinton Road
Donnybrook
Dublin 4 Eire

Dr B Philpott
12 Kingswood Firs
Grayshott, Hindhead
Surrey GU26 6EU

Dr Janet Pickett
Department of Anaesthesia, Level 4
Addenbrooke's Hospital
Hills Road
Cambridge CB2 2QQ

Dr M W Platt
16 Shenstone, 9-11 Culmington Road
Ealing, London W13 9NL

Dr F S Plumpton
241 Wishing Tree Road
St Leonard's on Sea
Sussex TN38 9LA

Dr Y L Pole
Department of Anaesthesia
Trafford General Hospital
Moorside Road,
Davythulme
Manchester M41 5SL

Dr Maria Pomirska
Department of Anaesthetics
Hinchingbroke Hospital
Hitchingbroke Park, Huntingdon
Cambs PE18 8NT

Dr Pamela Portal
'The Briars', Beech Hill Road
Swanland, North Humberside HU14 3QY
E-mail: portal.briars@virgin.net

Dr J Powell
17 Gloucester Road
Almondsbury
Bristol BS12 4HD

Dr G S Priestley
4 Redmayne Square
Strensall, York YO32 5YN
E-mail: george@maddys.demon.co.uk

Dr J Pring
5 Lidden Road
Penzance
Cornwall TR18 4PG
E-mail: j.pring@talk21.com

Dr R J Purnell
6 Taylor Avenue
Cringleford
Norwich NR4 6XY

Mr F Pyke
12 Stirling House
Simmons Road
Woolwich, London SE18 6UP

Dr Sarah J Ramsay
Garmoyle, Main Road
Langbank
Renfrewshire PA14 6XP

Dr J J Rao
2 Cragside Court
Ingleby Barwick
Stockton
Teeside TS17 OEZ

Dr P Ravenscroft
5 Elm Grove
Taunton
Somerset TA1 1EG
E-mail: dr.r@sag.org.uk

Dr Nancy Redfern
'Westfield House'
Acombe, nr Hexham
Northumberland NE46 4RJ

Dr S Rehor
124 Heythorp Street
Southfields
London SW18 5BU

Brigadier J Restall
'Maple Lodge'
Frimley Hall Drive
Camberley
Surrey GU15 2BE

Dr B C Roberts
'The Lodge'
8 Drysgol Road
Radyr, Cardiff CF4 8BT

Dr Jean Robson
3 Abbots Way
Merrow, Guildford
Surrey GU1 2XP
E-mail: robson@chantries.demon.co.uk

Dr A M Rollin
101 College Road
Epsom
Surrey KT17 4HY

Dr D E M Roman
196 Springvale Road
Commonside
Sheffield S6 3NU

Dr A L Ronald
4 Ashdale Drive
Westhill, Skene
Aberdeenshire AB32 6LP
E-mail: a.l.ronald@abdn.ac.uk

Dr N M Rose
'The Hacketts', Fromes Hill
Ledbury
Herefordshire HR8 1HS

Mr N Rosenbaum
31 Mount Pleasant
Cockfosters, Barnet
Herts EN4 9ES

Dr E C Rouse
Tyn-y-Cae, Eglwysbach
Colwyn Bay
Clwyd LL28 5TS

Dr M A Rucklidge
'Old Hall Farm', Littledale Road
Brookhouse
Lancaster LA2 9PH
E-mail: miles@ohfl.freeserve.co.uk

Dr G B Rushman
'Godbegot', 16 Aylesbury Road
Thame
Oxfordshire OX9 3AW

Dr M L C Rutledge
'Cedar Lodge', 74 Trinity Road
Edinburgh EH5 3JT

Dr D W Ryan
GICU - The Freeman Hospital
Newcastle upon Tyne NE7 7DN
E-mail: DWRYN@aol.com

Dr D A Saunders
'The Gatehouse', Exbury Road
Backfield
Southampton SO4 1XD

Dr S Saville
30 Oakhill Court
Edge Hill
London SW19 4NR

Dr Aileen Sced
24 New Road
Netley Abbey
Southampton SO31 5DL

Dr Wendy E Scott
'Tudor Lodge'
92 Radbourne Street
Derby DE22 3BU

Dr J F Searle
Belle Isle Lodge
Belle Isle Drive
Exeter, Devon EX2 4RY
E-mail: Johnlizex@aol.com

Dr J Secker Walker
40 Woodland Gardens
Highgate Wood
London N10 3UA

Dr H F Seeley
2 Salisbury House
Somerset Road
London SW19 5HY

Dr M G Serpell
Department of Anaesthesia
Western Infirmary
Dumbarton Road
Glasgow G11 6NT
E-mail: mgserpell@altavista.net

Dr Janti L Shah
15 St Denis Road
Selly Oak, Birmingham B29 4LN

Dr R K Shah
33 Pendle Fields
Fence, nr Burnley
Lancs BB12 9HN

Dr R N Shah
2 Lime Crescent
Saldal, Wakefield WF2 6RY

Dr T C Shaw
Department of Anaesthetics
Northern General Hospital
Sheffield S5 7AU

Dr P H Simmons
Jasper Cottage, 1 Queens Road
Barnet
Herts EN5 4DH

Dr M A Skivington
34 Ravine Road
Boscombe, Bournemouth
Hants BH5 2DU
E-mail: mikeskivington@yahoo.co.uk

Dr B H Smith
26 Metchley Park Road
Edgbaston, Birmingham B15 2PG

Prof G Smith
University Department of Anaesthesia
Leicester Royal Infirmary
Leicester LE1 5WW
E-mail: gs30@le.ac.uk

Dr G B Smith
164b Castle Street
Portchester
Hants PO16 9QH

Dr I Smith
8 North Deeside Road
Bieldside
Aberdeen AB1 9AJ

Dr M R Smith
Havergate House
24 The Street
Butley, Woodbridge
Suffolk IP12 3PB

Dr T G C Smith
Department of Anaesthetics
Royal Berkshire Hospital
Reading, Berkshire RG1 5AN

Dr Ursula Smith
26 Metchley Park Road
Edgbaston
Birmingham B15 2PG

Dr D G Smyth
1 Boxer Road
Wittering
Peterborough PE8 6AE
E-mail: Deniss7@aol.com

Mrs Stephanie Snow
Erway Hall
Pentre Coed
Ellesmere
Shropshire SY12 9ED

Dr P M Spargo
'Camellia',
Whitesnap Lane
Romsey
Hants SO51 8RS
E-mail: paul.m.spargo@btinternet.com

Dr J R Spears
32 Roxwell Road
Chelmsford, Essex CM1 2NB

Prof A A Spence CBE
Department of Anaesthetics
University of Edinburgh
The Royal Infirmary
Lauriston Place
Edinburgh EH3 9YW

Dr Carol Stableforth
17 Springfield Road
Wimbledon
London SW19 7AL

Dr J Stevens
42 Chiswick Quay
London W4 3UR
E-mail: iam@johnstevens.co.uk

Dr P J Stow
6 Harrow Road
Knockholt, Sevenoaks
Kent TN14 7JT

Mr B R Sugg
1 Grosvenor Avenue
Richmond
Surrey TW10 6PD

Dr S Swindells
36 Hookstone Drive
Harrogate
NorthYorks HG2 8PP

Prof Sir Keith Sykes
10 Fitzherbert Close
Iffley
Oxford OX4 4EN

Mr P Sykes
'Hawthorns'
The Avenue
Ampthill
Bedford MK45 2NR
E-mail: Peter.Sykes@asmec-it.co.uk

Dr T H Taylor
60 Wood Vale
London N10 3DN

Dr T A Thomas
14 Cleeve Lawns
Downend
Bristol BS16 6HU

Dr P W Thompson
2 Lakeside Drive
Cardiff CF2 6DF

Dr B A Thornley
15 Whittall Street
Kings Sutton
Banbury
Oxon OX17 3RD

Dr J A Thornton
8 Beaumond Green
Winchester
Hants SO23 8GF

Dr M E Thornton
23 Shelsey Drive
Moseley
Birmingham B13 9JU

Dr P Thornton
43 Granby Hill
Clifton
Bristol BS8 4LS

Dr A J Trench
'Mereylaw', Doune Road
Dunblane, Perthshire FK15 9HR
E-mail: a.j.trench@talk21.com

Dr W D Turner
25 Ashfield Road
Leicester LE2 1LB

Dr D G Tweedie
Castle Hill
Lower Fulbrook
Warwick CV35 8AS

Dr G K Vanner
2 Brockside Barn, Badgers Wood
Bilsborrow, Preston PR3 0GQ

Dr M Van Ryssen
'Dobbins', Castle Lane
Bramber, nr Steyning
West Sussex BN4 3FB

Dr H Velasquez
Flat 301, Cheviot Court
Freeman Hospital, High Heaton
Newcastle upon Tyne NE7 7DN
E-mail: Judith.Iley@tfh.nuth.northy.nhs.uk

Dr I R Verner
'Crompton Cottage', Stoner Hill Road
Froxfield
Petersfield GU32 1DY
E-mail: iandjverner@AOL.com

Dr N G Volpe
15 Smyth Close
Market Harborough
Leicestershire LE16 7NS

Dr Jocelyn Wace
42 Barton Drive
Hamble
Hants SO31 4RE

Miss Catherine A Wade
14 Roath Court Place
Roath
Cardiff CF2 3SJ

Mr J B R Walker
23 Weir Close
Mainstone, Plymouth
Devon PL6 8SD

Dr D A Walmsley
'Willow House', School Lane
Great Leighs, Chelmsford
Essex CM3 1NL

Dr Barbara M Q Weaver
'Quamaine', 79 Sandford Road
Winscombe
Avon BS25 1JJ

Dr Carole Webb
The Ridgeway
46A Main Street
Repton
Derbyshire DE65 6FB

Dr J R Wedley
Department of Anaesthesia
Guy's Hospital
London SE1 9RT

Dr R M Weller
2 Miles Road
Clifton
Bristol BS8 2JN

Dr D K Whitaker
'Westholme'
22 Pine Road
Manchester M20 0UZ
E-mail: whitaker@doctors.org.uk

Dr A P White
22 Parklands
Great Linford, Milton Keynes
Bucks MK14 5DZ

Dr D C White
Department of Anaesthetics
Northwick Park Hospital
Harrow, Middlesex HA1 3UJ

Dr G M J White
South Ryehill, Nunthorpe Village
Cleveland TS7 0NR

Dr M J Whitehead
19 Dysgwylfa
Sketty, Swansea SA2 9BG

Dr G Whitfield
471 Scalby Road
Newby, Scarborough
North Yorkshire YO12 6UA

Dr B R Whittard
5 Woodleigh Park
Shaldon, Teignmouth
Devon TQ14 0BE

Mr J Wickens
9 Pannal Ash Grove
Harrogate HG2 0HY

Prof J A W Wildsmith
6 Castleroy Road
Broughty Ferry
Dundee DD5 2LQ
E-mail: j.a.w.wildsmith@dundee.ac.uk

Dr D J Wilkinson
'High Willow'
49 Spring Grove
Loughton, Essex IG10 4QD
E-mail: davidwilkinson1@compuserve.com

Dr W M Wilkinson
11 Randolph Road
Bromley Common
Kent BR2 8PU

Dr Sheila M Willatts
Department of Anaesthesia
Bristol Royal Infirmary
Bristol BS2 8HW

Dr A Susan Williams
Institute of Education
18 Woburn Square
London WC1H 0NS

Mr S Rhys Williams
336 Sandbanks Road
Poole, Dorset BH14 8HY

Dr V Williams
8 Ashdale Close
Alsager
Stoke on Trent ST7 2EN

Dr J Wilson
15 Campbell Road
Edinburgh EH12 6DP

Mrs Patricia Willis
68 The Drive
Bexley, Kent DA5 3BZ
E-mail: TrishWillis@aagbi-org

Dr J U Wilson
26 Franklyn Gardens
Biddenham
Bedford MK40 4QE

Dr C M Wisely
5 Hillway
Westcliff on Sea
Essex SS0 8QA

Dr C H M Woollam
105a Newmarket Road
Norwich NR2 2HT
E-mail: chmw@cwcom net

Dr C M Wragg
'The Rowans'
5 Dunstan Hill
Kirton in Lindsey
nr Gainsborough
Lincs DN21 4DU

Dr D Wright
Department of Anaesthesia
Western General Hospital
Edinburgh EH4 2XU
E-mail: dr.david.wright@virgin.net

Dr S Yarrow
Home Farm Cottage, 6 High Street
Weston, Towcester
Northants NN12 8PU

Dr S M Yentis
Magill Department of Anaesthetics
Chelsea & Westminster Hospital
369 Fulham Road
London SW10 9NH
E-mail: s.yentis@cxwms.ac.uk

Dr E Young
68 Beech Lane
Earley, Reading
Berks RG6 2QA

Dr T M Young
64 Stamford Road
Bowdon
Altrincham
Cheshire WA14 2JF

Dr P M E Youngman
Cherry Trees, Victoria Mill Road
Framlingham
Suffolk IP13 9EG

Dr J S M Zorab
Holmway Cottage
Ivor Acton
Bristol BS35 1UJ

Dr D Zuck
Craigower, St Andrew's Close
Woodside Avenue
London N12 8BA
E-mail: fy96@dial.pipex.co.uk

Overseas Members

Dr H Abbas
Sikrori House, Kazman Road
Lucknow 226003 India
E-mail: abbas_haider@hotmail.com

Dr A Atkinson
18 Outlook Drive
Eaglemont
Melbourne 3084 Australia
E-mail: ttatkin@bigpond.com

Dr D R Bacon
6494 Old Post Circle
East Amherst
NY 14051 – 1513 USA
E-mail: Douglas.Bacon@med.va.gov

Dr R J Bailey
c/o Australian Society of Anaesthetists
PO Box 600
Edgecliff NSW 2027 Australia

Dr T W Baillie
Hof van Oxford 65
7007 GV Doetinchem Netherlands
E-mail: baillie@tref.nl

Prof A B Baker
Nuffield Professor of Anaesthesia
University of Sydney
Royal Prince Alfred Hospital
Missenden Road
Camperdown
Sydney NSW Australia

Dr Betty Bamforth
3519 Sunset Drive
Madison WI 53705-1430 USA

Dr Jan Baum
Abteilung fur Anasthesie und Intensivemedizin
Krankenhaus St Elizabeth- Stift
Lindenstrasse 3-7
D 49401 Damme Germany

Dr G Bause
PO Box 43100
Cleveland OH 44143-0100 USA

Prof H Breivik
Dept of Anaesthesiology
The National Hospital
N-0027 Oslo 1
Norway 23
E-mail: harald.breivik@rh.uio.no

Dr Selma H Calmes
5821 Tellefson Road
Culver City CA 90230 USA

Dr J Castano
Homero 31-33 1-3
Barcelona 08023 Spain

Dr D Caton
Department of Anaesthesia
University of Florida, PO Box 100254
1600 Archer Road
Gainesville
Florida FL 32610-0254 USA
E-mail: Caton@anest2.anest.ufl.edu

Dr M G Cooper
65 Woodside Avenue
Strathfield
Sydney NSW 2135 Australia
E-mail: MichaelC@nch.edu.au

Prof Doris K Cope
University of Pittsburgh Medical Center
St Margaret Pain Management Center
4B Nursing Unit
15 Freeport Road
Pittsburgh PA 15215 USA

Dr P H Cosh
Dept of Anaesthesia
Taumarunui Hospital
Taumarunui New Zealand

Dr Marie-Thérèse Cousin
9 Rue du Haras 78350 BUC,
Paris France

Dr C F Damstra
Van Ketwich Verschuurlaan 5
Groningen 9721 SB
The Netherlands
E-mail: damstra@knmg.nl

Dr K E Davis
'La Fuente'
Calle Monte Blanco
Urb el Chaparral
Mijas-Costa
Malaga Spain

Prof J J De Lange
De Boelelaan 117
Amsterdam 1081 HV
The Netherlands

Dr J C Diz
Servizio de Anestesiologia y Reanimacion
Hospital Clinico Universitario de Santiago
Travesia La Choupana s/n 15706
Santiago Spain
E-mail: jcdiz@uvigo.es

Dr B S Dunbar
Chief Paediatric Anesthesiologist
Texas Children's Hospital
6621 Fannin Suite 310,
Mail Code 2-1495
Houston Texas 77030 USA

Dr B Dworacek
Zwanenkade 86
Krimpen ad Yssel
2925 AS The Netherlands

Dr A Fortes Esphinheira
Rua Jose Duro 17-3° DTO
1700 Lisboa Portugal

Dr M Evans
27 Durham Street
Eaglemont
3084 Victoria Australia

Dr J G Fairer
Maison Rouge
Moulinveau 17400
St Jean d'Angely 01033 France

Dr M Goerig
Osterfeldstrasse 45 H
22529 Hamburg Germany
E-mail: goerig@uke.uni-hamburg.de

Dr R Gray
c/o MrA Gray
17 Dundas Street
Ormiston
Queensland 4160 Australia

Dr R Haridas
12 Jain Road
Effingham Heights
Durban 4051 Republic of South Africa

Dr P B Hayse-Gregson
8 Lancaster Road
Rondebosch
7700 Capetown Republic of South Africa

Dr C Hervas Puyal
Padilla 236 4°1ª
08073 Barcelona Spain

Dr L Jacobson
8542 SE 79th Place
Mercer Island WA 98040-5716 USA

Sir Anthony Jephcott
26 Sage Road
Kohimarama
Auckland 5 New Zealand

Dr D Kandela
Askvei 21
3500 Honefoss Norway

Dr Gerda van Konijnenburg
Queridolaan 37
Oegstgeest 2343 KK The Netherlands

Dr J Lagunilla
Servizio de Anestesiologia
Hospital General de Galicia
c/Galeras s/n, 15705 Santiago Spain

Dr H Lorang
24 Edwards Bay Road
Mosman 2088 NSW Australia

Dr P Mahoney
PO Box 690, Moree NSW 2400 Australia
E-mail: mahopckt@northnet.com.au

Prof J R Maltby
1290 77 Street SW
Calgary, Alberta T3H 3Z9 Canada
E-mail: maltby@UCALGARY.CA

Prof M Mauve
Veldweg 32 1251 HD
Laren NH The Netherlands

Dr R K McGregor
29 Beyers Lake Road
Pana Illinois 62557 USA

Prof D Morison
RR2, Corkums Island
Lunenburg,
Nova Scotia B0J 2CO Canada
E-mail: morison@tallships.ca

Dr Csaba Nemes
Krankenhausstrasse 72
Pfaffenhofen D-85276 Germany

Dr A J Newson
165 East Coast Road
Milford
Auckland New Zealand

Dr K Nollain-Hochman
Riedhofstrasse 309
CH - 8049 Zurich Switzerland
E-mail: karin.nollain@ksb.ch

Dr A Owies
7 Power Avenue
Hawthorne
Victoria 3122 Australia

Prof Dr med B Panning
Brabeckstrasse 159 B
D30539 Hannover Germany
E-mail. Panning.Bernhard@MH-Hannover.de

Dr N Parhboo
Fairly Lodge, 9 Portadown Road
Bergvliet 7945, Capetown
Republic of South Africa
E-mail: nparbhoo@mweb.co.za

Dr C Parsloe
Hospital Samaritano (Anestesia)
Rua Conselheiro Brotero 1486
01232.010 São Paulo Brazil
E-mail. Parsloe@originet.com.br

Dr R Patterson
PO Box 1712
Paonia
Colorado 81428 USA

Prof J Pokorny
Pod Krocinkou 9
190 00 Praha 9
Czech Republic
E-mail: pokorny@ipvz.cz

Prof L Rendell-Baker
630 Beauregard Crescent
Redlands
California 92373 USA

Dr Linda Jo Rice
565 21st Avenue NE
Saint Petersburg
Florida FL 33704-4641 USA

Dr R Rollinson
37 The Esplandade
Pallarenda
North Queensland 4810 Australia

Dr J Rupreht
Dept Anaesthesiologie, Academisch Ziekenhuis
Dr Molewaterplein 40
3015 GD-Rotterdam The Netherlands

Dr J L Scholtes
Cliniques Universitaires St-Luc
Avenue Hippocrate 10/1821
Bruxelles1200 Belgium
E-mail: scholtes@anes.ucl.ac.be

Dr Mark Schroeder
306 Cheyenne Trail
Madison
Wisconsin WI 53792-3272 USA
E-mail: MESCHRO2@FACSTAFF.WISC.EDU

Dr D Shephard
20 Katie Drive
Charlottetown PEI
C1E 1X8 Canada
E-mail: acnpei@isn.net

Dr J E Simpson
1524 Agawela Avenue
Knoxville
Tennessee TN 37919 USA
E-mail: josnooze@bellsouth.net

Dr J Smits
Ruijstraat 2A
6712 Ed Ede The Netherlands
E-mail: jiesmits@hetnet.nl

Dr H Stoeckel
Hobsweg G87
Bonn-Rottgen D53125 Germany

Dr C M P Theunissen
Kapelstraat 41
Molenschot 5124 RL The Netherlands

Dr S Tirer
431 Anthwyn Road
Narberth
Pennsylvania 19072 USA
E-mail: stirer@snip.net

Dr E Troch
Marcel de Backerstraat 2
B - 2180 Ekeren
Antwerpen Belgium

Dr Kim Turner
102 Centre Street
Kingston
Ontario K7L 4E6 Canada

Dr Turner's husband
102 Centre Street
Kingston
Ontario K7L 4E6 Canada

Dr M Van Wijhe
Greekerinckskamp 6
Delden 7491 BW The Netherlands
E-mail: m.van.wijhe@hetnet.nl

Prof D M E Vermeulen-Cranch
Nijenburg 82
1081 GG Amsterdam The Netherlands

Dr J Vernooij
Eikstraat 6
3581 XL Utrecht The Netherlands

Dr R N Westhorpe
162 Cotham Road
Kew, Victoria 3101 Australia

Wood Library Museum
520N Northwest Highway
Park Ridge
Illinois 60068.2573 USA
E-mail: wlm@ASAhq.org

Mr A J Wright
Dept of Anesthesiology Library
School of Medicine, University of Alabama
619 19th Street South JT 965
Birmingham
Alabama 35233-6810 USA
E-mail: a.j.wright@ccc.uab.edu

Dr G I Zeitlin
104 Plainfield Street
Newton MA 02468-1636 USA
E-mail: AANDGZEITLIN@aol.com

Dr Marguerite Zimmer
55 Rue de Selestat
67100 Strasbourg France
E-mail: zimmer@easynet.fr

THE HISTORY OF ANAESTHESIA SOCIETY PROCEEDINGS

VOLUME 28 SUPPLEMENT

HISTORY SATELLITE MEETING, 12TH WORLD CONGRESS

MONTREAL, 10 JUNE 2000

Co-sponsored by the History of Anaesthesia Society and The Anesthesia History Association

Registrants

Dr N Adams (UK) Hon Secretary, History of Anaesthesia Society
Professor B Baker (New Zealand)
Dr I Corall (UK)
Professor MTh Cousin (France)
Dr C Diz (Spain)
Dr F Haddad (USA)
Dr Jean Horton (UK) President, History of Anaesthesia Society
Dr I Houghton (UK)
Dr D Howat (UK) Past President, History of Anaesthesia Society
Mrs Joan Howat
Professor I Gullo (Italy)
Professor R Maltby (Canada)
Dr I McLellan (UK)
Dr L Morris (USA)
Mrs L Morris (USA)
Dr Carlos Parsloe (Brazil)
Professor J Severinghaus (USA)
Mrs J Severinghaus (USA)
Dr D Shephard (Canada)
Mrs J Shephard (Canada)
Dr BM Shrestha (Nepal)
Mr P Sim (USA)
Dr C Theunissen (Netherlands)
Dr K Turner (Canada)
Dr Turner (Canada)
Dr G van Hasselt (USA)

On the day following the World Congress, through the kind offices of Dr David Shephard, the History of Anaesthesia Society and the Anesthesia History Association were given a unique opportunity to meet jointly at the Faculty Club at McGill University and to visit the Osler Library.

The organising committee of Dr Shephard, Dr Douglas Bacon, Dr Jean Horton and Dr Neil Adams produced an excellent one-day programme:

Dr D D C Howat - London,UK
A mastectomy without anaesthesia

Prof M Th Cousin - Paris, France
A Vulpian, and not Claude Bernard, postulated a specific structure at the level of the neuro-muscular junction

Prof J Severinghaus - San Francisco, USA
Priestley: the furious free thinker of the Enlightenment

Dr I McLellan - Leicester, UK
Local heroes

Dr B M Shrestha - Kathmandu, Nepal
History and development of anaesthesia in Nepal

Dr Jean Horton - Cambridge, UK
The Battle of the Somme 1916. Anaesthetics at Casualty Clearing Stations

Mr P Sim - Wood Library-Museum, USA
Deyan Shang and the development of modern Chinese anaesthesia

Dr J C Diz - Santiago, Spain
History of blood transfusion in the Spanish Civil War. Norman Bethune and the episode of the Malaga-Almeira Road

Most of the presentations have been or will be published elsewhere. We are grateful to the authors of the following two papers of particular international interest who agreed to publication in this Supplement to the History of Anaesthesia Society Proceedings.

THE HISTORY AND DEVELOPMENT OF ANAESTHESIA IN NEPAL

Dr B M Shrestha, Dr N B Rana, Bir Hospital, Kathmandu, Nepal
Prof J R Maltby, University of Calgary, Canada

Nepal is a landlocked country that lies between India and Tibet (China) with a population of 23 millions and with Kathmandu as its capital. Bir Hospital, established in 1889 in Kathmandu, was Nepal's first hospital. Since then the total number of hospitals - government, mission and private, has risen to 128. The only government hospitals with posts for trained anaesthetists (and surgeons and obstetrician-gynaecologists) are three tertiary care hospitals in Kathmandu, two regional hospitals (150-200 beds) and seven zonal (25-50 beds) hospitals. Today there are 6370 hospital beds in Nepal and 1950 doctors. The health budget is approximately one US dollar per person per year. Most of the hospitals still lack proper and reliable equipment, drugs and adequately trained manpower, especially in the field of anaesthesia.

Until 1933 anyone who could pour ether or chloroform was the anaesthetist. Usually the surgeons conducted their own anaesthesia by delegating juniors or paramedics to do the job. This is still true in district hospitals with no specialists, and some zonal and mission hospitals.

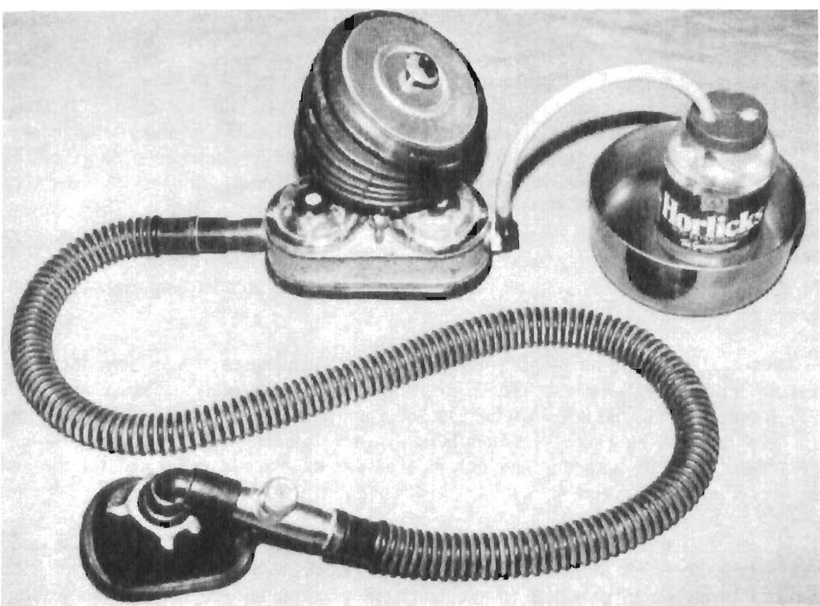


Figure 1.
Dr Singh's Vaporiser

The first anaesthetist

Most of the early medical manpower came from India. In 1933, Dr B B Singh, one of the very few Nepali doctors, joined Bir Hospital and did the job of an anaesthetist using ether and sometimes chloroform. In 1955 he went for training and obtained the Diploma of Anaesthesia (DA) from Bombay, India.[1] He was then the only qualified anaesthetist in Nepal, and was practising before anyone had qualified in surgery! He introduced intubation anaesthesia. He improvised a Horlicks bottle vaporiser (Figure 1) for ether, and combined this with an Oxford inflating bellows to make a draw-over anaesthesia machine. In 1968 he published a report on 1000 endotracheal intubations,[2] using the open drop technique in half and draw-over with the Horlicks bottle in the other 500. He regularly participated in meetings of the Indian Society of Anaesthetists. In 1962 he anaesthetised for intracranial surgery by Dr D N Gongol, a Nepali surgeon who gained his MS in India, joined Bir Hospital in 1961 and later obtained the Edinburgh fellowship.

In 1966 Sir Robert Macintosh visited Nepal and anaesthetised two cases in Bir Hospital using the Epstein Macintosh Oxford (EMO) vaporizer. He later donated an EMO. In the same year the first Nepali FFARCS, Dr N B Rana, co-author of this article, returned from the UK and joined the department. At first he had to use the Horlicks bottle and bellows as there was not enough oxygen and nitrous oxide for the one Indian Boyle's machine, but within two years he was able to introduce balanced. anaesthesia.

In 1968, several improvements were made in the Bir Hospital. With American help a new surgical block was built containing an operating theatre suite, later named The B B Singh Operating Theatre. Two new Boyle's machines with more N_2O and O_2 cylinders, ventilators and an ECG monitor with defibrillator then became available. Newer anaesthetic drugs and piped oxygen and nitrous oxide were also introduced. Outside the Kathmandu valley, however, in the district and zonal hospitals facilities, equipment and drugs were still lacking. There were only two anaesthetists working outside the valley – one in the east (Biratnagar) and one in the west (Pokhara). In the early days they were from mission hospitals. While working at Biratnagar, one of the authors, with help from a sheet metal worker, developed an ether vaporizer based on the EMO using local material (Figure 2).

From 1964 to 1984, in spite of government initiation and persuasion very few doctors went abroad for training in anaesthesia. The British Government sponsored technical and financial help for training but this did not solve the acute shortage of anaesthetists in the country. About a dozen were trained in the United Kingdom but only a few of them returned to Nepal. At the end of 1984 there were 80 surgeons and only 6 anaesthetists - not even enough for the central hospitals of Kathmandu.

In 1984, the University of Calgary, Canada, Tribhuvan University in Kathmandu and the Ministry of Health of His Majesty's Government of Nepal, resolved to address the problem of anaesthesia manpower by providing an in-country one year training programme. This would lead to a Diploma of Anaesthesia (DA) of Tribhuvan University (TU) Nepal. The University of Calgary offered to coordinate academic and administrative help for the first three years.

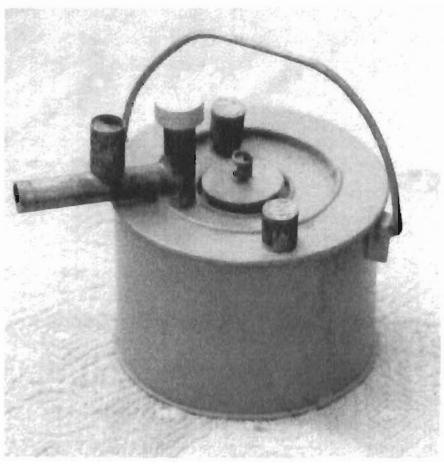


Figure 2.
Dr Shrestha's apparatus

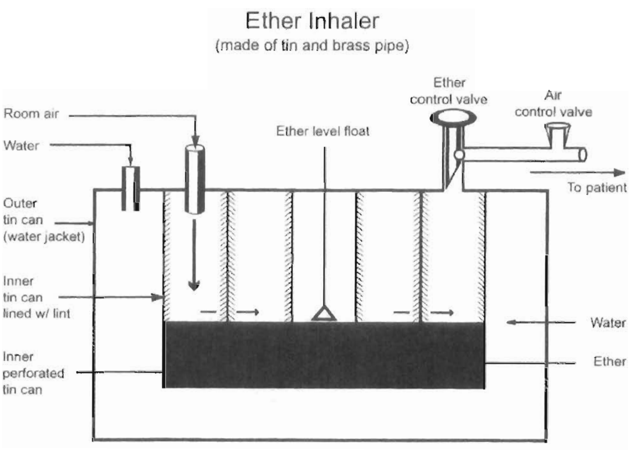


Figure 3.
Diagram of Dr Shrestha's ether inhaler. The inner tin cans are lined with lint to increase evaporation. The inlet and outlet tubes are of half-inch brass pipe

In 1985 the DA program was launched. Four or five candidates were accepted for training every year. This programme improved the manpower situation and anaesthetists became available to provide services in some 10 hospitals outside the Kathmandu valley. By the end of the century 44 DA graduates had been produced but again more than half have left Nepal for higher training in UK and better job opportunities.[3]

Senior members of the Canadian anaesthesia faculty helped to organise the first Nepalese anaesthesia symposium in 1986, and to form the Society of Anaesthesiologists of Nepal (SAN) in 1987. In 1988, SAN was accepted as a member of WFSA at the 9th World Congress in Washington, DC.[4] Four years later, at The Hague in the Netherlands, two Nepali anaesthetists participated in a World Congress for the first time.

With the development of super-specialties in surgery, anaesthesia in Nepal has tried to keep pace. Anaesthetists were sent abroad for training in neuroanaesthesia in the UK in 1984, and cardiac anaesthesia in Australia in 1989.

Owing to the difficulty of obtaining higher training outside the country and to avoid the loss of trained manpower, Canadian faculty members Drs J R Maltby and T J McCaughey helped to develop the training requirements and curriculum and conducted a feasibility study for in-country higher training in anaesthesia. A three-year degree programme was started in 1996.[5] Every year two or three new candidates are accepted. The first batch of MD Anaesthesia candidates graduated in April 1999 and the second batch in 2000. Professor Dennis Reid of the University of Ottawa was an external examiner. Professors Roger Maltby and Dennis Reid reviewed the programme according to Canadian Royal College guidelines in 1997 and again in 1999.

Although SAN and His Majesty's Government of Nepal do not recognize the concept of Nurse Anaesthetist, some mission hospitals still rely on trained Anaesthetic Nurses. Dr. Tom Fell of Olympia, Washington was the first anaesthetist to train nurses at the mission hospital in Patan in the early 1980s. Regular training of paramedics and nurses as anaesthetic assistants is done by individual hospitals in the Kathmandu valley.

To help the single handed anaesthetists in District hospitals, the Training Division of Department of Health Services with co-ordination from the Anaesthetic Department of Bir Hospital recently introduced an Anaesthetists' Assistant training programme involving nurses and paramedics from different zonal and district hospitals. Twenty-five have so far completed this 12 weeks training programme.

With many more government hospitals and private medical colleges and hospitals being established in the country, the limited number of trainee posts is unable to cope with the need for trained anaesthetists. Nevertheless, the available trained and qualified manpower has provided great improvements in the quality of service and patient care, evidenced by the reduction in morbidity and mortality. In most hospitals the anaesthetic drugs and equipment are still limited and simple, but the practice of anaesthesia has become much safer.

At present anaesthetists are not able to provide regular services outside the operating theatre, for example in intensive care or pain clinics. There are 50 anaesthetists in the country and we need nearly 50 more just to cope with the current situation. To meet this target Nepal looks for continued support from friends old and new and from all organisations concerned with the provision of safe anaesthesia throughout the world.

References

1. Rana NB, Shrestha BM, Maltby JR. History of Anesthesiology in Nepal. *Anesthesia History Association Newsletter* 1993; **11**:1.
2. Singh BB. Endotracheal anaesthesia at the Bir Hospital, Kathmandu, Nepal. *Journal of the Nepal Medical Association* 1968; **6**:59.
3. Maltby JR, Rana NB, Amatya RA, Shrestha BM. Anaesthesia Training in Nepal. *Canadian Journal of Anaesthesia* 1987; **34**:51-55.
4. Maltby JR et al. Anaesthesia training and development in Nepal 1985-1990. *Canadian Journal of Anaesthesia* 1991; **38**:105-110.
5. Maltby JR, Rana NB. Helping to establish anaesthesia training and development in Nepal. *World Anaesthesia* 1997; **1**:7-8.

DEYAN SHANG AND THE DEVELOPMENT OF MODERN CHINESE ANAESTHESIA*

Dr G Wang* and Patrick Sim MLS, Librarian
Wood Library-Museum of Anesthesiology

In China, pain relief for surgery is believed to have been used circa 220 AD by the surgeon Hua T'o who gave Indian hemp, among other concoctions, to his patients during operations. Yet medicine and surgery in China never developed to their full potential while Western medicine made remarkable strides in the ensuing centuries. Social stratification in traditional China seems to have stifled such progress. The status of the physician in Chinese society was often relegated to the category of astrologer.[1] This would have discouraged talent, and helps to explain the lack of medical progress in such a vast nation until the advent of the modern era.

The history of modern Chinese anaesthesia is relatively sketchy. It was introduced about a year after Morton's successful demonstration in Boston, as part of the attempt by the West to open imperial China for trade and evangelism. The Rockefeller Foundation helped establish Western medical education in China in early 20th century through its China Medical Board. This connection was to some extent responsible for the training of the most influential first generation Chinese anaesthesiologists since 1949, personified by Jone Wu, Deyan Shang and Yung Shieh, all of whom studied anaesthesia in Midwestern America.[2] The focus of this paper is on the career of Dr Deyan Shang, whose influence on modern Chinese anaesthesia is immense, and whose medical career paralleled the development of anaesthesiology in China after the founding of the People's Republic of China.

Deyan Shang's road to medicine and anaesthesia

Deyan Shang was born in 1918 to a poor family in Northeastern China, son of a minor government bureaucrat. Life was hard for the Shang family and young Deyan's education was interrupted by frequent family relocations. He managed to complete his elementary and secondary education, including three years of French language instruction, in 1937. He entered Lanchou University Medical School in 1938, graduating in 1942. His proficiency in the French language, and his interest in other western languages, enabled him to read medical literature of the West. After three years as a surgeon at Lanchou General Hospital, in 1945 he was invited to develop the anaesthesia service at the medical school. For further training he was sent to America in 1947, arriving in Chicago for an anaesthesia residency to be undertaken at the University of Illinois. His career goal remained surgery, despite the fact that anaesthesia would become an inseparable part of his career. Indeed, surgery was the main vehicle he would use to propel his anaesthesia programme when he returned to Lanchou. Throughout his subsequent career, he would hold dual appointments in surgery and anaesthesiology, and would contribute chapters on anaesthesia, resuscitation and related topics to surgical textbooks. His anaesthesia-related papers were also published in surgical journals.

Deyan Shang and the development of anaesthesiology in China

Upon his return to China, Dr Shang was appointed chairman of the Department of Anaesthesiology at the Lanchou Central Hospital, the first such appointment in modern China, with simultaneous appointments as Vice Chairman of Surgery, and Director of Surgical Education. To develop and promote anaesthesiology, he required medical students and surgical residents to study anaesthesia. As his teaching institution later became a general hospital for veterans in Northern China, he was able to travel extensively to develop anaesthesia in Northern and Northwestern China in affiliated veterans' hospitals.

Integrated anaesthesia service: clinical care, teaching and research

In 1954, following the Korean War a new research centre for the study of surgery for the wounded was established in Dr Shang's native province in northeast China. He was appointed chairman of its department of anaesthesia, where clinical responsibility, teaching and research were centralized. In clinical care, Dr Shang led his team of multidisciplinary experts in the treatment of end-stage wounded patients. He was proud to record that none of the mortality at this centre was anaesthesia related. To broaden the teaching of anaesthesia, Dr Shang instituted an anaesthesia rotation system for military surgeons. The great numbers of patients also provided abundant opportunities for research; he culled foreign medical journals for research topics, and wrote book chapters on anaesthesia for the wounded.

Fuwai Cardiovascular Research Institute. The first animal and biomedical engineering laboratories in China

Dr Shang's research focus intensified in 1956 with the founding of the Central Military Cardiovascular Hospital in suburban Beijing, where he was appointed Anaesthesia Research Director. This facility later became a civilian institute, and was renamed the Chinese Academy of Medical Sciences at the Fuwai Hospital Cardiovascular Research Institute. Here he established the first laboratories for animal and biomedical engineering research. His team investigated the physiology of hypothermia for cardiovascular surgery, devised extra-corporeal circulation apparatus, and designed manufacturing apparatus for mass production of nitrous oxide. Their accomplishments engendered further research in the physiology of haemodynamics, and the pharmacophysiology of anaesthesia. Pulmonary physiology and resuscitative medicine were also studied. Dr Shang's research was halted in 1966 at the beginning of the Cultural Revolution and it did not resume until a decade later.

Professionalisation of Chinese anaesthesia

Dr Shang's vision for the professionalisation of anaesthesiology was reminiscent of that of the early pioneers of American anaesthesia led by Ralph Waters. He travelled abroad extensively for communication and exchange of ideas to advance Chinese anaesthesia. He established liaison with other medical disciplines to gain respect for anaesthesia in medicine. It was through his incessant petitioning of brother specialists that anaesthesia became formally recognized as a branch of clinical medicine. He rallied his colleagues to organise the Chinese Society of

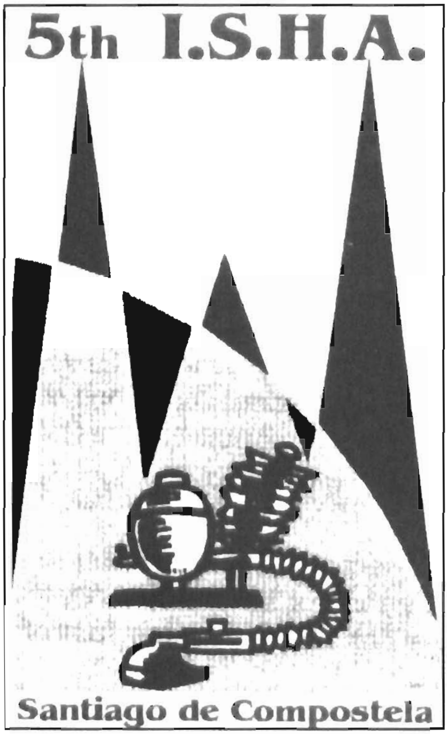
Anesthesiologists in 1979. Simultaneously, he encouraged the publication of a professional journal for Chinese anaesthesiology, and in March 1981 he took on significant editorial activities.

Dr Shang died in 1985 after a prolonged illness. His professional life had run parallel to and had massively influenced the development of modern Chinese anaesthesia.

References

1. Balme H. *China and Modern Medicine.* London, United Council for Missionary Education. 1921: pp 19-36.
2. Sim P, Du B, Bacon DR. Pioneer Chinese Anesthesiologists: American Influence. [*Anesthesiology*, in press]

* Co-author Guyan Wang conducted research on Deyan Shang. His research effort was aided by Dr Douglas Reinhart of Utah, and later facilitated by the Paul M Wood Fellowship of which he was named the 1999 Rod Calverley Fellow. This paper is the outcome of a cooperative effort between the Librarian of the Wood Library-Museum and Dr Wang. It also appears in the *Bulletin of Anaesthesia History* 2000; **18**:7. A presentation in these *Proceedings* was mutually agreed by the Editors.



Santiago de Compostela
19 -23 September, 2001

For information and abstract forms contact:
Dr JC Diz
Servicio de Anestiologia y Reanimaccion
Hospital General de Galicia
c/ Galereas s/n
15705 Santiago, SPAIN
Tel 34 981 540223
Fax 34 981 540172