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THE HISTORY OF ANAESTHESIA SOCIETY PROCEEDINGS

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Proceedings of the meeting in Cambridge
30th October 1999

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THE HISTORY OF ANAESTHESIA SOCIETY

Cambridge Meeting - October 1999

Acknowledgements

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Proceedings of the History of Anaesthesia Society

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

Editorial

It is never a hardship to come to Cambridge, and the autumn meeting of the HAS, thanks to the President and her organising committee, was a great success, with 80 registrations.

The lecture theatre in the Wolfson Hall at Churchill College is spacious, the audio-visuals were impeccable, and the papers were of sustained interest. Carenza Lewis from the TV programme 'Time Team' arrived from an archaeological find in East Anglia with seconds to spare, and delivered the Guest Lecture in her working clothes.

There was a bonus in the opportunity to browse round the Churchill Archives in the early afternoon, and the day was completed with an excellent dinner in the skilfully converted Old Kitchen at Trinity College. Officially, there were no speeches, but nobody minded Dr Zoltan Lett saying some complimentary things about the President and the Society.

Peter Drury
Honorary Assistant Editor

Members and Guests attending the Cambridge meeting
30 October 1999

Dr Neil Adams	Bury St Edmunds
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Dr Edward Armitage	Hassocks
Dr Richard Atkinson	Southend
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Dr John Blizzard	Chelmsford
Dr Tom Boulton	Reading
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Dr Peter Drury	Liverpool
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Dr Anne Florence	Liverpool
Dr Steven Forde	RAF Wittering
Dr Elizabeth Gibbs	Billericay
Dr Alan Gilston	London
Dr Norman Gorbutt	Nottingham
Dr Paul Goulden	Dewsbury
Mrs Jean Goulden	Dewsbury
Dr Jean Guy	Bury St Edmunds
Dr Geoffrey Hall-Davies	Birmingham
Dr Helen Hannah	Chippenham
Dr Jean Horton	Cambridge
Brigadier Ivan Houghton	Haslar
Mrs Teresa Houghton	Haslar
Dr Douglas Howat	London
Mrs Joan Howat	London
Dr Michael Inman	Plymouth
Dr Lars Jakt	Truro
Dr Zoltan Lett	Hong Kong
Dr Geoffrey Lewis	Leicester
Dr David Macfarlane	Birmingham
Dr Ken Macleod	Huntingdon
Dr Ann Maher	Bury St Edmunds
Dr Roger Maltby	Calgary, Canada
Dr Edward Mathews	Birmingham
Dr Alistair McKenzie	Edinburgh
Dr Colin McLaren	Wootton Bassett
Dr Lorna Mendonca	Potters Bar
Dr Peter Morris	Leicester
Dr James Mulvein	Bristol
Dr Ann Taylor	Ingatestone
Dr Adrian Padfield	Sheffield
Dr Michael Palmer	Bury St Edmunds
Prof James Payne	London
Dr Yash Pole	Manchester
Dr Maria Pomirska	Huntingdon
Dr John Pring	Penzance
Dr Anna-Maria Rollin	Epsom
Dr Nigel Rose	Ledbury
Dr Miles Rucklidge	Lancaster
Dr Geoffrey Rushman	Southend
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Dr Michael Skivington	Bournemouth
Dr Brian Smith	Birmingham
Dr Ursula Smith	Birmingham
Dr Tim Smith	Reading
Dr John Stevens	Cambridge
Prof Sir Keith Sykes	Oxford
Mr Peter Sykes	Bedford
Mrs Nancy Sykes	Bedford
Dr Alistair Trench	Dunblane
Dr Maureen van Ryssen	West Sussex
Dr Martin van Wijhe	Delden, N'lands
Dr David Walmsley	Chelmsford
Dr Crispian Ward	Huddersfield
Dr Barbara Weaver	Bristol
Dr David White	Northwick Park
Prof Tom Wildsmith	Dundee
Dr David Wilkinson	London
Dr Christopher Woollam	Norwich
Dr David Zuck	London

Speakers at the Cambridge Meeting

Dr Aileen Adams

Dr Y Pole

Dr P Drury

Dr M Palmer

Ms Carenza Lewis

Dr A McKenzie

Professor J Payne

Dr D Howat

Dr F Bennetts

Dr C McLaren

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Future Meetings

Leicester:	7-8 July 2000
London:	4 November 2000: Joint Meeting with Royal Society of Chemistry Historical Group
Edinburgh;	29-30 June 2001
Santiago de Compostela:	19-23 September 2001: 5th International Symposium on the History of Anaesthesia

Membership List

A revised membership list will be published shortly. Would any member who does not wish his/her name to appear please notify the Honorary Editor. If you believe the Society has any of your details incorrectly, please contact the Membership Secretary:

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HISTORY OF ANAESTHESIA SOCIETY

Papers presented at the Cambridge Meeting 30 October 1999

AN 1897 *CONVERSAZIONE* AT 20 HANOVER SQUARE

Dr Aileen K Adams
Formerly Consultant Anaesthetist, Addenbrooke's Hospital, Cambridge

This paper arose from a number of coincidences:

- an invitation from the Society of Anaesthetists to attend a lecture
- an electrician from Australia taking his seat in the House of Lords
- an opportunity for the Royal Society of Medicine to buy a valuable freehold

An invitation card

In 1998, Professor Cecil Gray sent me a photograph of an invitation card from the Society of Anaesthetists requesting the recipient to attend a *conversazione* to be held on 18 November 1897. Gray had himself been given it by a Liverpool thoracic surgeon, Mr Leslie Temple, who had found the card being used as a bookmark in a volume that had once belonged to the eminent surgeon Wilfred Trotter.

Many years ago Temple acquired Trotter's copy of Osler's *Principles and Practice of Medicine* dated 1885 from another surgeon, Morriston Davies. He said Trotter had given it to Davies who had been his registrar. When Temple received the book he found inside a number of scraps of paper with notes written on them, including this card, being used as bookmarks in the appropriate chapters. To Temple, a surgeon, the link with Trotter was all-important, to anaesthetists it is secondary to the occasion it commemorates. Temple contacted Trotter's son, also a doctor, who confirmed that his father made notes this way and never wrote on the pages of a book.

The name of the person in the invitation space has eluded identification. Certainly one cannot turn it into 'Wilfred Trotter'. Surely had it been issued to an individual the name would have been clearly written, probably very neatly in copperplate or similar script. It would not have been a scribble as here. Had this particular card therefore never been issued? If so, how did a blank card come to be in Trotter's possession?

There are notations on both sides. We can make out most of the words, *myelitis, neuralgia, infection, cachetic, neurotic*, etc. together with some sketches of the anatomy of the eye. In view of the provenance and the fact that his son saw the card we know that this is indeed Trotter's handwriting. They presented the book to the library of his hospital, University College Hospital Medical School (UCH), leaving all the notes *in situ* except the invitation card. This they removed, framed and gave to the Anaesthetics Department in Liverpool. Temple was vague about the dates but it was during the 1950s or 1960s.

The Society of Anaesthetists' *conversazione*

The year 1897 saw the 50th anniversary of the first use of chloroform as an anaesthetic. The invitation was to hear an oration by Dr Dudley Buxton entitled: *Empiricism or Science? Anaesthetics 1847-1897.* The venue was 'the rooms of the Society at 20 Hanover Square,

London W'. The *Lancet* of 27 November 1897 recorded the introduction of chloroform in an unsigned editorial that is an erudite account of the development of surgical anaesthesia from Humphry Davy onwards by someone with a good knowledge of history.[1] It also printed Buxton's lecture in full and it is a scholarly dissertation, quoting 27 references, an unusually large number for that time.[2] The *British Medical Journal* also records the occasion.[3]

One might wonder why did the Society commemorate the 50th anniversary of chloroform rather than that of the introduction anaesthesia with ether the year before. It was, as their minutes show, because of the human failing that they did not think far enough ahead.

The Society of Anaesthetists

The Society of Anaesthetists was formed in 1893 and it was the first such society in the world.[4] From its start it leased rooms at 20 Hanover Square and held regular meetings there. At the Council meeting on 3 July 1896 they clearly intended that the November meeting that year should be a commemoration of the 50th anniversary of anaesthesia itself. However, it proved to be too short notice. They reckoned they would need £100 in guarantees but by the October council meeting they had only raised £34, so wisely they postponed it to the following year and decided to celebrate chloroform instead. They planned to invite about 1,000 people and as the rooms at Hanover Square were not very large, they agreed that 'ladies be not invited unless they were members of the Society'.[5] At this time at least six women were members, about 10% of the total.[6] Sir Joseph Lister was asked to give the oration but replied that he 'failed to see why a chloroform commemoration was necessary as it was quite secondary to the discovery of anaesthesia by the introduction of ether'.[5] Hence, Council agreed that Dr Dudley Buxton, their President, should speak instead, a wise decision with which anyone reading his lecture today will agree.

There is no record of how many of the 1,000 people invited actually attended. Today the house has no room capable of holding anything like this number. The occasion was a success, a surplus of £27.11.8. [£27.58] was made and the guarantors agreed that this could go towards starting a museum or library.[5]

The history of 20 Hanover Square

From its beginning the Society of Anaesthetists rented rooms in 20 Hanover Square. This house was owned by the Royal Medical and Chirurgical Society of London (RMCS), the forerunner of the Royal Society of Medicine (RSM). No 20 is one of the few remaining original houses in the Square and today is a Grade II listed building.

The Square was built in the period of prosperity following the end of a war in Europe. Britain had acquired a new Royal dynasty. The aristocratic families were building elegant houses for themselves in London, moving steadily westward away from the previously fashionable area around Covent Garden which was becoming dangerous and insalubrious. The earliest picture of the Square is the painting by Edward Dayes looking south towards St George's Church and No 20 can be seen on the west side. It is a delightful painting full of detail of everyday activities in the 1780s.[7]

The Square was laid out between 1717 and 1719 on land owned by the Earl of Scarborough, who was an admirer of the new Hanoverian monarchy; hence the germanic place names such as Hanover Square, George Street, St George's Church, etc. No 20 was designed by the French Huguenot architect, Nicholas Dubois. Such was the demand for houses that many were actually built by independent craftsmen following a general pattern based on an architect's ideas. Perhaps this accounts for the fairly plain frontages of the houses, although the interior, including that of No 20, were often decorated in elaborate almost Rococo style.[8] It is a considerable tribute to the craftsmen's skills that so many of the houses in this neighbourhood still survive.

During the ensuing years the fashionable families of London continued to move westward and the houses they vacated became occupied by the professional classes. By the end of the 19th century they had virtually taken over. The medical profession still retains its dominance in the Harley and Wimpole Street areas north of Oxford Street. The musicians came to occupy the south-east corner where the Hanover Square Rooms were built in 1774 as a concert hall, familiar to Haydn, J C Bach, Mendelssohn and Liszt amongst others. The site is now a Japanese bank. No.20 also had musical connections for, in the 1890s the Incorporated Society of Musicians rented rooms here and a music publisher called Ashdown used the cellars for storage of his stock. The musicians today maintain their presence in the Wigmore Hall and nearby piano showrooms in Marylebone Lane. The Civil Service, too, had a foothold just off the Square in Tenterden Street, where the Oriental Club was established for those who had served in the East India Company.[8]

The RMCS made many moves. When founded in 1805 it had its first home in two rooms in Verulam Buildings, Gray's Inn and it too followed the general move westwards, successively to three sites in Lincoln's Inn Fields, Nos 3, 30 (later demolished) and No 57, then to No 53 Berners Street (also demolished) and finally to Hanover Square where, in 1890, it bought No 20 for £23,000.[9] Such was the demand from other societies for meeting rooms that, under the influence of their entrepreneurial librarian, John MacAlister, they immediately set about enlarging their premises, extending into the garden, adding an extra floor and making the entrance grander by adding a portico. They then leased their rooms to a variety of bodies, including, in 1893, the newly founded Society of Anaesthetists. The story of how, after 40 years of effort, the RMCS persuaded the specialist medical societies to merge in 1905 and change its name to the Royal Society of Medicine, is well-known.[10]

In 1910 when the present Wimpole Street building came into use, the Hanover Square property was leased to the estate agents, Knight Frank (KF). In 1999 they were still there with the RSM retaining the property within its investment portfolio.

A framed document giving a short history of the house and a list of its owners is displayed in the entrance hall. This attributes the design not to Dubois but to the more famous James Wyatt. It records that the house was built for the Earl of Dunmore and that the numbering was changed from 19 to 20 in 1935. This brings me to my second coincidence. In 1998 the present Earl of Dunmore, realising that due to the governmental decision to expel the hereditary peers from the House of Lords, this year was his last chance to take up his seat in the House and attend the Queen's State Opening of Parliament. The 12th Earl, Malcolm Murray, is an electrician in Tasmania, the title having passed to Australia in the early 1800s. Last November, 'Mac' as he is known, came to England, took the oath in the Lords and made

his maiden speech. It was on the very relevant topic of how the proposed constitutional reforms in Australia would affect Britain.[11]

This was a pleasing coincidence but on checking the original documents[12] in the RSM, I found the Dunmore connection was erroneous. It was No 19, not 20, that was built for Dunmore by the much more famous architect, James Wyatt. The first entry on the KF list that is verifiably correct is that in 1842 the property was acquired by the Earl of Lucan. It is true, as the history poster states, that originally the houses on the west side of the Square were not numbered. The claim that No 20 was originally 19 was copied from an entry in a rates book and perhaps it was just a clerical error. More intriguingly, it seems that KF really wanted to believe that their house was designed by the better known architect, Wyatt. There is an exchange of letters in 1910, when KF took up the tenancy, between Mr Howard Frank and Mr John MacAlister, in which Frank asks MacAlister to send him 'a history of the house, accuracy is not so important, if only some actress of repute, whether good or evil, had lived here!'[13] Obviously, he craved a famous background and was prepared to be economical with the truth to achieve it. The actual first owner of No 20 was the Duke of Montrose. However, the early occupants are not relevant to this paper.

The interior of the house

Knight Frank, with the agreement of the RSM, have since 1910 continued to alter and enlarge, but we can gain some idea of how it appeared to the Society of Anaesthetists in the 1890s. Two floor plans were displayed in the house, the earlier dated 1877, shortly before the sale to the RMCS, the later 1976 which is much as it is today. Fortunately, the archives contain an intermediate plan dated 1889 showing the alterations made by the RMCS.[15] Georgian houses usually had no corridors, the rooms opening out of each other. The Society therefore drove a wide corridor through the centre of the house. A new large room, the Meeting Room, was built on the site of the garden and a smaller long narrow room, the North Room, added on the north side of the new corridor. The original dining room became the combined library and secretary's office, and today KF call it their senior partner's room. The steps and their handsome porticoes originally leading into the garden have been retained as attractive interior features in a room and the corridor.

In 1905, the Society celebrated its centenary and commissioned Elizabeth Drake to make drawings of the house and its rooms. Some of these are reproduced in the histories of the Societies[9,10] and prints of the remainder are in the archives.[14] Drake depicts the library with MacAlister seated at a table and the room today is virtually identical. The Meeting Room is a handsome and elaborate domed room in the Georgian style, decorated with pillars and cornices, but there is no drawing of the North Room.

The Society of Anaesthetists leased the North Room, paying a rent of £10 a year to hold ten meetings and to have their name displayed on a board. However, MacAlister wrote that it would not hold even 200 people,[13] so as the anaesthetists invited 1,000 to their celebratory *conversazione*, it seems certain that they would have booked the larger and more prestigious Meeting Room, for which they would have paid 3 guineas. I have found no record of how many this would hold, nor how many actually attended.

The parts of the house listed Grade II today are those abutting Hanover Square, namely the frontage, the reception area with its staircase and the front room used successively as dining room, library/secretary's office and, finally, as the senior partner's room. The splendid Meeting Room sadly has disappeared and been replaced by several smaller entirely undistinguished offices. Whilst there exists today a large and quite attractive domed room, its decoration is different and it is situated south of the corridor, on the site of the original terrace leading towards the garden. The North Room, too, has been sub-divided.

The Royal Society of Medicine's investment

Although my second coincidence proved invalid, the third coincidence remains and it concerns the reassignment of the freehold. A strange aspect of the agreement of 1890 was that the freehold of only half the property was transferred to the RMCS. The lease of the rear of the property including Dering Yard, then used for stabling and with its important access rights from New Bond Street, was retained by the Corporation of London. The line of demarcation, following some later building, ran diagonally across the rooms. The back entrance at 69 New Bond street and the passageway leading to Dering Yard are still very attractive, although the yard itself is a collection of ugly buildings.

In 1999 the RSM purchased the remaining freehold from the Corporation of London in order to increase its investment value.

The unsolved problem

The unanswered question is, how did Trotter come to acquire the invitation card?

Wilfred Trotter was one of the more distinguished surgeons of the early 20th century, specialising in neurological, pharyngeal and laryngeal surgery. His whole career from student to professor was at UCH. He was noted as teacher, researcher and superb clinical surgeon, one observer commenting that a tumour 'would present itself to him in the middle of his incision apparently of its own volition'.[16] He was Surgeon-in-ordinary to the King and a Vice President of the Royal College of Surgeons, an eminently suitable person to be invited to an important anaesthetic occasion. But in the summer of 1897 Trotter had only recently qualified and was still a house surgeon, hardly a likely person to receive a prestigious invitation. However, his chief, Mr Arthur Barker, the professor of surgery, certainly would have been invited, for the anaesthetist on the staff of UCH was Dudley Buxton himself. One might speculate whether Buxton inadvertently left some blank invitation cards in the theatre one day, the house surgeon might have picked one up, taken it away and in due course used it as a bookmark and scribbled some notes on it. We cannot know.

What is easy to see is how a book from Trotter's library could have gone successively through the hands of Morriston Davies and Temple. Davies qualified seven years after Trotter and whilst both were awaiting vacancies on the staff of UCH, they worked together on research into the mechanism of conductivity in cutaneous nerves, using themselves as experimental subjects, important work that in 1909 achieved publication in the *Journal of Physiology*.Davies was a pioneer in thoracic surgery, and amongst other achievements he was the first surgeon ever to remove a tumour of the lung; but in 1917 he pricked his hand whilst operating on an infected patient and this left him, in spite of radical treatment from Trotter,

with an almost useless right hand. Consequently, he left UCH and London and took charge of the Vale of Clwyd Sanatorium in North Wales, turning it into a leading centre for the rapidly developing surgical treatment of pulmonary tuberculosis.[17] He was able to take up operating again and Temple, himself a chest surgeon in nearby Liverpool, knew Davies well until his death in 1965.

Summary: This paper traces the movements over 102 years of an invitation card to a prestigious occasion in the history of anaesthesia. It also prompted an investigation into the first home, at 20 Hanover Square, of the first Society of Anaesthetists in the world.

Acknowledgements:

As well as Professor T C Gray and Mr Leslie Temple, I am grateful for the help of Dr Anne Florence, Dr Penelope Hunting and Ms Claire Jackson, archivist to the RSM; also to the staff of the Westminster City Archives and the British Museum for their help in tracing the Dayes painting. The photographs of the invitation card and all relevant documents have now been lodged with the records of the Society of Anaesthetists at the Royal Society of Medicine.

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INTENSIVE CARE MEDICINE
A brief history of development

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Origins of intensive care: Poliomyelitis epidemic in Copenhagen

From July to December 1952 the city of Copenhagen suffered a severe poliomyelitis epidemic. The Blegdam hospital for infectious diseases admitted some 2,830 patients during the course of this epidemic, which saw a remarkably high incidence of bulbar paralysis. Within the first three weeks some 31 patients had required artificial ventilation, in tank or cuirass ventilators, and 27 of these patients had died. The chief physician Professor HCA Lassen was aware that something had to be done. He was advised to seek the help of an anaesthetist, Dr Bjorn Ibsen, who had been involved in the management of a child with tetanus neonatorum earlier that year.[1]

In 1949 Ibsen had been an anaesthetic resident in the Massachusetts General Hospital in Boston. Whilst there he had studied the mechanisms of carbon dioxide accumulation in anaesthetised patients, particularly those undergoing thoracic surgery. He was convinced that the polio victims who had died whilst being ventilated had done so as the result of airway obstruction leading to hypercarbia, rather than hypoxic respiratory failure.

A test case was undertaken to demonstrate Ibsen's theory and show how controlled ventilation could be used successfully. The patient was a 12 year old girl who had bulbar paralysis with secretion retention and atelectasis. A tracheostomy was performed under local anaesthesia and tracheal suctioning was used along with positive pressure ventilation. A Brinkman carbovisor demonstrated that the carbon dioxide content of the blood was elevated despite the absence of hypoxia.

As the result of this case Ibsen made several recommendations, which were later published by Lassen.[2] The early use of tracheostomy with cuffed endotracheal tubes was advocated, together with regular suctioning and physiotherapy to remove secretions. Intermittent manual overpressure ventilation with a Waters' to-and-fro system was employed with a carbon dioxide absorber. Most importantly Ibsen argued that resources should be centralised in special departments rather than scattered throughout various wards. Such departments were the forerunners of intensive care units. Ibsen also proposed the early involvement of the anaesthetist in treating these cases – even to the extent of sending anaesthetists out with the ambulance crews to stabilise patients on their way into hospital.

After the epidemic it was decided that there were too few cases to maintain a respiratory support service, but that the proposed departments of anaesthesia in Copenhagen would be able to provide pools of equipment and trained personnel in the event of future crises. It was not long however, before Ibsen was again asked to provide help in a general medical case. In this instance it was a ten-year-old boy with severe tetanic convulsions and ventilatory failure. Once again Ibsen drew on his anaesthetic knowledge. He was aware that curare had been used to provide muscle relaxation for electro-convulsive therapy. He therefore employed curare muscle relaxation and positive pressure ventilation, together with an oxygen-nitrous oxide

anaesthetic to support the boy, who made a full recovery after some 17 days. Once again a dedicated room was set up with trained nursing staff and the equipment to treat other cases. However, after four cases the chief of the hospital decided that there was no longer any need to maintain an anaesthetic consulting service and that in future instructions could be left by the anaesthetists on how to operate the ventilator.

Respiratory units - forerunners of intensive care units

A number of respiratory units had been set up in many centres to deal with patients with respiratory failure. These patients were suffering from acute intoxication - primarily of barbiturates, smoke and carbon monoxide inhalation, as well as neurological disorders. One such unit was the respiratory centre of the medical clinic at the Free University of Berlin. Founded in 1957 it was typical of the many units in Europe. It had 22 beds, of which 11 were occupied at any one time, with the rest being reserved for times of epidemics and other emergencies. Between 1957 and 1962 some 1200 patients were admitted, which represented an increased workload at a time when the incidence of respiratory failure due to polio was falling rapidly after the introduction of the Salk/Sabine vaccine. This was seen in many such units. In 1962 at the First European Congress in Anaesthesiology in Vienna a symposium was held on the development of these respiratory units [3].

The fact that this topic was being discussed at a symposium on anaesthesia indicates recognition that anaesthetists would be involved in bringing new techniques for treating respiratory disease into the field of general medicine, although Dr Mushin did comment that he wondered if anaesthetists would ever be responsible for the administrative running of such units. Dr Sandiford from Scotland put forward the point of view that anaesthetists were the best clinicians at diagnosing early respiratory failure, from their work with muscle relaxants in the operating theatre. He suggested that if any physician wished to have the best care for these patients they should consult with a senior anaesthetist and allow them to assess the patient early on.

The meeting suggested an ideal size for such units as having 10 beds per 1 million population, although it was recommended that the units should not be more than 100 miles apart to minimise problems in transporting patients. It was also decided that such units should be located in major hospitals so that support could be obtained from other disciplines when required. This would also allow a large medical and nursing staff to be trained to maintain a 24 hour cover of those patients requiring respiratory support.

There was much discussion on what patients should be admitted, as some centres were treating patients with irreversible disease. It was suggested that patients with pathology associated with respiratory failure should be admitted as well as those with overt respiratory failure. This would allow early therapy to be commenced.

The need for early recognition and treatment of the critically ill, reiterated again and again in these early days of intensive care, continues to be a problem even today, with a recent paper describing sub-optimal care for critically ill patients prior to their referral to intensive care units.

Other developments

The Copenhagen epidemic provided the impetus not just to provide specialist units to treat patients with respiratory failure but also stimulated development in ventilator technology and monitoring of arterial blood gases.

Positive pressure ventilators, which are common in intensive care units today, arose from the Copenhagen polio epidemic. Positive pressure ventilators had been around since the introduction of the Draeger Pulmotor in 1907 but the development of these devices was halted with the outbreak of World War 1.[4] In 1929 Drinker introduced the iron lung which became standard equipment for artificial ventilation in hospitals until the 1950s. In 1951 Dr Engstrom demonstrated his volume ventilator. He hurried this into production during the polio outbreak to relieve the medical students maintaining 24-hour manual ventilation of patients with ventilatory failure. Over the next 30 years ventilators were developed with many different modes of ventilation and ventilatory support, such as positive-end expiratory pressure, that are seen on intensive care units today.

Many critically ill patients have a disturbance in acid-base balance. It was Paul Astrup, chief of the clinical chemistry laboratory at Blegdam hospital, who devised equipment to make accurate and rapid analysis of arterial blood gases to optimise ventilation of the polio victims.[5] He later introduced the concepts of base deficit and standard bicarbonate which have allowed, with some qualification, the metabolic component of such disturbances to be assessed.

What did the physicians think?

In 1962 the Ministry of Health gave its blessing for hospitals in the UK to set up intensive care units. With increasing numbers of intensive care units being developed anaesthetists were encroaching more and more into the realm of internal medicine. In 1966 the *Proceedings of the Royal College of Physicians* published the minutes of one meeting at which this new development was discussed.[6] At this meeting Professor Dornhurst of St George's Hospital said that he was unimpressed by the published descriptions of such units and thought the assessment of their results was naïve. He is recorded as saying that anaesthetists in these units were quick to master apparatus used and over-ready to employ drastic treatments but had a shallow understanding of disease processes. Another viewpoint at this meeting was that intensive care consisted of time consuming physiological and biochemical investigations.

If anaesthetists were to run intensive care units they would have no time to work in the operating theatre. Thus it was argued that clinical physiologists should run the units and anaesthetists should be called upon to help when ventilation and muscle relaxation was required. Professor J S Robinson on the other hand suggested that with the 24 hour services of anaesthetic departments, the anaesthetist should have a large part to play in running intensive care units, and that it would be beneficial to have someone who was clinically neutral to administer such units.

The BMA gets involved

In 1967 a British Medical Association working party was set up to formally assess the role of intensive care units.[7] It defined intensive care as: 'A service which provided constant observation of the vital functions and could support these functions more promptly and efficiently than anywhere else in the hospital'.

It was proposed that approximately 1% of patients in a district general hospital would require intensive care management at some point. An optimal size of 6 – 8 beds was recommended, with more than 10 beds being unwieldy and less than 4 beds being uneconomical. The working party considered that suitable patients for intensive care would be: 'those patients who were deemed reversible but requiring continuous or frequent observations or investigations and those requiring complicated, often mechanical, treatment'.

Some disadvantages of building intensive care units were noted. It was mentioned that elitism and separation from other hospital departments might occur and that training could become unbalanced, with less well-trained staff being left to manage the general wards. Once again the tendency for over-energetic treatments to be employed was commented upon.

The Intensive Care Society

In 1970 Dr Alan Gilston wrote a letter to the *Lancet* in which he noted that the exchange of information and ideas between the increasing numbers of intensive care units was, in his words 'haphazard', and proposed setting up a new multidisciplinary society to improve the situation.[8] The Intensive Care Society held its first meeting in 1971 at The Royal College of Surgeons, London. Not all anaesthetists welcomed the formation of this society. One professor of anaesthesia refused to meet Dr Gilston when he visited the professor's department to lecture to the technical staff there.

In spite of this opposition to an extended role, by 1989 in the United Kingdom 85% of intensive care units were run by anaesthetists. In 1999 intensive care medicine was granted category 2 status as a speciality and the intensive care training group have formulated a training plan for anaesthetists, surgeons and physicians who wish to become intensivists. It is not impossible visualise a time when intensive care medicine will separate from anaesthetics from which it began to evolve almost 50 years ago.

Conclusion

Modern intensive care was founded when anaesthetists brought techniques developed in the operating theatre into the field of general medicine. The work of Bjorn Ibsen and others not only drastically reduced the mortality rate of polio victims in Copenhagen, but I feel also provided the stimulus for the development of many techniques which are used in intensive care today. The principles of managing critically ill patients are essentially unchanged since those early days but some lessons, particularly the need for early referral of critically ill patients, remain to be learned. Anaesthetists are running at least 85% of all intensive care units in the UK.

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EVOLUTION OF THE PULSE-OXIMETER*

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In 1658, Isaac Newton explained the mechanism of the rainbow. Almost a century later, Johann Heinrich Lambert showed that a beam of light passed through a coloured particulate solution, underwent a diminution in its intensity (Lambert's Law). August Beer demonstrated that light absorption was directly proportional to the solute concentration (Beer-Lambert's Law). Bouger showed that the absorption also depends on the distance travelled in the medium (Beer-Lambert-Bouger's Law). The chemist, von Bunsen of burner fame, also known as 'the father of coefficients' introduced the exponential factor, the light extinction coefficient. Beer-Lambert-Bouger-Bunsen's Law is known by the majority simply as Beer's Law.

In 1911, Wilhelm Berg invented the photo-electric cell. The first device to measure tissue oxygenation was constructed in 1932 by an Austrian, Ludwig Nicolai, using Berg's photo-electric cell. Various names were suggested for this gadget: Oxyhemograph, Oxy-Hemo-Globinograph, Anoxia-Photometer and, finally, Glen Millikan, the American physiologist, coined the term 'Oximeter'.

In 1935, Karl Matthes, a Professor of Physiology from Vienna, constructed the first device to continuously measure the SaO_2 of human blood in vivo. He enunciated and explained its principle, that 'Red light can pass through oxy-haemoglobin, but reduced haemoglobin absorbs it'. Matthes is regarded as the father of oximetry.

During World War II Millikan constructed his Ear-Oximeter with a built-in servo-control for pilots, to help deal with the problem of high altitude hypoxia. J R Squire and Goldie from Scotland, introduced an inflatable pressurising capsule in Karl Matthes' oximeter to set the 'bloodless-zero'.

In 1948, McClure, Behrmann and Hartmann, using an oximeter, published a report on: 'How to control Anoxaemia during anaesthesia', which went virtually unnoticed! Earl Wood and Geraci modified Millikan's ear-oximeter with an inflatable balloon to compress the tissue and produce the ' bloodless- zero.'

In 1949, Robert Brinkman and William Zilstra introduced the concept of reflection (as opposed to transmission) oximetry and showed it to be remarkably accurate. In 1950, Earl Wood and Geraci improved the accuracy based on light extinction curves. Stephen and colleagues in 1951 published a paper: 'The Oximeter, a technical aid for the Anesthesiologist' which met with almost total indifference.

In 1953, Leland Clarke invented the polarographic oxygen electrode to measure the PaO_2 and began the era of measurement of tension or partial pressure of O_2. Interest in saturation oximetry declined until revived by an international colloquium in Bremen in 1959.

Further advances came with the fiber-optic catheter oximeter to assist cardiac surgeons and the self-calibrating 8-wave-length ear oximeter to contain the problem of dysfunctional haemoglobins.

In 1974, Takuo Aoyagi, a Japanese bio-medical engineer, and his chief, Professor Nakajima, modernised and miniaturised the oximeter with the incorporation of LEDs, and renamed it 'the pulse-oximeter'. The device could perform 30 saturation measurements per second, which were then averaged out by a micro-processor. Since the signals were pulsatile, they could also compute the pulse-rate, and since they were associated with blood-volume changes, they could obtain the plethysmogram. It was a superb invention, yet the manufacturers turned it down as a costly 'unnecessary aid'. The Minolta company in 1980 manufactured a compact three-section oximeter, the Minolta Pulse Oximeter.

In 1982, William New and Mark Yelderman, two New York anesthesiologists began educating the world of anaesthesia in the use of pulse oximetry. New founded the Nellcor Company which mass-produced its Pulse-Oximeters.

In 1988, the Association of Anaesthetists of Great Britain and Ireland introduced pulse oximetry as their standard for intra-operative monitoring. Two years later the American Society of Anesthetists made the same decision.

*** Abstract only at author's request**

THE NATIONAL BIRTHDAY TRUST FUND

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On 12 November 1928 a meeting was held at a private house in central London to inaugurate the National Birthday Fund for Maternity Services. It was called by Edith, Marchioness of Londonderry, a celebrated hostess, and Ina, Lady Cholmondeley. It was reported in *The Times* the following day, and the attendance was said to be 'large and representative of the services interested'. The original aims were very general: to give help to hospitals and other agencies involved in maternity work. The meeting was addressed by the Minister of Health, Neville Chamberlain, and by Lucy Baldwin, the Prime Minister's wife.

Maternal mortality

The question of maternal mortality, which had been simmering for some years, came more to a head in 1928; the published figures showed a rate of 4.5 per thousand. This was the same as it had been at the turn of the century, and it seemed to be increasing. Earlier in the same year, on 28 February, at a public meeting in Central Hall, Westminster, a message from Queen Mary was read out: 'The Queen considers the time has come for concerted action to be taken in dealing with so pressing an evil, and will await with interest the conclusions of the conference'.

Fund members

Lucy Baldwin joined the Fund in the following year, 1929, and brought with her a particular interest in pain relief in labour; she had already initiated an Anaesthetic Appeal Fund in 1927. A Resident Anaesthetist was appointed at Queen Charlotte's Hospital, and it was claimed that by 1930 over 90% of mothers were getting some form of analgesia. This was considerably better than in other institutions where babies were born; at this time 80% of deliveries were domiciliary, and 60% of these were delivered by midwives. Thus the majority of women got no pain relief at all.

In 1930, Lady Juliet Rhys-Williams joined the Fund. She was to be one of the most prominent members over the next thirty years. She was a member of the Board at Queen Charlotte's, and her vision was an improvement in maternity services through better trained midwives who could administer some form of pain relief. In this she was influenced by Dame Janet Campbell, a Senior Medical Officer at the relatively new Ministry of Health, who had highlighted the maternal mortality problem as early as 1921,[1] and had produced reports on the training of midwives and the teaching of obstetrics in medical schools.

Largely at the Fund's initiative, the Joint Council for Midwifery was set up in 1934, with representatives from obstetrics, general practice, midwives and the Ministry of Health. Although it was an unofficial committee, it played a large part in the drafting of the Midwives Act passed by Parliament in 1936, which created a salaried service of better trained midwives. It is fair to say that previously the status of midwives had been less than that of State Registered Nurses. For this work Lady Juliet Rhys-Williams became DBE in 1937.

Change of Name

Having taken out a Trust Deed, the name of the Fund was changed to The National Birthday Trust Fund in 1930 and will hereinafter be referred to as the Trust. There had been a misunderstanding in some quarters that it existed to give people presents on their birthdays. Their early concern with pain relief ran like a thread through the 6 years of their existence. In 1993 they merged with the Royal College of Obstetricians and Gynaecologists' research arm (Birthright), and the name was changed to Well-being. They did have other concerns including nutrition in pregnancy and a human milk bureau.

Their first exercise was to write to some hospitals and local authorities offering to provide three months free supply of chloroform capsules if they would agree to a study which included its use by supervised midwives. The capsules contained 20 minims of chloroform and could be crushed on a swab and inhaled. Two hundred cases were presented to the Royal Society of Medicine in June 1932 by Carnac Rivett[2] who believed that they were safe and foolproof. They were also discussed at the Obstetrics and Gynaecology section of the BMA meeting in the same year, where one delegate perceptively asked who would sign the death certificate. There was in fact one death in a patient who, having had capsules, was given a chloroform anaesthetic for perineal stitching; the cause of death was said to have been the tongue falling back on the throat.

The Trust also paid for a young anaesthetist to travel to the hospitals to demonstrate the use of the capsules. The second of these was Hilda Garry (who died in January 1999) and she subsequently became R J Minnitt's assistant in the trials of his gas and air machine.

British College of Obstetrics and Gynaecology investigation

There were some difficulties with the capsules; some were non-crushable and some exploded. There was one death in a patent given 37 capsules in 5¾ hours and one patient was discovered in a semi-conscious state with a capsule clenched tightly between her teeth. (Stanley Sykes in his *Essays on the First Hundred Years of Anaesthesia* includes chloroform capsules in the chapter headed 'Stupidities'). Nevertheless, the Trust asked the British College of Obstetrics and Gynaecology (founded in 1929) to investigate the capsules further, with emphasis on their use by midwives; the Trust would cover the cost. The committee appointed to organise the trial included one anaesthetist, Zebulon Mennell of St Thomas's. They suggested that other techniques should be compared with the capsules: these were the Mennell Inhaler (a modified Junkers he thought foolproof), the Christie Brown inhaler[3] (rather like a safety inkwell, chloroform concentration unknown but probably not high), and rectal paraldehyde.

More or less simultaneously, in September 1933, R J Minnitt started trials of his gas and air machine in Liverpool, with financial help from the Trust. It had been used in very few cases when it was demonstrated at the annual meeting of the Association of Anaesthetists in October 1933. The Minnitt apparatus aroused considerable interest, notably from J Elam of Barnet, and Katherine Lloyd-Williams of University College Hospital. The BCOG was persuaded to include the Minnitt in its investigation, and when the report was published in January 1936[4] it was the only technique considered suitable for use by appropriately trained midwives, chloroform being regarded as too dangerous and paraldehyde inadequate. Shortly

afterwards, the Central Midwives Board sanctioned the use of Minnitt's apparatus by midwives, but among the conditions laid down was the presence of a second suitably qualified person, i.e. a nurse or midwife, and this was difficult to fulfil in remote or rural areas. The Trust made efforts to get this modified, but not until six years later (1932) was it agreed that the second person could be someone of, for example, Red Cross or St John's Ambulance status.

For this and other reasons, including shortage of training courses, the spread of analgesia to domiciliary midwifery must be regarded as disappointing. The survey *Maternity in Great Britain* (in which the Trust was only indirectly involved), showed that in 1946 only 20% of home deliveries received analgesia, and of those delivered by midwives only 8% did. Chloroform was still about, used in 14% of cases. There were some complaints about the portability of gas and air machines, but they could fit into the carrier of a bicycle, and there was a scheme whereby British Oxygen Company delivered cylinders to a patient's home for a nominal charge.

By the time of the beginning of the NHS it was calculated that the Trust had provided 1775 gas and air machines either fee of charge or for a nominal sum. Some of these went overseas (Britain had an Empire in those days). Even so, only 52% of mothers delivered in hospital received analgesia.

Postwar

After World War Two the Trust kept in touch with developments in obstetric analgesia. Following Josephine Barnes' paper on pethidine in the BMJ in 1947,[5] they lobbied the Home Office to allow midwives to administer it, and this became legal in 1951. They wanted the Medical Research Council to investigate Trilene (trichloroethylene) and they gave financial help to Tunstall during his work on Entonox.

Josephine Barnes eventually became President of the Trust (1981-93), but in their early days they were viewed by obstetricians with some suspicion. Blair Bell, the first President of the BCOG, told Lucy Baldwin that she had got hold of the wrong end of the stick, that there was more to the subject than she realised, that lay folk should not rush in to such questions, and dismissed the campaign as 'sociological sentiment'. An obstetrician in London objected to 'being rushed around by a pack of London titles through a letter in the press'.

In the postwar period the Trust worked more closely with the (by now) Royal College of Obstetricians and Gynaecologists, notably in four surveys in which financial and administrative help was given. The 1946 survey mentioned above was more of an economic and social nature. Two members of the Trust on the steering committee wearing other hats (Barnes and Rhys-Williams) ensured that a section on pain relief was included, which was not in the original questionnaire.

Surveys

The 1958 survey was originally intended to be a repeat of 1946 but it broadened to include perinatal mortality, which had not been falling at the same rate as maternal mortality. A new development was official cooperation from the Ministry of Health under Sir George Godber. A similar survey was done in 1970, and published later as *British Births*. Subsequently, when

others were doing similar surveys, and it was hoped that official figures would be available (a hope not entirely fulfilled), there were surveys of single issues. *Birthplace*, for example, published in 1987, looked at facilities present at the units where deliveries took place. A chapter on anaesthesia was written by Barbara Morgan, and the Faculty of Anaesthetists, the Association of Anaesthetists and the Obstetric Anaesthetics Association were represented on the steering committee. One of the editors was Geoffrey Chamberlain, who later held the Chair of Obstetrics at St George's Hospital and became a committee member of the Trust. He was also joint editor of the 1993 publication *Pain Relief in Childbirth* - a National Survey. The chapter on anaesthesia here was written by Mal Morgan. In this survey the views of women and their partners (who were at this time present at 90% of deliveries) were sought, leading one obstetrician to comment: 'We never used to ask them, we used to tell them'.

Politics

Although the Trust was not a political organisation, most of its members were probably Conservative by inclination; Lady Juliet Rhys-Williams, however, twice stood (unsuccessfully) as a Liberal candidate. It is tempting to see the influence of Lucy Baldwin in the Conservative manifesto for the General Election of 1929, which promised improved care for mothers and babies. This was the first General Election in which women aged 21-30 were able to vote.

In January 1949 the Conservative MP, Peter Thorneycroft, introduced a Private Members Bill for Analgesia in Childbirth. This had cross-party support and was publicly welcomed by the Trust. The Minister of Health, Aneurin Bevan, was suspicious of anything to do with Tories and suspected political motivation. Eventually the Government introduced an appropriate amendment to the NHS Bill, and the Thorneycroft Bill was defeated at the Third Reading. The Trust thought that the publicity was useful.

Personalities

Three personalities stand out strongly from the early days of the Trust. Lucy Baldwin had a gas and oxygen machine called after her, and also a maternity hospital in Stourport, Worcestershire. This is still in existence, although no longer a maternity unit. She was a tireless fund-raiser and enthusiastic speaker, once comparing the mortality in childbirth with going over the top in World War One trenches.

Lady Juliet Rhys-Williams was described in a *Times* obituary as a 'tremendous dynamo'. She was the daughter of Elinor Glyn, who wrote novels and Hollywood scripts that were regarded as advanced for the time. If there was a sub-committee or representative of the Trust on another committee Lady Juliet would assuredly be there. She was Chairman of the Trust from 1954 until she died in 1964. It was said that after her death the Trust for a while lost its sense of direction. Sir Julien Cahn was the first Chairman of the Trust and held the position from 1934-44. He was a seriously rich man who had inherited wealth from his father's furniture empire in Nottingham. He was also a generous man; besides providing money and equipment for the Trust, he not infrequently took out his own cheque book. He was passionately keen on cricket, and had a well equipped ground at his home - Stamford Hall, near Loughborough. He also took teams of first-class cricketers on tours abroad, and usually packed some gas and air machines with the cricket bags to present to local hospitals. (Lucy Baldwin was also a keen cricketer, being a member of one of the rare ladies' teams). As a

mere male, Sir Julien was somewhat outnumbered on the Trust committee, and was heard to mutter occasionally that he did not understand the psychology of women.

Acknowledgment

Much of this information is contained in the book *Women and Childbirth in the Twentieth Century* by the historian A Susan Williams, which makes use of, among many other sources, the extensive archives of Trust papers in the Wellcome Institute.

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'TIME TEAM'

Carenza Lewis

The Guest Lecture at the Cambridge Meeting was given by Carenza Lewis, an archaeologist from the Royal Commission on the Historical Monuments of England (RCHME) working in Cambridge, and more popularly known for her work with the Channel 4 Documentary Series, Time Team.

The lecture had been organised many months in advance, and this did not allow for the vagaries of television schedules. Though filming of the seventh series should have ended, a telephone call in the preceding week indicated that a further 'special' was to be produced over the Cambridge Weekend. This as has subsequently been shown on Channel 4, was the rescue of the Seahenge on the Norfolk coast, and its removal to Flag Fen. Valiantly, the speaker agreed to keep her promise to give her lecture, though this would involve breaking off from archaeology and filming, then driving down from Norfolk to Churchill College. However, every chairman's worst nightmare seemed to be happening, when five minutes from the programmed lecture time, the speaker had not appeared! With moments to spare, Ms Lewis arrived, still dressed in T-shirt and mud-stained turquoise jeans. Apparently, to allow for excavation at low tide, the team had worked through the night to remove one of the ancient timbers.

With barely a pause for breath, she launched into a description of Time Team, its personalities, subjects, and behind-the-scenes organisation. It was devised by Tim Taylor who worked initially with Mick Aston and Phil Harding on Time Signs for Channel 4. Following this, he created the Time Team format.[1] The programme is fronted by Tony Robinson, who rose to the television audience's attention as Baldrick in Blackadder. Professor Mick Aston from the University of Bristol is the team's leader, with Phil Harding, a field archaeologist from Wessex Archaeology; Victor Ambrus a freelance illustrator; Robin Bush, formerly deputy county archivist for Somerset; Stewart Ainsworth, a trained surveyor also with the RCHME; Bernard Thomason, who first worked in archaeology in 1972 interpreting air photographs at Cambridge University; John Gater, an archaeological geophysicist, who has worked with British Gas, the Ancient Monuments Laboratory of English Heritage and Bradford University and, finally, Dr Chris Gaffney, also a geophysicist. The computer graphics, so much a part of bringing the past back to life in the hour-long programme, are produced by Creative TV run by husband-and-wife team Steve Breeze and Sue Francis.

With seven seasons of filming to draw on, the lecture dipped into anecdotes and themes that run through the programme's history. Medical items included upper Palaeolithic human remains from Cooper's Hole, Cheddar, a mediaeval leper burial, and from the current series, Roman remains lying in the grounds of an hotel in York. Incidentally, this item had been screened live so that the lecturer had not seen the final result. Of most interest was an earlier series excavation by a Norman church to the east of King's Lynn in Norfolk. Here, a skull had been unearthed apparently with a horrific sword wound possibly from a Viking raid, by removing the top of the vault. However, analysis of the damaged skull indicated the possibility of early attempted medical treatment as shown by the lack of radiating fracture lines around part of the fragment, suggesting that surgery may have been employed. Another

long-running theme was the team's desire to find a Roman mosaic. The audience at Cambridge were given a preview of this being finally accomplished during the seventh series. Of many unusual locations that Time Team have excavated, that on the Island of Nevis, the plantation owned by John Pinney, coincidentally links with that character's place in the Bristol slave trade, the English connection being described in the History of Anaesthesia Society's Bristol meeting.[2] English sites have ranged from open fields in Gloucestershire, where a Roman Villa complex was excavated, to back gardens in the Midlands looking for the remains of the factory of Matthew Bolton.

Pausing only to answer questions from the audience, the speaker returned to Norfolk to complete filming later that day.

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THE CONTRIBUTIONS OF SIR HENRY DALE TO ANAESTHESIA

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Many of today's anaesthetists know little or nothing about Henry Dale. Yet if it were not for his fundamental scientific advances, current anaesthetic practice would probably be very different. It was Dale's breakthroughs that led directly or indirectly to at least seven landmark events:

- the development of alpha and beta (adrenaline receptor) agonists and blockers;

- the use of oxytocin and ergometrine in obstetric anaesthesia;

- the modern concept of surgical shock;

- the understanding of anaphylactic and anaphylactoid reactions;

- the development of antihistamines;

- the use of muscle relaxants in anaesthesia;

- the scientific foundation for hypotensive anaesthesia.

Figure 1. Sir Henry Dale 1875-1968
Photo reproduced courtesy of The Wellcome Institute Library, London

Henry Hallet Dale was born on 9 June 1875 in Islington (north London). He attended the nearby Tollington Park College where his academic prowess became evident.[1] In 1891 he was on the point of leaving school for an office job when, by chance, he was entered for a scholarship to The Leys School in Cambridge. So began a long association with Cambridge as he progressed from The Leys School to Trinity College in 1894. Four years later he obtained the Natural Science Tripos with first class honours in both physiology and zoology. Then as a Coutts-Trotter student he spent two years from 1898 to 1900 doing research work in the physiology laboratory under JN Langley.

In 1900 Dale began the clinical part of his medical course at St Bartholomew's Hospital. He graduated B Chir in 1903, but he never practised medicine. Instead, elected to the George Henry Lewes studentship, he continued his physiological studies at University College, London, in the laboratory of E H Starling (who with Bayliss had just discovered secretin). While at University College Dale met Otto Loewi, who was on an attachment from Marburg. This was the start of a lifelong friendship. From October 1903 to February 1904 (as part of his studentship) Dale worked in Frankfurt under Paul Ehrlich, whom he found stimulating. In the summer of 1904, on the recommendation of Starling, Dale applied to Henry S Wellcome for a post in the Wellcome Physiological Research Laboratory. He was appointed Pharmacologist and 18 months later was promoted to Director at Herne Hill, a position he held until 1914. While at the Wellcome he proceeded MD in 1909, and became a Fellow of the Royal Society in 1914.

Henry Dale was appointed in 1914 to the scientific staff of the newly formed Medical Research Committee. This became the Medical Research Council in 1920 and Dale became head of its Department of Biochemistry and Pharmacology, working at the National Institute for Medical Research at Hampstead. He was Director of this Institute from 1928 until his retirement.

Dale's Researches:

Ergot and the dual action of adrenaline

Ergot, the fungus parasitic on rye (and long known to stimulate smooth muscle contraction) had first received the attention of Dale when he was a student at Cambridge. At the Wellcome Laboratories, George Barger prepared 'chrysotoxin' (a crude powder) from ergot, and Dale tested this on the arterial blood pressure (BP) of the spinal cat - finding an initial pressor action. One day, while finishing this experiment, Dale was asked to determine the adrenaline content of a sample of dried adrenal glands, and he resolved to try it on the spinal cat already under test. Surprisingly, the adrenal extract did not raise, but lowered the BP, and Dale therefore condemned it. By coincidence exactly the same thing happened a week later and Dale was alerted to the apparent 'adrenaline reversal' by ergot.[1] In his paper 'On some physiological actions of ergot' published in *Journal of Physiology* in 1906, Dale concluded that 'chrysotoxin' paralysed the motor functions of sympathetic nerve stimulation and of adrenaline.[2] He thereby introduced the first adrenergic blocking agent into pharmacology. He also noted that it was much more difficult to antagonise the actions of adrenaline on the heart than on the blood vessels. These observations anticipated adrenergic alpha and beta receptors and were the basis of all subsequent work on alpha and beta agonists and blockers.

Sympathomimetic amines

In 1904 T R Elliott, another Coutts-Trotter student of Trinity College, suggested that sympathetic nerves might bring about their actions by liberating adrenaline.[3] This idea captured Dale's imagination. Years later, in 1953, he dedicated his book *Adventures in Physiology* to Elliott.[4] Dale had an interest in chemical structure and he combined this with his profound physiological knowledge. In 1910 Barger and Dale studied over 50 amines chemically related to adrenaline and determined the structural requirements for inotropic and pressor activity.[5]

Oxytocic drugs

During his investigations of the pharmacology of ergot, Dale in 1906 discovered that posterior pituitary extract contained a potent oxytocic substance.[2] This was another lucky accident in an experiment in which, by chance, he was using posterior pituitary extract as a control and also recording the response of a cat's uterus.[1] With Dale making the physiological controls, H W Dudley succeeded during 1919-22 in separating posterior pituitary extract into two components: one with oxytocic and the other with vasopressor activity.[6] In 1932 Chassar Moir, using a uterine recording balloon devised by Dale, established that there existed a specific water-soluble ergot alkaloid with striking oxytocic activity.[1] Dudley and Moir isolated this in 1935 and called it ergometrine.[7] Dale and G L Brown reported on its pharmacology the same year.[8]

Anaphylaxis

In 1912 Dale discovered that the antigen-antibody reaction occurs not only in blood, but also in the tissues, owing to the formation of cell-fixed antibodies.[9] While studying the effects of horse serum and comparing them with those of histamine on the isolated uterus of a guinea pig in a traditional organ bath, he encountered a uterus which responded with a maximal contraction to serum in a dilution usually inactive. Suspecting that the animal had been sensitised he questioned the source, and received confirmation that the guinea pig had been injected with small amounts of horse serum (in assays of antitoxins).[1] Dale's paper 'The anaphylactic reaction of plain muscle in the guinea pig'[10] published in 1913 led to the histamine theory of anaphylaxis.

Histamine

In 1910 Barger and Dale demonstrated the natural occurrence of histamine in ergot.[11] Its pharmacological actions were first described by Dale and P P Laidlaw in the same year.[12]

In 1919 Dale and Laidlaw showed that large doses of intravenous histamine not only dilated the capillaries, but also caused a general increase in their permeability, resulting in loss of plasma through the capillary wall into the extracellular space. The consequent reduction in circulating blood volume and the tendency of the increasingly viscous blood to stagnate in the dilated capillaries and venules, were the classic features of histamine shock.[13] In 1929 Dale theorised that the tissue injury from the intracellular reaction of antigen and antibody results in a liberation of histamine from an inert bound form.[14] Dale's work on histamine formed

the basis of much of the modern concept of surgical shock and was also a prerequisite to the development of antihistamine drugs.

Acetylcholine and the theory of chemical transmission of nerve effects

Dale's work on acetylcholine began in 1914, again with ergot! An extract had been sent to him from the Burroughs Wellcome factory for routine testing. When he injected 1 ml of it intravenously into a spinal cat the BP (recorded by mercury manometer) instead of showing the expected moderate rise, fell abruptly to zero. Thinking he must have inadvertently injected an air bubble causing a fatal embolism, Dale was preparing to abandon the experiment when the rapid re-ascent of the manometer float caught his eye. He tried another 1 ml injection: again the heart stopped beating, but after about 2 min it 'began to beat again, slowly at first, but then rapidly gaining in strength and acceleration'. Dale seized the moment and pretreated the spinal cat with a small dose of atropine. As he had anticipated this completely annulled the effect.[1] Realising that the batch of ergot must contain something like muscarine, Dale and a chemist colleague, A J V Ewins, set about isolating the active substance. They were rewarded with a double platino-chloride with unidentified active base. Then Dale remembered a paper from 1906 by Reid Hunt on the intense vagomimetic action of acetylcholine.[15] On Dale's request, Ewins prepared some acetylcholine and they found the substance isolated from ergot indistinguishable from it.[16]

Dale's classic paper 'The action of certain esters and ethers of choline and their relation to muscarine' soon followed.[17] This was arguably his greatest contribution to physiological theory. In it he subdivided the actions of acetylcholine into two distinct types: a *muscarinic* action antagonised by atropine, and a *nicotinic* action antagonised by excess of nicotine. He drew attention to 'the biochemical similarity as shown by their common responsiveness to acetylcholine, between ganglion cells and nerve endings, voluntary motor as well as craniosacral involuntary' - thus anticipating the possibility that acetylcholine might be the transmitter at all these points. He also suggested that the evanescence of acetylcholine effects might be due to the activity of an esterase - thus predicting the action of cholinesterase.

In 1921 Otto Loewi's experiments on the isolated frog heart provided convincing evidence of chemical transmission of nerve effects by 'vagus-substance'.[18] In 1933 Dale coined the terms *cholinergic* and *adrenergic* neurones. Following breakthrough experiments that year, Dale and W Feldberg, demonstrated in 1934 that the 'vagus-substance' was liberated by stimulation of vagal fibres to the stomach and that this was indeed acetylcholine.[19] Just after this they showed that acetyl-choline is also the transmitter responsible for neuromuscular transmission and that a close intra-arterial injection of acetylcholine caused muscle contraction.[20, 21] In 1936 Henry Dale and Otto Loewi were jointly awarded the Nobel Prize for Medicine for their work on neurohumoral transmission.

Excursions into anaesthesia

Muscle relaxants

Since the classic experiments of Claude Bernard in 1856, it had been known that curare acted at some point between nerve and muscle. The elucidation of the chemical basis of neuromuscular transmission by Dale and Feldberg[20,21] provided the long awaited

breakthrough in determining the mechanism of action of curare. In 1936 Dale, Feldberg and Vogt demonstrated that acetylcholine was released from the motor nerve terminals during excitation by nerve volleys and so bridged the gap between nerve endings and muscle. In the presence of curare such excitation no longer caused muscle contraction - yet the liberation of acetylcholine was not affected.[22] Thus it became evident that the principal site of action of curare was the acetylcholine *receptor* site - the mystery of curare had been solved (at least partially) by the pharmacologists at the Medical Research Institute. Since in 1935 d-tubocurarine chloride had been isolated in Dale's laboratory,[23] the stage was set for the first use of purified curare in anaesthesia.

Anaesthesia in traumatic shock

In 1920 Dale recommended the avoidance of chloroform and ether in cases of traumatic or bacterial toxaemia. He pointed out the comparative safety of the combination of local anaesthetic with nitrous oxide and oxygen.[24] However, he was aware of the difficulty in obtaining sufficient depth of anaesthesia with a non-hypoxic mixture of nitrous oxide and oxygen. The following year Dale and L Hill reported on experiments on cats which were anaesthetised with nitrous oxide and oxygen under pressure of 1.5 atmosphere in a hyperbaric chamber: soft bellies yet pink pads were achieved. They suggested the feasibility of this method in man.[25]

The 'Cotton process ether' and 'Ethanesal' controversies

In 1923 Dale, C F Hadfield and H King published a paper in the *Lancet* confirming that chemically pure ether *was* a satisfactory anaesthetic and as effective as good commercially available ether.[26] This exploded the myths that 'Cotton process ether' (marketed in North America) and 'ethanesal' (marketed in the UK) were superior to ordinary ether.[27]

Possible substitutes for cocaine

Dale was appointed by the Minister of Health to a Committee to investigate the possible substitutes for cocaine, which was well known to have the dangerous side effects of toxicity and addiction. In this regard he gave sound advice in meetings held at the Royal Society of Medicine in 1924.[28]

Extracorporeal circulation

In 1928 Dale and EHJ Schuster designed a double perfusion pump 'to replace the heart, and to carry on both major and minor circulations of the whole body'. With defibrinated blood, they used this successfully for experiments on heartless cats and dogs.[29] Adaptations of the Dale and Schuster pump were used in all the early cardiopulmonary bypass attempts in humans, including the first successful bypass operation by Gibbon in 1953.[30]

Induced hypotension

Dale and Laidlaw's work on histamine shock in 1919[13] provided the scientific foundation on which safe hypotensive anaesthesia rests - a selected low pressure can be safe in a vasodilated circulation, yet unsafe when there is vasoconstriction. In 1949 Dale coined the term 'postural

ischaemia' for the influence of elevation of the operative field in induced hypotension - after he had seen its effective use by Sherrington on a cat and by Enderby on a human.[31]

Veterinary anaesthesia

Though not in clinical practice Dale was versatile in the administration of anaesthesia to laboratory animals. As early as 1906 he was using chloroform, ether, A C E mixture and, when necessary, curare, cannulation of the trachea and artificial respiration.[2]

The doyen of British pharmacologists, Henry Dale justifiably received innumerable awards, honorary degrees and medals. The list includes his election to Honorary Fellowship in the Faculty of Anaesthetists, Royal College of Surgeons of England in 1960.[32] He died in Cambridge in 1968 at the age of 93.

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THE INFLUENCE OF THE EDINBURGH DENTAL HOSPITAL AND SCHOOL ON THE ADVANCEMENT OF ACADEMIC ANAESTHESIA

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The close association between dentistry and anaesthesia is well recognised given that both William Morton and Horace Wells were dentists who carried out their initial studies on dental patients. In Edinburgh, within days of James Young Simpson's description of the anaesthetic properties of chloroform, his friend and neighbour, the dentist Francis Imlach, gave chloroform to one of his apprentices for a tooth extraction. Imlach had trained in Paris and was a distinguished dental surgeon, later to become the first to be elected President of the Royal College of Surgeons of Edinburgh. He also became an accomplished anaesthetist who with John Smith helped to found the Edinburgh Dental Dispensary in 1860.

John Smith

John Smith (1825-1910), the son of an Edinburgh dentist, graduated with an MD from the University in 1847. Like Imlach, he continued his education in Paris with the intention of practising as a surgeon on return to Edinburgh. However, on his father's death in 1851 he inherited the practice and switched to dentistry. Before long he became concerned about the quality of dental training in Scotland. Accordingly in 1856 he established a course of lectures on physiology and diseases of the teeth, lectures that were to form the basis of his 1864 *Handbook of Dental Anatomy and Surgery*, which also contained a chapter on anaesthesia.[1] Again, like his colleague Imlach, he had become interested in anaesthesia and was soon recognised as an able and careful administrator whose services were frequently called upon by surgeons and by Simpson himself.

In 1857 Smith was appointed Surgeon-Dentist to the Royal Public Dispensary. The problem of dental education still concerned him and shortly after his appointment, early in 1858, he wrote to the President of the Royal College of Surgeons of Edinburgh. He pointed out that the only method of training dentists in Scotland was by an apprenticeship in mechanical dentistry, that the quality of instruction in such apprenticeships varied widely and that the clinical experience open to apprentices was very limited. He made two suggestions for improving the situation; either dentists should be required to obtain a basic medical qualification and thereafter have some dental education or they should be required to undergo a specialised, defined course of instruction in dental surgery.[2] His arguments had little immediate impact. Smith decided that to improve the scope and quality of dental teaching what was needed was a separate independent establishment controlled by dentists. He therefore resigned his appointment at the Royal Public Dispensary and with the cooperation and assistance of various colleagues (including Francis Imlach) he founded in 1860 the Edinburgh Dental Dispensary managed by a committee of directors. The dispensary flourished. As its reputation grew it was recognised by the Royal College of Surgeons of England in 1865 as part of the curriculum for the College's diploma in dental surgery (LDS).

John Smith himself was deeply involved both with teaching and practice. In 1863 he had been appointed surgeon to the Dental Department of the Edinburgh Royal Infirmary but he continued to be in demand as an anaesthetist and remained active politically. As a member of the Dental Reform Committee he became Chairman of the Scottish Dental Education Committee in 1877. Its purpose was to confer with the staff of the Edinburgh Dental Dispensary as to the possibility of extending it to meet the teaching requirements for the LDS diploma of the Royal College of Surgeons of England; the Committee would also appeal to the Royal College of Surgeons of Edinburgh to seek powers to grant its own diploma.

Dental Hospital and School

With the passing of the Dentists Act 1878[3] the Committee's work was to some extent overtaken by events. Within months, a Licentiate in Dental Surgery (LDS) was instituted by the Royal College of Surgeons of Edinburgh with the first examinations arranged for January 1879. Obviously it was now essential for the implementation of proper training that a dental school should be established. Again with the cooperation of his colleagues, John Smith founded the Edinburgh Incorporated Dental Hospital and School based on the Dental Dispensary he had founded nearly twenty years earlier.

The combined hospital and school was formally opened in November 1879, with a Board of Directors drawn from the original Dispensary, the University, the Royal Colleges and from the Church. It was an immediate success. Among other innovations during the first decade the Board appointed chloroformists who by 1892 were four in number. It is not clear when exactly they were appointed but it would seem they included two brothers, J M and D A Farquharson. The other chloroformists were W M T Lundie and George Mathieson Cullen, one of the two Scottish founder members of the London Society of Anaesthetists (founded in 1893 by F W Silk). It is equally unclear what teaching, if any, was undertaken at that time. What is known is that in 1897 D A Farquharson was authorised by the Board to give a short course of lectures on the action of anaesthetics and to give practical demonstrations on Saturday mornings. Further, according to the minutes of the hospital dated 24 October 1899: 'Dr Jamieson having kindly offered to give demonstrations on the administration of ether to patients on Friday mornings during the present session and having kindly offered to supply his own ether, his offer was accepted'. J J Jamieson graduated MB ChB in 1897, obtained his FRCS in 1900 and his MD in 1902. It is likely that he was appointed Anaesthetist to the Dental Hospital shortly after graduation to replace Dr J M Farquharson who resigned in 1897.

Almost certainly the above offer was occasioned by the decision of the hospital, taken only a few months earlier, to abandon the use of chloroform as an anaesthetic for dental extractions. This decision followed the death on 4 May 1899 of a young woman, Miss Frances Ross, under chloroform anaesthesia. No details are provided in the hospital minutes other than that this was the first death under anaesthesia to occur in the hospital. Another effect of this decision was that the title 'chloroformist' was abolished and replaced by 'anaesthetist' from 1899 onwards, with the approval of all concerned.

William Guy

In the meantime, John Smith had resigned from the Board of Directors in 1898. His place on the administrative committee of the joint hospital and school was taken by his son-in-law,

William Guy (1859-1950) who had married Smith's daughter in 1895. Guy qualified in Edinburgh as a Licentiate of the Royal College of Physicians and Surgeons in 1884, and went into practice in Cumberland where he worked until 1890. He then returned to Edinburgh to study dentistry, becoming LDS and FRCS in 1892. He entered partnership with Smith and in 1895 he was appointed surgeon to the Dental Department in the Royal Infirmary. In 1899, on the death of the incumbent Bowman Macleod, he was appointed Dean of the Dental School, a post he held until 1933.

Like John Smith, William Guy strongly supported the need to have properly trained anaesthetists to give dental anaesthetics. One of his first acts after appointment as Dean was to persuade his colleagues that in future gas (nitrous oxide) and ether should only be administered in the Hospital by or under the directions and in the presence of a qualified medical practitioner. This decision was given unanimous support by the staff, undoubtedly helped by his earlier, significant appointments to the staff of the Dental Hospital - J H Gibbs as Anaesthetics Tutor and T D Luke as Anaesthetist. The latter was a University appointment later to be upgraded to Lecturer. The decision also reinforced the regulations for the Dental Diploma of the Royal College of Surgeons of Edinburgh first published in 1890 in the *Medical Directory*:

> 'The attention of all Dental Licentiates is drawn to the recommendation of Crown Counsel that in the administration of anaesthetics due care should be taken to ascertain the condition of the patient, and that when the practitioner does not himself possess a medical qualification, he should in such cases obtain, where practicable, the presence or assistance of a medically qualified practitioner'.[4]

Later, in 1896, the regulations were made more specific, in that there was a requirement for a knowledge of anaesthetics, local and general, on the part of candidates presenting themselves for the LDS examination.

John Herbert Gibbs

Of the two anaesthetists appointed to the staff of the Dental Hospital in 1900, John Herbert Gibbs, a New Zealander by birth, qualified LDS in Edinburgh in 1898 and the following year he qualified in medicine (LRCP&S). He practised both as an anaesthetist and a dental surgeon, first in the Dental Hospital. In 1902 he obtained his FRCS and in 1903 was appointed surgeon in the Dental Department of the Royal Infirmary. The following year he gave up his post as Clinical Tutor in Anaesthetics to the Dental Hospital, duties which were then undertaken by the Dean himself.

Gibbs did not, however, give up his anaesthetic practice. A founder member of the Scottish Society of Anaesthetists in 1914, he was President in 1923. He was among the first to condemn the use of chloroform for the extraction of teeth[5] and initially advocated the use of the nitrous oxide -ether sequence which he continued to use for major surgery. But for short cases in the Dental and ENT Hospital he switched to ethyl chloride after its introduction into dentistry in 1901 by W J McCardie [6] in Birmingham.

For anaesthetists of the authors' generation and before, Gibbs' major contribution was to introduce the so-called 'vapour' method for use with Guy's inhaler whereby ethyl chloride

was measured accurately into a small boiling tube which was immersed to a greater or less extent in hot water. Unfortunately, to the best of our knowledge he failed to publish a description of his technique. The first reference we could identify was in *Anaesthesia in Dental Surgery*[7] by Thomas D Luke. The 5th edition of this textbook published in 1924 after Luke's death, was edited by J Stuart Ross who succeeded Luke as Lecturer in Anaesthetics in the University of Edinburgh. Guy's inhaler is an inhalation system consisting essentially of a Clover's face-piece, a Barth three-way tap and a one gallon Clover's bag adjusted to take ethyl chloride vapour as described by the Dean in his paper on the administration of ethyl chloride published in 1904.[8]

Thomas Luke

Thomas Luke (1873-1922), the second of the two anaesthetists appointed to the Dental Hospital in 1900 by the Dean, graduated MB BCh from Queen's College, Belfast in 1894. For the first five years after graduation, he divided his time between spells at sea as a ship's surgeon and periods as the resident physician in various hydropathic clinics.[9] Thereafter, he moved to Edinburgh and took up the appointment of anaesthetist to the Deaconess Hospital before applying for the post in the Dental Hospital.

Luke was an outstanding teacher with drive and enthusiasm for his subject. He became a Fellow of the Royal College of Surgeons of Edinburgh in 1902 and in the same year he was appointed Instructor in Anaesthetics to the medical students in Professor Annandale's wards in the Royal Infirmary. His course of instruction was optional but so successful that in 1904 the University Senate decided that the importance of his instruction was such that it should be extended to include all students in the teaching wards of the Royal Infirmary, and he was promoted to Lecturer.[10]

As it happened, Luke's period in Edinburgh coincided with the efforts to improve anaesthetic techniques in the wake of the decision of the Dental Hospital staff to abandon chloroform for dental extractions. Initially, Luke promoted the use of nitrous oxide and oxygen supplemented by ether, and worked with Guy to develop suitable apparatus for the delivery of the sequence. At that time, anaesthetists were concerned that the equipment needed was both bulky and unwieldy and that it was impossible to determine accurately the concentrations of the agents required. For many, the problem was resolved in 1903 with W J McCardie's description of his experiences with ethyl chloride for dental extractions and other short procedures.[11] According to McCardie, the apparatus was easily portable, the induction of anaesthesia was rapid and recovery was prompt when the agent was withdrawn. It was his view that ethyl chloride was ideal for dental extractions and indeed for any short operation, particularly in country practice.

McCardie's advocacy made a substantial impact on the Edinburgh anaesthetists. Thomas Luke, William Guy and J H Gibbs began to investigate the suitability of ethyl chloride for short procedures like dental extractions and guillotine tonsillectomies, and to devise convenient apparatus for its administration. Guy described what came to be known as the Guy's inhaler, the system of administration that was later greatly improved by the method of vaporising ethyl chloride introduced by Gibbs. Luke did much to promote the technique in his lectures, in his published papers, and more particularly in *Anaesthesia in Dental Surgery*, first published in 1903. Despite his anaesthetic expertise, his acknowledged skill as a teacher and

his successful publications – his first book *A Pocket Guide to Anaesthetics for the Student and General Practitioner* was published in 1902[12] and reached its fourth edition in 1908, by which time Luke had an MD degree from the Royal University of Ireland – the surgeons in the Royal Infirmary of Edinburgh were unwilling to allow Luke to give anaesthetics there. On the death of his mentor, Thomas Annandale, in December 1907 his position became untenable. In his frustration he wrote a characteristically tactless and bitterly acerbic letter to the *Lancet*[13] describing his opponents for what they were! The subsequent row led perhaps inevitably to Luke's resignation. In March 1909 he withdrew from anaesthesia entirely to become Resident Physician in Peebles Hydropathic Sanatorium. But he has to his credit the distinction of establishing the first anaesthetic course in a University medical curriculum.

J Stuart Ross

Luke's successor, J Stuart Ross, graduated MB ChB in Manchester in 1896 and obtained his FRCS in Edinburgh in 1902. Together with William Guy, he described the use of nitrous oxide and oxygen as an anaesthetic technique for dental and surgical procedures in a paper published in the *Edinburgh Medical Journal* in 1912.[14] Two years later he described the Edinburgh System of dental anaesthesia in the *British Dental Journal*,[15] a system based on nitrous oxide and oxygen supplemented with ethyl chloride. Ross had the added distinction of being the first anaesthetist to obtain a research grant from the University of Edinburgh. In 1910, on the recommendation of the Senate, the University Court awarded him a grant of £5 from the Earl of Moray Endowment for the Promotion of Original Research. The grant was to meet the cost of animals and drugs needed to investigate the action of certain drugs in the presence of inhalation anaesthesia.

It is not surprising that Ross should have become involved in research. His Dean, William Guy, had already embarked on a programme of original research related to anaesthesia with the cooperation of colleagues in the Department of Physiology; between 1910 and 1913 three papers had been published on the cardiovascular effects of anaesthesia. It is interesting to speculate on how these activities might have developed had not the First World War supervened to divert attention to matters more related to the war effort.

Conclusion

What is clear is that from the time chloroformists were first appointed to the Dental Hospital in the 1880s, the discipline of anaesthesia had made steady progress in that hospital. From the beginning, training was important and gradually became more formalised, first with demonstrations and tutorials, followed later by a more academic lecture programme. Thereafter, various anaesthetic techniques were developed, new apparatus was designed to exploit physical principles, and pharmacological and physiological responses began to be studied. In fact, the Dental Hospital was at the centre of anaesthetic teaching and research in Edinburgh before the Royal Infirmary had even appointed an anaesthetist.

Credit for these developments must lie primarily with John Smith and William Guy who had the foresight, wisdom and understanding to appreciate that the safety of their patients depended on expertise and knowledge, and they themselves set the example. They were ably supported by colleagues like Francis Imlach, JH Gibbs and Thomas Luke, many of whom were doubly qualified in dentistry and medicine and most of whom held higher qualifications

in surgery. In our view, the contributions of these early Edinburgh pioneers deserve much wider recognition than has hitherto been acknowledged and it is hoped that this presentation will do something to remedy that deficiency.

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A TOTAL SPINAL IN 1950

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Dr. Fischer's and Professor Wildsmith's history of spinal anaesthesia and the description of the Woolley and Roe case to our Society's meeting in Southend[1,2] brought back a poignant memory to me.

In 1950, as a new consultant anaesthetist in my first post I began working in a hospital in the Midlands. I found that I was expected by the obstetrician, and indeed by the patients, to administer spinal anaesthetics for the Caesarean sections. Hitherto, these had been given by the surgeon, while the obstetric houseman gave low spinals for the forceps deliveries.

There was only one not very experienced anaesthetic registrar and this was a busy hospital. Moreover, this was only three years after the Woolley and Roe episode,[3] in which you will recall two men developed permanent neurological damage after spinal anaesthesia for two relatively simple operations, one for a hydrocoele, the other for a torn cartilage of the knee. The atmosphere in my teaching hospital had been definitely against spinal blocks, so my experience of spinal analgesia was small.

Rather than take the probably exaggerated risk of giving spinals, I decided to use epidural block, although I had no experience of it. In order to familiarise myself with the technique, I gave epidurals to the women on the gynaecology list which I attended with the same obstetrician-gynaecologist. He was a very rapid and skilled surgeon and I was hard put to induce the next patient by the time he had completed the previous operation. The following is a brief description of one of the more interesting cases.[4]

A woman of 31 whose respiratory and cardiovascular systems were normal (her BP was 145/80) was scheduled to undergo a pelvic floor repair. She received papaveretum 20 mg and scopolamine 0.4 mg one and a half hours before induction.

My technique was to introduce a Howard Jones needle between the spines of T12 and L1 with the patient on her side. I did not use an indicator, but relied on the sensation of piercing the ligamentum flavum and on the fact that no CSF dripped from the hub of the needle. A syringe containing 20 ml of 2% lignocaine with adrenaline 1:50,000 was attached. I drew back on the piston; if no blood or CSF appeared in the syringe, the whole amount was injected and the patient was turned on to her back. I then gave an intravenous injection of thiopentone 0.5g in the 5% solution which was commonly used at that time. The blood pressure, pulse rate and respirations were monitored and recorded.

From the title of this presentation, you will not be too surprised at the sequence of events which then followed:

In 3 minutes the patient was apnoeic, the pupils widely dilated and not reacting to light; the pulse slow and regular, the colour good. Her condition might possibly have been due to thiopentone, but of course I suspected accidental subarachnoid injection. I gave 100% oxygen by manual ventilation with a Boyle's machine, on a semi-open circuit. The operation

proceeded with the patient in the lithotomy position, relaxation was excellent, and the bleeding was minimal. At 20 minutes, she was still apnoeic, the colour still good, the pulse regular at 84 per minute and the systolic BP was 90 mm Hg. At 25 minutes I gave an intravenous injection of nikethamide 5 ml, which had no effect on the apnoea, pulse-rate or blood pressure.

Thirty-five minutes after induction the operation was finished, the pulse was still 84 and the systolic BP was 95 mm Hg. The patient was transferred to a trolley with a 10% head-down tilt and I passed an oral endotracheal tube (with no reaction from the patient). I continued ventilation with 100% oxygen in a Coxeter-Mushin closed-circuit. The pulse remained steady at about 80 per minute, the BP rose slowly from 90/60 to 110/70 (I was taking quarter-hourly readings).

Fifty minutes later (i.e. 85 minutes after induction), there was a definite tracheal tug, but no respiratory movements. In another 5 minutes the pupils, though still widely dilated, reacted to light; a further 5 minutes saw the return of adequate diaphragmatic respiration. Fifteen minutes later the BP was 100/75, the pulse-rate was 78, the respirations seemed adequate and regular and the colour was pink.

Over the following 15 minutes, she became paler and the pupils no longer reacted to light, although the colour of ears and lips remained good. Just over 2 hours from the injection of lignocaine, the BP was 80/55, the pulse rate was only 38, and the respirations were shallower. During the next 5 minutes, I gave slightly over 30 mg N-methyl amphetamine (Methedrine) intravenously in divided doses with no effect: respiration, pulse and apex beat were by now all undetectable, but the colour was still pink.

Ten minutes later I could detect a faint pulse at 32 per minute. I gave nikethamide 5 ml intravenously. Within a minute, the patient opened her eyes, looked about and began to breathe again. I removed the endotracheal tube, oxygen being continued via a BLB oronasal mask. Four minutes later, two and a half hours after induction, the BP was 200/100, and the pulse-rate still 32 per minute. During the next 15 minutes the BP crept down to 190/105 and the pulse rate rose to 44 a minute. We discontinued the oxygen and returned the patient to the ward.

Half an hour later the BP was 120/75 and the pulse rate 50. She complained of weakness and tingling in the arms and numbness and paralysis of the rest of the body, which passed off during the next hour. The circulation remained stable and measurements of pulse and blood pressure were reduced to half hourly. Ten hours later the BP was 140/80 and the pulse-rate was 110.

Twenty-four hours after induction, the only complaints were of slight dizziness and diplopia and slight breathlessness. At 48 hours the patient felt well, apart from normal postoperative pain and discomfort. A slight pyrexia due to an E coli urinary infection persisted until discharge from hospital, but there were no other ill effects.

An interesting bradycardia

Presumably all or most of the lignocaine entered the subarachnoid space. What is interesting is that, as the block wore off, there was a sudden collapse of the circulation associated with an extreme bradycardia. The explanation is probably that the medulla and vagal centres recovered before the sympathetic cardio-stimulatory fibres and a relative overaction of the vagus led to an 'escape' of the ventricles to their intrinsic rhythm. The transient hypertension which followed was undoubtedly due to the vasopressor drugs I had given.

I have found only one reference to this intrinsic rhythm of the ventricles, although I am sure others must have noticed it in such cases. Vehrs in the United States in 1931 recorded one case of total spinal block in which the heart-rate fell to 30 a minute. He stated: 'The vital heart center is also paralysed, but the heart action continues as long as nutrient blood is supplied because of the inherent automatic properties of the heart muscle after complete block of its nerves and automatic center by analgesia or otherwise'.[5] He makes no mention of assisted ventilation.

I performed some 10-20 epidurals on women undergoing Caesarean section in 1950-1951, though I claim no distinction for this as I kept no records and published no figures. Hypotension was counteracted with methylamphetamine and oxygen given at 2 litres a minute by a nasal catheter. A few mothers felt some pain at the lower end of the wound.

The real point of this account is to show how a newly-fledged consultant dealt with the hazards of widespread subarachnoid block 50 years ago, with no electrocardiogram and only a sphygmomanometer to monitor the circulation.

None of these mothers was given parenteral fluids. At that time, it was not my habit to give intravenous fluids routinely except in major thoracic and abdominal surgery or when there was appreciable blood or fluid loss. In cases of widespread sympathetic block it was common practice, when blood loss was negligible, to give vasopressor drugs combined with head down tilt to combat hypotension. The importance of setting up an intravenous drip before performing an intrathecal or extradural block was not fully appreciated until some years later.

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CHLOROFORM AT THE BIRTH OF THE KAISER:
An Anaesthetic Of World Significance

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A year or so ago, I read a biography by a Cambridge author - the wife of a history don - of Princess Victoria (Vicki) (1840-1901), eldest child of Queen Victoria.[1] In 1857, at the age of 17, the Princess married Prince Friedrich Wilhelm, the grandson of the then King of Prussia. As dynastic marriages go, it was a good marriage and the couple were happy. They set up home in Prussia and not surprisingly, pregnancy quickly resulted. But unlike most of her mother's pregnancies, it was not a pleasant or happy time for the princess. Labour started on 26 January 1859 while she was at the Kronprinzenpalais on the Unter den Linden in Berlin.

Differing accounts

Here our troubles begin, because after finishing the biography I began to read accounts by other writers on Vicki's labour and delivery, and they differed remarkably. They not only disagreed in specifying the particular palace in which the labour took place but also in many other important aspects, including those related to anaesthesia.[2-5] In view of the historical importance of the occasion – Vicki's firstborn was to become Kaiser Wilhelm II and the leader of Germany during World War I - these discrepancies seemed surprising and worthy of further investigation.

Princess Vicki's basic medical attendants in Berlin were the Prussian Court physicians and midwives. However, according to some biographers, the Princess's mother, our Queen Victoria, was sufficiently doubtful of the skills of Prussian obstetricians that she arranged for a Scottish expert - a Dr Martin - to go over to Prussia to attend her daughter in labour. One account goes on to describe in some detail how, due to jealousy on the part of the Prussian doctors, this Dr Martin was refused residence at the palace, was summoned very late in the labour, and then only when things were going seriously wrong. When Dr Martin finally arrived, these sources relate, it was to find the exhausted, slight figure of the 19 year-old Princess (no! She was actually 18 years old at the time) with a breech presentation and a cervix not yet fully dilated. It was only too clear that the baby was a boy and therefore in the direct line to become King of Prussia.

Summing up the situation, Dr Martin is said by at least one author to have chloroformed the Princess and delivered the breech, only to find the left arm trapped with the aftercoming head in the pelvis. In bringing down the arm, so much force had to be used that gross damage to the brachial plexus occurred. Some accounts also suggest that there was a placenta praevia and that forceps were used. The descriptions of the difficult delivery and of the severe nerve and plexus damage are broadly correct, but in fact there was no placenta praevia and forceps were not used.

Not surprisingly the infant was flat and only after a lengthy period of stimulation and mouth to mouth ventilation (according to one account), did he begin to breathe.

The elusive Scottish doctor

Here, I thought, is an event of interest to the Society; less than 12 years after the discovery of chloroform anaesthesia, it appears that a Scottish disciple of Simpson was sent to Germany to dramatically save the day - and their future Kaiser and leader during the First Great War - for the incompetent Prussians.

Who then, was this 'Scottish' anaesthetist/obstetrician Dr Martin who was sufficiently well-known to Queen Victoria to be sent to her daughter's rescue?

I could find no-one fitting the description in the Queen's biographies or accounts of her pregnancies, nor is there anyone suitable in either the Medical Registers or Directories of the late 1850s or early 1860s. However, on looking through the Royal Society of Medicine catalogue for works on obstetrics by someone called Martin I found some highly authoritative-looking textbooks by two Martins, father and son, and these books were in German.

Professor Edouard Martin (the father) was born in Heidelberg in 1809. He studied law, and then medicine in Göttingen. He began to teach midwifery in Jena and gained the chair there in 1837 at the age of 28. In 1858, just as the Princess became pregnant, he was appointed to the highly prestigious Chair of Midwifery and Diseases of Women in Berlin. Among other honours, Martin later was awarded an Honorary Fellowship by the Obstetrical Society of London and his death is recorded in their Transactions of 1877. Not only did the Society acknowledge his outstanding contributions to the specialty, but in his obituary notice it is said that he had attended the Crown Princess of Prussia in her first confinement, my first authoritative identification of her elusive obstetrician.[6]

In Fasbender's History of (German) Midwifery of 1906, there is, perhaps not surprisingly, no mention under Eduard Martin's entry of the Kaiser's birth. But Martin appears not only as a pioneering obstetrician,[7] he is credited as having been the first in Germany to use chloroform for the assistance of women in labour. This is almost certainly the case as he published a paper on the subject in 1848, just a few months after Simpson's discovery. So he *could* have chloroformed the princess, but did he? And what of the story of Scottish doctor sent to Prussia by Queen Victoria?

The real British doctor in Berlin

At the beginning of 1999, an exhaustive study of Kaiser Wilhelm II by J C Röhl was first published in English and this has helped to clarify the issues. Professor Röhl confirmed what I had already discovered, that 'the historical literature on the birth of the last German Kaiser is riddled with misinterpretations, contradictions and half-truths.'[8]

The real truth of the matter is that it was Queen Victoria's personal physician, Sir James Clark, who arrived in Berlin (with the Queen's personal midwife, Mrs Innocent!) about a fortnight before the actual birth of the future Kaiser. Clark, in a later letter to the Queen, said that he had brought a bottle of chloroform with him to Berlin and while he seems to have had little experience in obstetrics, or indeed in anaesthesia, it was he who administered chloroform several times both as an analgesic during the princess's very painful labour, and

for full anaesthesia during the obstetrician's manipulations and the final delivery. Clark said that two-thirds of his bottle - we don't know its size - were administered to Vicki. In this connection it is worth remembering that John Snow wrote that he gave very small, 15 minim (0.9ml), doses for some of Queen Victoria's labour pains.[9,10]

To digress for a moment; some years before, Clark must have become aware of Snow's growing reputation as an anaesthetist in London as he, Clark, arranged for Snow to attend Queen Victoria during each of her last two deliveries, in 1853 for the birth of Prince Leopold and 1857 for that of Princess Beatrice.[9] Clark wrote to James Young Simpson after the first of these, describing the excellent analgesic effect obtained and of the Queen's satisfaction, so contributing to the settlement of the controversy over analgesia in childbirth so ably dealt with earlier by Simpson. One apparently authoritative writer states that Clark and Snow were contemporaries as students at Edinburgh with Simpson as a mutual acquaintance, but as far as I know Snow had no Edinburgh connection.[4]

A traumatic birth

To return to the main theme: although details of the birth of the man we call 'The Kaiser' appear differently according to which author you read, it is now clear that Martin, the German expert, was the obstetrician, while Clark, the Scot, acted as the anaesthetist during these desperate events, life-threatening for both mother and child.[11] Cord compression and a complicated breech delivery are strongly implicated in the causation of neonatal hypoxic cerebral damage, and if you accept that brain injury coupled with total and permanent paralysis of the left arm due to birth trauma are likely to have had a lasting effect on the Kaiser's physical and mental development, the circumstances of his birth may clearly have had a considerable impact on world affairs when the child became an adult, and his nation's leader.

A further adverse factor is the possibility, indeed the likelihood, that this neonate's cerebral hypoxia was intensified by deep chloroform anaesthesia. Supporting this view, accounts agree that the mother, having had several previous administrations of chloroform for analgesia during her labour, was deeply anaesthetised for the final difficult delivery. And we know that two thirds of Clark's bottle of chloroform were used over a period of several hours, and that prolonged resuscitation was required before normal spontaneous respiration was established.[12]

So, to reiterate, here we have the origins of factors which could be expected to profoundly influence the later life of the child surviving this difficult birth: the strong likelihood of severe cerebral hypoxia from a traumatic breech delivery coupled with anaesthesia-induced respiratory depression or paralysis, plus a severe brachial plexus injury leading to a permanently paralysed left arm in the first-born boy of a ruling military family.

What were the consequences?

In my view, the consequences of this traumatic birth on the character of the man who, at the age of 29, became the autocratic Kaiser of a recently united Germany, must have been profound. We can but guess from historians' character analyses at the subtleties of his mental disturbance, but it is easy to imagine the effect of the palsied arm in a man who gloried in his

army, rapidly enlarged his navy and had a fascination for uniforms; a young man who believed his kingship was bestowed on him by heaven and that it was his divine right to rule as he wished.[13]

His early attempts, on coming to the throne in 1888, to appear a benign liberal autocrat were belied in practice by his desperation to make his country a world power capable of tackling Great Britain or Russia - or both. Once war was inevitable, he tried (unsuccessfully) to distance himself and his empire from the conflict, but a reactionary, militaristic, anglophobic temperament in a ruler with absolute power must surely bear substantial responsibility for the catastrophe of 1914-18.

To revert to the birth, and bearing in mind that the regular medical attendants had given up the Princess and her child for lost, let us suppose:

- that the then very recent innovation of chloroform anaesthesia had not been available at his birth

- or that Sir James Clark had been either more or perhaps less successful as an anaesthetist

- or that Martin, the obstetrician, had been unable to accomplish that complicated delivery

- or that the baby, or both mother and child, had died.

All these, to my mind, are perfectly feasible possibilities in the situation I have described. Would World War I then have been avoided? Or, with a very different leader in Germany, would it have been a very different war? Would the history of the 20th Century have been written differently?

I leave you to make your own responses to these thoughts, but would suggest we still honour the professional memories of Sir James Clark, GP to the Queen and amateur anaesthetist, and Professor Eduard Martin, pioneer accoucheur and anaesthetist, who both kept their heads in a tight corner. They, after all, did not know what they were letting the world in for.

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PROFESSOR SPASOKUKOTSKIJ AND HIS SOPORIFIC MIXTURE

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Sergei Spasokukotskij is one the best known Russian surgeons, a perfect example of an experienced physician and scientist. He was one of the founders of thoracic and gastro-intestinal surgery in Russia. Some of his other interests resulted in a solution to problems with blood transfusion and asepsis in surgery.

He was born in Kostroma, a city on the Volga 100 miles north east of Moscow, on June 10th 1870, one of seven children. His father, Ivan Vasiljevich, was a general practitioner. Two other members of his family were trained as physicians. Kostroma, situated at the junction of the Volga and Oka rivers, was established in 1152 and is famous for the Monastery of St Ipaty which was built in 1332. The city was practically destroyed by fire in 1773.

Education

Sergei was educated at the gymnasium in Yaroslavl which is the oldest city on the Volga. It was founded in 1010 and from the 12th to the 15th centuries was a rival to Moscow to become the capital of Russia. It is a city of magnificent churches and is also one of the oldest educational centres in Russia. At this time the country was in a period of severe repression by the Tsarist government, which resulted in Sergei spending his formative years in an environment where any signs of free thought or deviation from the establishment norm were severely punished.

In 1888 he began his training in the medical faculty of Moscow University. At this time, Professor N V Skifosovski, one of the first in Russia to appreciate the advantages of Lister's work (1865) describing the benefits of asepsis and antiseptics, was head of the Surgical Faculty. His teachings aroused a life-long interest in asepsis in the young medical student. Two further interests, public health and laboratory research (new topics in Russia then) were also stimulated during his training. The part played by his father during a cholera epidemic was no doubt another reason for his concern with preventative medicine.

Early clinical work

He qualified with honours in 1893. From 1894-1896 he was a Senior House Officer in the clinic of Professor L Leishin, another pioneer in the field of asepsis, which reinforced all his earlier teaching. One of Leishin's claims to fame was that in 1879 he had carried out the first ovariotomy in Russia under aseptic conditions. The disinfective agents being tested at this time were potassium soaps, 1% solution of formalin, 5% solutions of carbolic, and manganese acid salts. The clinical assistant was not paid for his work but this did not diminish his enthusiasm. Sergei improved his CV during his surgical training by spending summers as a railway doctor. In 1897 he was a member of a Red Cross Detachment in the Balkans, assisting the Turkish Army during the Greek-Turkish war. In1898 Sergei took up his first managerial post in a district hospital in the Smolensk area, even though he had still not

'gone solo' in any intra-abdominal surgery. Smolensk, a city founded in the 9th century was unfortunately on the main route of advancing or retreating armies, and was the scene of many battles notably against the French, Polish and later the Germans. At this time herniotomy and appendicectomy were considered major operations, carried out at the Moscow Clinics, usually by the Professor. Consequently the surgical work seems to have been of low volume, only 330 cases during his first year. In an attempt to solve the problems facing the conservative surgeons, he modified the procedures for hernia repair and gastric surgery, techniques which were in the development stage towards the end of the 19th century. Although ether seems to have been available, much surgical work was still being carried out under local anaesthesia, cocaine being the drug of choice. Probably this was the reason for the apparent conservative approach to surgical intervention.

The claims made by Sergei to be carrying out these 'new' operations were greeted with scepticism by the Russian surgical hierarchy when he presented his results in Moscow in 1907 at the 7th congress of Russian Surgeons; the comment being 'we in the capital rarely come across suitable cases."

Career Moves

In 1909 he moved from Smolensk to Saratova, a city on the Volga about 200 miles north of Volvograd (Stalingrad), another important University centre in developing Russia. His initial reception was anything but friendly. He did not do much private practice, but reorganised the work regimes, and demanded punctuality, swift examination of patients, and a precise time for the length of handwashing, so limiting the time for the patients lying on the operating table to experience excessive nervous tension. In1912 he was nominated for the post of Professor of the Surgical Deparment in Saratova University Hospital. Eventually, after demonstrations from the reactionary elements who accused him of unreliability, he was appointed, despite police reports in 1908 naming him and two of his brothers as being involved in anti-government agitation. During his time in Smolensk he had given support to the underground revolutionary organisations in that city.

At the end of the October Revolution he approached the Soviet authorities, and obtained permission to set up an Institute of Traumatology in Saratova, to treat the large numbers wounded Red Army soldiers. He was also a leading light in the organisation of tuberculosis clinics in this part of Russia, the disease having become rife in the social shambles which obtained at the end of the Revolution all over USSR. His interest in gastro-intestinal surgery developed during this period of his career, so that there was a huge increase in the work load in his clinics, where he is credited with the development of gastric surgery for peptic ulcer, apparently very prevalent in Russia. He was also one of the pioneers in pulmonary surgery, carrying out in 1924 the first reported lobectomy in the Soviet Union. There is no report of the type of anaesthetic given, or whether or not the patient survived. The results of his pioneer work in antisepsis produced a sharp decrease in cases of postoperative shock, which reduced some of the surgical problems in treating pulmonary diseases and enabled him to convince his surgical colleagues that it was possible to open the pleura without fear of damage.

Theory and Practice in Shock

In 1926 he was invited to Moscow to become a chairman of the Department of Surgery in the 2nd Moscow State University, taking over from Professor F A Regn whose surgical interest had been the development of genito-urinary surgery. He was at the same time head of one of the Surgical Departments at the 1st City Hospital in Moscow. The new Professor reorganised the direction of the research work into gastro-intestinal and pulmonary surgery. Incredibly, on his arrival there were no laboratory facilities. The organisation and manning of a laboratory was seen as an urgent requirement as the number of intra-abdominal operations increased. Many of the surgeons at this time were troubled with a high incidence of postoperative shock. It was suggested that the frequent use of enemas and laxatives caused exhaustion which might be responsible for the high incidence. Professor Spasokukotskij considered that the problem was due to the severe metabolic disturbance, especially at the end of the operation, indicated by disorder of protein and carbohydrate metabolism and lowering of the chloride levels along with hypothermia.

To test the theory he introduced, in 1930, his breakfast mixture. This was given initially per rectum towards the end of surgery which seems to have been carried out under local and regional anaesthesia. The mixture consisted of two cups of milk, 30g of plum butter, 50g of sugar, two fresh eggs, a pinch of salt, along with 30-60ml of absolute alcohol. The volume of alcohol depended on the sex and size of the patient and his or her daily vodka intake. In 1934 the mixture was given directly into the first part of the duodenum before the operation started. The reports of the experiment are sketchy to say the least. But it was noted that absolute alcohol was an excellent analgesic.

The patients who did not receive the mixture were noted to be developing signs of shock, beginning to complain, and asking for the operation to be completed. The patients who received the mixture were completely different, commenting on their own feeling of well-being (alcohol?), and were less afraid of the operation, sometimes nearly falling asleep. The administration of the mixture gave 1200kCal which provided enough to lessen the incidence of shock in the immediate postoperative period. The apparent success of this technique led to its quick adoption in many other centres in Russia.

Lectures and Publications

Sergei was recognised as a brilliant lecturer and authority on a whole range of surgical subjects, publishing 143 papers between 1893 and 1943. A selection of titles includes:

1922 - Surgical access to the brain
1928 - Deep hand scrubbing without soap (0.5% ammonia solution)
1936 - The future of taking blood for transfusions
1941 - Blood transfusion: complications, causes, and prophylaxis

The contributions made to Soviet surgery by Spasokukotskij were recognised by many awards. He was made Honoured Figure of Science in 1934, and in 1938 he was awarded The Order of Lenin, and Order of the Red Banner. In 1942, a year before his death, he was made an Active Member of the Academy of Sciences of the USSR.

Last Years

During the Great Patriotic War of 1941-1945, even though now an old man, he was said to have carried out the work of ten men. He performed his last operation (for a bleeding gastric ulcer) on 5 November 1943. Twelve days later the Father of Russian surgery died.

This, however, is not the end of the story, for in 1955 at the University Clinic of Yaroslavl two surgeons, Professors Rukosuev and Abramova decided to review the use of the Soporific Mixture during gastric surgery. A series of 90 patients (53male, 37 female) were admitted to the trial, most of them being over 57 years old. They all had long histories of peptic ulcer. The Professor's original mixture was modified in that 86 of the group were given pentobarbitone, the dose varying between 100-300mg. The mixture was placed into the first part of the duodenum prior to surgery. The volume of alcohol in the mixture for females was 30-40ml, whilst for the men it varied between 40-60ml. In all cases the normal vodka intake was determined in the preoperative assessment, which also looked at the patient's general condition, nervous system, and individual specifics (not described). There is no mention of anaesthetic technique except that in nine cases it was necessary to use ethereal anaesthesia, to prevent shouting and excitation during surgery, probably related to the high vodka intake of this small group.

The monitoring carried out during surgery consisted of half-hourly measurements of blood pressure, pulse, and respiratory rate. In 77 cases blood transfusion was not necessary, whilst a few received a further injection of pentobarbitone to ensure a good nights sleep. In the first 48h after the operation all patients were given 2 litres of physiological solution via dropper enema. A mass of biochemical tests were carried out in the postoperative period but not tabulated. However, the claims made for the Professor's mixture with a soporific agent, were that the mixture turns off external impulses to spare the patients psyche, and so facilitate the performance of the operation without the need of intravenous therapy.

After his death in 1943, the Second Moscow Medical Centre was named after this famous surgeon, and the Spasokukotskij memorial built at the First City Hospital in Moscow.

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OXYGEN - A play in two acts by Carl Djerassi (Professor of Chemistry at Stanford University, National Medal of Science for first synthesis of an oral contraceptive) and Roald Hoffmann (Professor of Humane Letters, Cornell University, 1981 Nobel Prize for chemistry).

Premiered in the UK as a staged rehearsed reading at the Tricycle Theatre, Kilburn, on Sunday 6th February 2000.

The idea of this play is said to have been stimulated by the very recent rediscovery of a letter from the 18th century Swedish apothecary and chemist Scheele to Lavoisier, the existence of which was always denied by the recipient. Dated 30 September 1774, the letter asked Lavoisier to repeat a certain experiment first performed by Scheele in 1771, the effect of which would be the generation of a gas which supported combustion and life, to which Scheele had given the name *fire-air*. Proof of Scheele's priority over Priestley, who first produced the gas we now call oxygen on 1st August 1774, would have been important and dramatic two hundred years ago, but today Scheele's place in the history of chemistry is so well established that it can be no more than a passing curiosity. Faced with this the authors try to keep interest in the letter alive by ostensibly setting out to assess the relative importance of the contributions to chemistry of Lavoisier, Priestley, and Scheele.

To present this to the audience they invent a Committee of four Swedish chemists set up to award the first retrospective Nobel prize for chemistry, but the members immediately disregard everything except the part played by each of the proponents in the discovery of the gas we now call oxygen. The recognition of its significance in relation to eighteenth century theory tends to take second place. The female chairperson attaches to the committee, in the guise of a secretary, a historian of science, who plays an important part in the denouement. Three of the committee are delegated to present the case for each of the proponents, and parallel with their presentations there are scenes in which the three chemists, and their wives, played largely by the same cast, also make their case. To further assist the audience the authors have invented a mythical 18th century congress in Sweden, called by King Gustav III, during which each, with the assistance of back-projected slides of well-known contemporary illustrations of their apparatus, demonstrates his crucial experiments.

The authors are faced with some difficult problems. It is necessary to explain to a lay audience the phlogiston theory, why it was wrong, and what replaced it. This is done partly by means of a masque enacted by the Lavoisiers, and partly by an exposition by one of the committee to the others. This mechanism raises the entertaining question asked by Sheridan in his play *The Critic* – if they know it already why is he explaining it to them? Because the *audience* don't know, stupid! The audience should be mightily *obleeged* to him for taking the trouble! But his concern for the audience results in the nonsense of his looking over the shoulder of the note-taking postgraduate historian of chemistry and informing her that the word phlogiston starts with *ph* not *f*. Unfortunately he does not make it clear to the audience that the refutation of the phlogiston theory depended on the fact that whereas most metal oxides need to be reduced by heating with charcoal, so that the end products are metal and carbon dioxide, a few, such as mercuric oxide, can be reduced by heat alone, yielding metal and oxygen. The significance of this did not come to Lavoisier as a blinding flash of light; it took several years for him to understand it. Any seeds that may have been sown by Priestley

or Scheele in 1774 took a long time to germinate. (Essentially the argument was whether the addition of phlogiston, the 'substance of fire', to a metallic calx or ash, or as we would say, oxide, produced the metal, and its removal from the metal resulted in the calx, or whether metal plus oxygen produced calx, and conversely, calx minus oxygen produced metal.)

A lot is made of arguments about priority. Scheele first prepared 'fire air' in 1771, and recognised that it supported combustion and life. He prepared it a number of times, by different reactions. He communicated his discoveries to the great Swedish chemist Bergmann, and on 30 September 1774 he wrote to Lavoisier, describing how to prepare his air, which he recognised was the respirable part of the atmosphere. Lavoisier always denied receiving this letter, which was discovered in 1891, mislaid, and rediscovered recently. The denouement centres on the claimed recent finding of a letter written by Mme Lavoisier to her husband in December 1793 when he was in prison awaiting execution, which she never sent but concealed in her travelling case. She confessed that she had hidden Scheele's letter and had never shown it to her husband. I have no idea whether this is fact or invention. Unfortunately for Scheele, the manuscript of the book in which he announced his discoveries was held up by the printer for several years, and was not published until 1777.

In the meantime Priestley had prepared his 'eminently respirable air' from red oxide of mercury on 1 August 1774, and told Lavoisier about it when he visited Paris with his patron, Lord Shelbourne, in October of that year. The importance to Lavoisier of Scheele's letter is never discussed. We are not told what the postal service was like between Sweden and Paris, so we have no idea whether Lavoisier would have received it before his meeting with Priestley. Then why should Mme Lavoisier have concealed it? The only person it would have harmed was Priestley, whose claim of priority would have been negated; and if Lavoisier did not immediately realise the significance of Priestley's discovery when told of it, would his wife have immediately understood the implication of Scheele's? If not, why hide his letter? Mme Lavoisier's motive is not gone into at all. Perhaps the letter was merely mislaid, and when Scheele's claim became known it would have been too embarrassing to reveal it (in any case, how lost was it? J R Partington cites it in his *Short History of Chemistry*, first published in 1937).

As regards the discovery of oxygen there can be no argument – Scheele got there well before Priestley, and had a better idea of what he had discovered. He carried on where Mayow left off a century earlier. If he had not been a blind phlogistonist he would have beaten Lavoisier to the understanding of oxidation also. Priestley really has no part in this play at all.

The device of the mythical contest in Sweden creaks rather. From Scheele's statement that his book is to be published in a few days time it dates itself to 1777. In contrast to Lavoisier of Paris, Priestley, perhaps to raise a laugh, is introduced as of Leeds, although as Lord Shelbourne's librarian he had been living at Bowood and in London since 1773. He is accused of confusing oxygen with nitrous air, which is a mistake. Nitrous air was nitric oxide. As we all know, Priestley confused oxygen with his 'dephlogisticated nitrous air' which was nitrous oxide, because both supported combustion. The authors' need to present Lavoisier's case requires them anachronistically to describe his metabolic balance experiments, which were not conducted on animals until 1782 to 1784 and on man even later, and for some reason they introduce the idea of a *rubber suit* in which they were performed! Lavoisier proposes the name 'oxygen', which he did not until November 1779, and his erroneous reason for the suggested name, that the gas is a constituent of all acids, is not explained.

Some anachronistic feminist remarks receive the expected titters from the audience, and there is a mild attempt to suggest a romantic attachment between two of the committee. A number of themes run in the background – honesty and dishonesty between scientists, their antagonisms, the forces that drive them, and the need to distinguish between science as method, and scientists as fallible human beings. At decision time the authors cop out; two names are to be put forward, and we are given to understand that one is Lavoisier.

In the presentation of historical events biographers, novelists, and dramatists, have a great responsibility both to the protagonist and to the public. They should strive for accuracy as regards facts, and balance as regards interpretation. The mechanism the authors have adopted to tell their story has only allowed them to present these three great scientists as cardboard cutouts displaying their conventional national characteristics. So the real hero of the story, Joseph Black, is lucky in that he escapes being mentioned at all.

David Zuck

Careers in Anesthesiology - Autobiographical Memoirs Vol 3. Fink BR, McGoldrick KE, eds. Park Ridge, Illinois: Wood Library-Museum, 1999, $35. Chapters by Stanley Feldman, Carlos Parsloe, Ephraim Siker, John Steinhaus, and Peter Winter.

Stanley Feldman trained at the Westminster and qualified in 1955. While a student he was shown how to give open ether by Magill, only discovering later that the smoothness of the induction was due to the secret ingredient, chloroform. As a house physician he found himself, like so many others, expected to give anaesthetics, and so took his first steps along the slippery path, assisting Wyman with his work on induced hypotension. A year in Seattle with Lucien Morris aroused his interest in the neuro-muscular blocking agents, which he continued to research by means of the isolated forearm for the next thirty years. Neostigmine-resistant curarisation led him to metabolic acidosis and the introduction of bicarbonate infusion. His career culminated in the Magill chair of anaesthesia. He concludes that the greatest change he has seen during his career is in the role of the doctor. Financial considerations, managers, and legal considerations, have come between him or her and the patient. An anaesthetist used to be a physician who applied his knowledge, gained through lengthy and rigorous training, to looking after a patient during anaesthesia. Today he is a technician employed to give anaesthetic A for condition B.

Carlos Parsloe was born in Brazil in 1919. He was influenced by the same books as the present reviewer, Alexis Carrel's *Man the Unknown* and Vallery-Radot's *Life of Pasteur* when a teen-ager, and Best and Taylor's *Physiology* and Goodman and Gilman's *Pharmacology* as a student, books which both still possess. After graduation he, also, found himself giving anaesthetics, using an Ombredanne inhaler, and not only generals but spinals and epidurals, so in 1946 he secured a postgraduate training scholarship in Chicago. Entertainingly he describes both the cultural and the climatic shock of leaving warm summery Rio de Janeiro on 30th December and arriving in snow-bound Chicago on a cold, grey, winter morning two days later. Here he was used as a pair of hands, and received no teaching, but at least he attended a concert by a skinny young man called Frank Sinatra, and discovered that the expression 'kicked the bucket' was not to be understood literally. Fortunately he was able to get a residency in Ralph Waters' department in Madison, Wisconsin, and he provides an invaluable account of what it was like to work there. He continues with the story of his most interesting career, and his involvement with the Latin American and World Federations. On a return visit to Madison fifty years later he reflected that at the time of his original attachment no-one now working in the department had yet been born.

Ephraim Siker's anaesthetic training was interrupted by a two-year stint in the US Navy during the Korean War. Returning home he secured an appointment in Frances Foldes' department in Pittsburgh. Here he found suxamethonium and plasma pseudocholinesterase being investigated, and also the pharmacology of local anaesthetics. An exchange with Leslie Rendell Baker took him to Mushin's department in Cardiff for a year, during which time he met many of the great figures of British anaesthesia and participated in a clinical trial of halothane. He returned home with the gift of a Boyle's machine and twelve bottles, and was the first to use halothane in the US. During his later career he became an examiner for the American Board, was active in the World Federation, and served as President of the ASA.

John Steinhaus was another who came under the influence of Ralph Waters, in his case as a student in 1944 witnessing a demonstration of methods of artificial respiration on a subject basally anaesthetised to the point of apnoea! His early postgraduate career was in pharmacology, and work on local anaesthetic agents eventually took him into the specialty. He provides an interesting account of medical politics and private practice as it concerned the development of the clinical departments at Emory University, Georgia. Here he organised training programmes in anaesthesiology, and participated in the development of physiological recording and monitoring equipment suitable for use in the operating theatre. At national level he became involved in the politics of the nurse anaesthetist. Dr Steinhaus has much of interest to say about training and levels of achievement.

Peter Winter has entitled his chapter *From the Time of no People to the Time of no Money*, and that says it all. His parents were Viennese left-wing intellectuals who were living in Sverdlovsk, USSR, where he was born in 1934. Being warned of impending trouble his parents returned to Vienna in 1938 just as the Nazis marched in. They were lucky to be able to escape quickly and make their way to the US, where his father, an engineer, built a distinguished academic career. After a spell in the Army Winter studied and graduated at the University of Rochester. Following a trial run at obstetrics and gynaecology, which he found almost devoid of intellectual content, he naturally gravitated towards anaesthesia. A request to investigate the literature on oxygen toxicity took him deeply into the subject, to contacts with the Navy, research on deep sea diving and decompression, and thence into critical care medicine. He became chairman of the department at Pittsburgh, which he had virtually to rebuild from scratch: 'The first year or two were tight sphinctered'. Gradually he was able to attract and train staff, and build up a state of the art department. He served for more than twice the normal period of seven years, but when the University decided to accommodate its medical service to the fiscal requirements of 'managed care' he decided that his time had come. But during all this time he had been able also to engage in mountaineering and sailing, about which he writes entertainingly.

So here are the most interesting recollections of five anaesthetists, replete with anecdotes and much clinical detail, who were working during the time when the specialty was evolving very rapidly, with basic research being undertaken into the neuromuscular blockers and the new inhalational and local anaesthetic agents, and with major developments in monitoring techniques, and the introduction of intensive care. One of the writers calls it *the golden age of anaesthesiology*. Recently on an Internet anaesthetics mailing list a brash young subscriber referred to anaesthetists of this vintage as *dinosaurs of the fifties*. How wrong he was!

David Zuck

IMPORTANT WEB SITES

Thanks to the efforts of our ex-President, David Zuck, the Society now has its own web site:

www.histansoc.org.uk

David also draws our attention to a comprehensive web site devoted to John Snow, set up by a Californian epidemiologist, with an exhaustive account of his background and early years, and detailed maps of mid-nineteenth century London, at:

www.ph.ucla.edu.epi/snow/

UNIMPORTANT BUT INTERESTING

Another piece of information from David Zuck:

Chloroform used in 1793?

Splash out a fiver on some holiday reading:

Who betrays Elizabeth Bennet? Further puzzles in classical fiction by Professor John Sutherland of University College, London. Oxford World Classics. Price: £4.99.

This little book contains a delightful chapter on 'Where does Sidney Carton get his chloroform' which is excellent on the literature side, if a little inaccurate on the detail of inhalational anaesthetics. The other puzzles are a good read, too.

Hon.Editor

A LAST LETTER FROM DR R S ATKINSON
Sir Ian Fraser and *The Casebooks of John Snow*

Members of the Society will have been distressed to learn of the unexpected death of our ex-President, Dr Dick Atkinson. An appreciation will appear in a later volume of the *Proceedings*.

At the Bristol meeting, following the recent death of the surgeon Sir Ian Fraser (obituary *Daily Telegraph* May 13, 1999) Dick Atkinson mentioned the part Sir Ian had played in bringing *The Casebooks of John Snow* to the attention of anaesthetists. At the Hon Editor's request, he wrote this short memorandum on a small but important piece of history:

'At the annual meeting of the Association of Anaesthetists in Belfast in 1967, Sir Ian Fraser gave the John Snow Lecture entitled *John Snow and his Surgical Friends* (*Anaesthesia* 1968; **23**:501-504). I remember him talking about the casebooks, but not in the detail his published papers gives. I think he said he had recently discovered the existence of the *Casebooks* and had he known of them earlier, his lecture would have been different. His paper was excellent, perhaps one of the best John Snow Lectures delivered. The publication in *Anaesthesia* should be recommended reading today.

This lecture was the first reference to the Snow *Casebooks*. I was so interested that I wrote to him afterwards and asked where they were. He replied that they were in the Royal College of Physicians Library - and there I went to read them. After several visits the Librarian finally arranged for a photocopy of them to be made which I still have at home.

As far as I can ascertain, I was the first anaesthetist to read the *Casebooks*, and I presented a paper on 'The "Lost" Diaries of John Snow' at the 4th World Congress of Anaethesiologissts in London in September 1968 (*Progress in Anaesthesiology*. Excerpta Medica International Congress Series No.200: 197-199).

Of course Richard Ellis did the real work in editing the *Casebooks* for publication (Ellis RH. ed. *The Casebooks of John Snow*. Wellcome Institute for the History or Medicine, 1994). It was, however, Sir Ian Fraser who first drew the attention of anaesthetists to them. Before publication of the book I wrote to Sir Ian asking how he himself discovered their existence. His reply was that he could not now remember!'

OBITUARY

DR W BRIAN GOUGH

Former consultant anaesthetist Birmingham and Midland Hospital for Women, Solihull Hospital, and general practitioner Solihull. (b 1909; q Birmingham 1932; DA Eng 1937). Died peacefully on 28 June 1999, after a short illness in his 90th year.

Brian was one of the last of the general practitioner-specialists to hold a consultant appointment in a teaching hospital and be senior partner of a suburban group practice. Born on 26 July 1909 at Putney, London, he was educated at King Edward's School, Birmingham and Birmingham University. He played an active role in the Birmingham Medical Institute, he was President of the Section of Anaesthetics 1961 and President of the Institute 1975-79. At the time of his death he was serving the Institute as honorary librarian.

Keenly interested in the history of medicine, he was a leading member of the University of Birmingham Society for the History of Medicine. He was also a member of the Osler Club, the Royal Society of Medicine, the History of Anaesthesia Society and the Birmingham Archaeological Society.

His collection of historical material was such that his help was sought by and freely given to such distinguished medical historians as John A Shepherd and Richard Ellis. His other interests included numismatics and philately. An active member of the BMA he was Chairman of the Birmingham Division 1965 and President of the Midland Branch 1971. He was made a Fellow of the BMA in 1981.

Predeceased by his wife Marjorie, he leaves three sons (one a consultant anaesthetist) and a daughter; fourteen grandchildren; and four great grand children.

Edward T Mathews

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OBITUARY

DR NORMAN A BERGMAN – 1926-1999

Named one of the *WLM Laureates of the History of Anesthesia* for 2000, Dr. Norman Bergman died on 14 November 1999, at the age of 73.

Born in Seattle, Washington, on 14 October, 1926, Dr Bergman moved at the age of nine to Portland, Oregon. He graduated from Reed College in 1949, and the University of Oregon Medical School in 1951. Dr. Bergman left the Northwest to do an internship at Michael Reese Hospital in Chicago, Illinois, and his residency at Columbia Presbyterian Hospital in New York from 1952 to 1954. During his four years on staff at Columbia Presbyterian Hospital, he developed his interest in research and education.

In 1958, Dr. Bergman became Chief of Anesthesia at the Veterans Administration Hospital and faculty of the University of Utah, College of Medicine in Salt Lake City, Utah. At this time, he devoted more time to his interest in Anesthesia research. Between 1963 and 1964, he spent a year at The Royal College of Surgeons, in London, England to research pulmonary gas exchange in the lungs during anesthesia.

In 1970, Dr. Bergman was appointed the first Professor of Anesthesia at the University of Utah. That same year, he returned to Portland, Oregon to become Chairman of the Department of Anesthesia at the University of Oregon Medical School, and he resumed his interest in education and the training of future Anesthesiologists. He resigned the Chairmanship in 1981, and returned to England to do more research. He also spent several months in Stockholm, Sweden at the Karolinska Institute. Later, he returned to OHSU where he remained on staff until his retirement in 1989.

Dr Bergman was a visiting professor at various universities and was Associate Examiner for the American Board of Anesthesiologists during his long career. In 1976, he was elected a Fellowship in Faculty of Anesthetics of the Royal College of Surgeons of England, FRCA.

A prolific writer, Dr Bergman published more than eighty articles, both scientific and historical, in a number of journals during his lifetime. He also served as a book reviewer and reference editor for various journals. After he retired from active practice, he continued his interest in the history of Anesthesiology. He published "The Genesis of Surgical Anesthesia" in 1998, and received the David M Little Award of the Anesthesia History Association in 1999.

Dr. Bergman also served as a Sergeant in the Medical Department of the U.S. Army from 1944 to 1946. He was a Reserve Officer in the Medical Corps, U.S. Army from 1951 to 1970, and Chief of Anesthesia in the 328th General Hospital, U.S. Army Reserve, 1959 to 1970, reaching the rank of Lieutenant Colonel.

This obituary appears in the July 2000 Bulletin of Anesthesia History. We are grateful for the Editor's permission to include it in our Proceedings. Ed.