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# THE HISTORY OF ANAESTHESIA SOCIETY PROCEEDINGS


**Volume 48**

2015

# The History of Anaesthesia Society Proceedings

## Vol 48

## Contents of Volume 48

# Papers and Abstracts from Falmouth Meeting

## Friday 3rd July 2015 Session 1 Chairman: Dr John Pring



## Friday 3rd July 2015 Session 2 Chairman: Dr Henry Connor



## Friday 3rd July 2015 Session 3 Chairman: Dr Alistair McKenzie

## HISTORY OF ANAESTHESIA SOCIETY

**Summer Scientific Meeting at the Falmouth Hotel, Castle Beach, Falmouth, Cornwall TR11 4NZ**

**Organiser: Dr John Pring**

**FUTURE MEETING 2016**

Hawkswell House Hotel, Iffley, Oxford
30th June to 2nd July 2016
Organiser:Dr Ken MacLeod
Email: kennethmacleod1@icloud.com
Further details will be posted on the HAS website

**The History of Anaesthesia Society Proceedings**
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## HISTORY OF ANAESTHESIA SOCIETY

### Council and Officers – July 2015

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## EDITORIAL

Producing the Proceedings of the History of Anaesthesia Society is a team effort and I must thank Dr Adrian Padfield for negotiating the printing with Pickards of Sheffield. I also thank the reviewers both internal and external for help, advice and support. Dr Peter Featherstone undertakes the electronic publication of the Proceedings on our website which enables the public at large to access the mine of historical information contained in all 48 volumes to date.

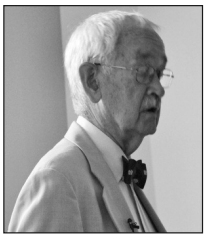
Last year, the Society published Dr Henry Connor's paper on how anaesthesia contributed to the origins of pharmacology as a supplement to the Proceedings. The Editor welcomes such original work that would normally be too long to present orally at our annual meetings. If you are looking to publish original historical anaesthetic research, please submit it to the Editor so that an opinion can be given as to its suitability for publication and on what terms.

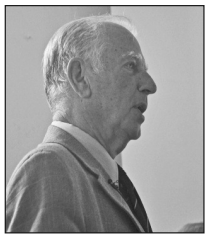
**Deaths**

| | |
|---|---|
| Dr Z Lett | Bexhill on Sea |
| Dr J P Murphy | Stourbridge |
| Dr G Whitfield | Scarborough |
| Dr C M Wragg | Gainsborough |

## Falmouth Meeting: Speakers' photographs


Dr John Pring


Dr Adrian Padfield


Prof. Roger Maltby


Dr Declan Warde

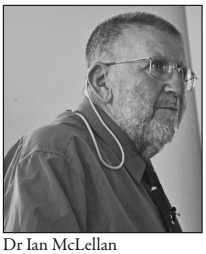

Prof. Tony Wildsmith


Dr Katherine MacGloin


Dr John Francis


Dr Silvia Baciu


Dr Dale Duncombe


Dr Ian McLellan


Dr Ann Ferguson

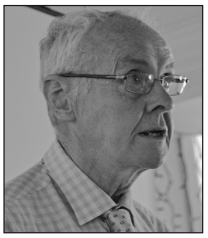

Dr Aileen Adams


Dr John Crowhurst


Dr Henry Connor


Dr Jean Horton


Mr Robert Pring


Dr Bob Palmer


Dr Alistair McKenzie


Dr Wulf Strätling


Dr Peter Featherstone


Mr James Instance

# LIST OF DELEGATES

## History of Anaesthesia Meeting, Falmouth, July 2015

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Dr Sylvia Baciu
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Dr Don Bethune
Dr Colin Birt
Dr John Blizzard
Dr Elizabeth Bradshaw
Dr Henry Connor
Dr John Crowhurst
Miss Sarah Dixon-Smith
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Dr John Pring
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Dr Trevor Thomas
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Dr David Wilkinson
Dr Chris Woollam
Dr Edward Young

# Charles Waterton 1782 - 1865

**Dr Adrian Padfield**
Emeritus Consultant Anaesthetist, Sheffield and Past President,
History of Anaesthesia Society

This paper was written because a friend asked me about Charles Waterton and curare. Naturally, I looked in the History of Anaesthesia Society's Proceedings for previous papers but drew a blank apart from an enthusiastic review of a biography by Julia Blackburn[1] which I had written! My first knowledge of Waterton was an article in '*The Listener*' in October 1973, presumably derived from a radio programme. Also I have a strong memory of the meeting in 1982 held in Wakefield under the aegis of the Yorkshire Society of Anaesthetists, to mark the bicentenary of Waterton's birth. On looking up the report of this meeting in the *British Journal of Anaesthesia,*[2] I found that our distinguished honorary member, Professor Roger Maltby, had been the original stimulus. He had contributed a paper about the naming of Waterton Lakes to the Canadian Anaesthetists Society's journal[3] and followed this with a paper at the first International Symposium on the History of Anaesthesia in Rotterdam in 1982.[4] The fact that nothing had appeared about Waterton at History of Anaesthesia Society's meetings spurred me to produce this paper in the 150th year of his death.[A]

Charles Waterton was an eccentric Roman Catholic landowner known locally as 'The Squire' of Walton Hall, a few miles south east of Wakefield. He came from a long Northern family line, mentioned by Shakespeare in Richard II, distinguished at Agincourt and supporters of Charles 1st at Marston Moor. His father Thomas was a direct descendant of Sir Thomas More, Henry VIII's chancellor.[5] In 1796 Charles was an early pupil at Stonyhurst College, founded from the English Jesuit Academy which had been expelled from Liège. At Stonyhurst his teachers stimulated his love of nature and he also became a fanatical rat catcher. On the advice of one of his teachers, he foreswore alcohol for life and he toasted one of his heroes, George Washington, annually in water. He left in 1801 but as a Roman Catholic one of the many restrictions prevented him from attending university. He sailed to Cadiz with his younger brother in November 1802 and went to Malaga to stay with two maternal

uncles (both naturalised Spaniards) but the next year there was a severe outbreak of plague from which one uncle died. Waterton survived and he and his brother escaped in 1803 from the quarantined city back to England. In late 1804, after convalescing he was advised to visit the warmer climes of family-owned estates in Demerara, one of the three provinces of British Guiana.[B] After a voyage of six weeks he arrived to act as an overseer of one of the plantations. He returned to England in 1805 as the 27th Lord on inheriting Walton Hall after his father died.

A letter Waterton wrote in 1839 to the Mayor of Nottingham recounts meeting Sir Joseph Banks (effectively the Government's Chief Scientist) on a visit to London when they discussed the potency of 'wourali', by then a famous South American Indian arrow poison. Sir Joseph believed it was not strong enough to kill large animals and asked him to collect samples of wourali to test if larger animals were susceptible. The date of the meeting is not mentioned, though Julia Blackburn[1] says they met in 1804 after his return from Spain and Wood agrees in his introduction to *Waterton's Wanderings*.[5] Banks warned Waterton of the danger of the 'insalubrious nature' of the tropical countries, of malaria, yellow fever, dysentery, and rheumatic fever, and counselled him to come home at not less than three yearly intervals.

As an aside, South American arrow poisons had been known from the early 1500s and reported by a number of explorers over the years including Edward Bancroft who Banks knew. It was Alexander von Humboldt, however, who saw the preparation of curare and sent specimens back for examination. There were a variety of methods of preparation depending on the different Indian tribes and what constituents were used so there were different words used to describe the poison. Curare later became a generic term. Probably depending on how European ears understood what the Indians told them, there were many other names. A German chemist, Rudolf Boehm later classified curare on the basis of the vessels in which they were prepared or kept. He named three types: tube curare in bamboo tubes; pot curare in pots and calabash curare in gourds. The first two were mainly derived from the bark of the *Chondrodendrum tormentosum* vine or liana whereas calabash curare was made

A Dr Ann Ferguson had described Waterton in her paper 'The Early History of Curare.' History of Anaesthesia Society Proceedings 2002; 31: 14 given in Sheffield, but this had escaped my notice.

B Now Guyana

from the bark of *Strychnos toxifera*, known as the wourali vine in Guiana. Other substances were used such as snake venom, pepper, black and red ants and other plant roots. However the active ingredients were provided by the above named plants. In 1811 Brodie read a paper to the Royal Society having used 'woorara' on a rabbit, ventilating it for 83 minutes when it died. The next year he reported a similar experiment on a cat, ventilating it for more than two and a half hours, which after sleeping for a further 40 minutes survived. Samples had been brought back by other travellers in the past including Bancroft and von Humboldt.

Waterton returned to manage the family estates in early 1806 although his brothers had inherited them. He travelled extensively around the West Indies as well as observing (distastefully) the local social life and in 1807 became a lieutenant in the Demerara Militia. About 1808 he became friendly with Charles Edmonstone who lived on an estate in Mibiri Creek, an eleven-day journey by canoe up the Demerara River. He married one of Edmonstone's daughters many years later. In 1812 he gave up his responsibility for the family estates and set off in the spring season into the jungle from the town of Stabroek (now Georgetown). One aim was to get samples of wourali but he also wanted to visit Lake Parima near where the fabled El Dorado was to be found. He paddled up the Demarara managing to get samples of wourali from the Macoushi Indians. The efficacy was demonstrated on a 'middle-sized dog',[5] which died about 15 minutes after being wounded with a wourali-tipped blowpipe-dart. He carried out experiments to see how much poison was needed for different animals. He recounts needing three 'wild hog arrows' to paralyse a large ox. There were also arrows used with bows with an ingenious way of preserving and reusing the arrow. Later he got more samples with all the separate constituents carefully wrapped. Sadly these were later lost when the canoe he was travelling in capsized but he brought back potent samples of the resin or paste. This upset was only a minor hazard in what was a thick tropical jungle infested with biting insects and dangerous animals, with torrential rain and flooded swamps though the native Indians seemed harmless. He and his party trekked through the jungle in the rainy season portaging from the Demarara to the Essequibo River and then up the Burro-Burro River, getting a second sample of the poison about 300 miles inland from Georgetown. After canoeing up the Burro-Burro, the party followed a

winding path across a plain or savannah crossing a deep creek infested with caimans or alligators, to the Pirara River, where he collected a third sample of wourali. The Pirara joins several other rivers which eventually led them across the border into Brazil to the Portuguese Fort of Sao Joachim. Here, at last, Waterton was able to rest after spending months of adversity and deprivation, suffering from various diseases, and partly recover from a debilitating fever. He now had to get back as soon as possible to survive and the party took the risky route down the falls of the Essequibo River. Having started in April he got back to Mibiri Creek in August at the end of the rainy season so ill and emaciated that the Edmonstones hardly recognised him. For three months, Mrs Edmonstone cared for him while nursing a new baby, Anne Mary, who became Waterton's wife seventeen years later. She died after the birth of their only child Edmund in 1830. Towards the end of 1812 he was able to return to Georgetown.

Waterton became famous after the news that he had reached the Portuguese fort. The Governor of Demarara entrusted him with despatches and a letter to Lord Bathurst in London. He sailed for England and in March 1813 arrived at Liverpool but he was too weak to travel far and first went to Walton Hall, sending the letter and despatches on to London. He had brought back many odd items: a ball of rubber, 150 stuffed birds, 'odiferous gum', a quiver and arrows, and a bowl in which the arrow poison was made, with 'considerable quantities of the vegetable poison' wourali. In May he travelled to London to see Lord Bathurst, Secretary for War and the Colonies, who offered him a government commission to explore Madagascar which he turned down much to his later regret. While in London he demonstrated the effect of wourali by killing several animals including applying a tourniquet above the site of injection in the leg of an ass which when released allowed the action of the poison. In April 1814 there took place the famous experiment at the Royal Veterinary College on a she-ass which was paralysed and ventilated until it recovered. It seems Waterton was there only to provide the wourali; Brodie performed the tracheostomy and Professor Sewell of the College used bellows to ventilate the animal. Stopping after two hours inflation, the ass worsened but after a further two hours she recovered and walked about seemingly without pain. The first President of the Royal Veterinary College, Earl Percy (later Duke of Northumberland), afterwards presented the animal to

Waterton. She was given the name of Wouralia and had the freedom of the grounds of Walton Hall living for another 25 years.

Sewell suggested the poison could be used to cure hydrophobia (rabies) and tetanus. He declared that if he contracted the disease he would not hesitate to have it used on himself. Waterton said he would do the needful with a steady hand. Twenty years later Sewell tried wourali in two cases of equine tetanus. The letter to the Mayor of Nottingham cited above resulted from Waterton being called to Nottingham to treat a policeman who had contracted rabies. He arrived too late but proceeded to demonstrate the effect of wourali in front of a large audience in the Medical school, paralysing and ventilating several animals. Dr Francis Sibson played a part in this and subsequently improved the bellows.[2] In following years a number of attempts were made to alleviate the muscle spasms associated with rabies and tetanus; there were reports of the use of the poison including one by Spencer Wells in three cases of tetanus.[2]

At the meeting in 1982, we were shown a Burroughs Wellcome ampoule of hypodermic curare produced in 1891 and told that both the British Pharmaceutical Codex of 1911 and the United States Pharmacopeia of 1916 included assays and tests for curare. According to Lee's Synopsis[6], the German surgeon Läwen used curare in 1912 to reduce the amount of ether needed for abdominal surgery. In 1928 the ill-famed Dr de Caux was the first to use curare as an adjunct to general anaesthesia[7] but perhaps because of his later disgrace never achieved recognition. In 1935 Harold King working in the National Medical Institute, Mill Hill, isolated d-tubocurarine from crude tube-curare and Ranyard West used it in the treatment of tetanus. Soon after this, Richard Gill, who lived and worked in Peru, described observing the making and use of curare by the Indian tribes. It was from Peru that Squibb and later Burroughs Wellcome got their supplies, which were purified and standardised by bioassay. It seems that wourali from Guiana was never used but in 1958 a new relaxant derived from *Strychnos toxifera* was described. It was used in anaesthesia under the trade name of Alloferin (generic name alcuronium) in 1961, having some advantages over tubocurarine.

Waterton was mocked, scorned and derided by various contemporaries particularly the German Schomburgh brothers who actually followed his route in the jungle about ten years after the first edition of *Wanderings* had

been published. They also associated *Strychnos toxifera* with strychnine which is derived from *Strychnos nux vomica* and so created a fictitious danger. If Waterton hadn't lost the constituents of the wourali he had carefully wrapped when the canoe capsized and brought them back to England he would soon have discovered that the active ingredient was *Strychnos toxifera*. Waterton was an eccentric of the first rank and this allied with his vehement condemnation of Protestant restrictions on Roman Catholics undoubtedly created enemies.

I have not said anything about his particular skills; he developed his own method of taxidermy and a number of his specimens can be seen in Wakefield Museum. He was a proto-conservationist. In 1826, he surrounded the park of Walton Hall with a nine-foot wall (the Barnsley Canal ran along the eastern side and it kept the boatmen from poaching!) and banned the use of guns, thus establishing what was the world's first nature reserve and bird sanctuary. He published three series of *Essays in Natural History* between 1838 and 1857. A compilation of these with letters and a biography by a close friend, Sir Norman Moore, was published in 1870.

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# Sherlock Holmes and Anaesthesia (Abstract)

**Professor J Roger Maltby**
Retired Anaesthetist, Jasper, Alberta, Canada

Sir Arthur Conan Doyle was born in Edinburgh in 1857, educated at Stonyhurst College in Lancashire and graduated MB, ChB from Edinburgh in 1881. After nearly ten years in general practice in Southsea, Portsmouth, he abandoned his medical career in 1891 for full-time writing. Between 1887 and 1927, Sherlock Holmes appeared in four books and 56 short stories. Holmes's use of cocaine is well known whereas Doyle's descriptions of sedative, analgesic and anaesthetic drugs, muscle relaxants, and pulmonary resuscitation are rarely discussed.

In the first Sherlock Holmes book, *A Study in Scarlet*, Watson assessed Holmes's knowledge of drugs as "well up in opium, belladonna and poisons generally". His knowledge of chemistry was profound, and immense in sensational literature.

Chloroform was used in an attempted murder in *The Disappearance of Lady Francis Carfax*, in pursuit of burglary in *The Adventure of the Three Gables* and, in *His Last Bow*, by Holmes to retrieve German secrets on the eve of the First World War. Ether was mentioned once, very briefly. In *The Adventure of Silver Blaze* the in-debt horse trainer added powdered opium to the night-watch stable lad's dinner to ensure he slept whilst he injured Silver Blaze. It was used in the same way in *The Adventure of Wisteria Lodge* for an exiled South American politician to abduct his children's governess. In *The Man with the Twisted Lip*, Holmes and Watson met unexpectedly in an opium den – Watson to rescue an opium-addicted acquaintance and a disguised Holmes hoping to find an opium dealer suspected of murder.

Morphine by injection was given for pain relief following trauma on three occasions. In *The Adventure of the Creeping Man*, a professor who gave himself rejuvenating injections of anthropoid crept about on all fours. Watson administered morphine after a wolfhound attacked the professor. In *The Illustrious Client* Holmes was badly beaten by two of Baron Gruner's thugs. A

surgeon made a domiciliary visit to Holmes and injected morphine. Later in the same story, a young woman threw sulphuric acid over Baron Gruner's face and Watson administered hypodermic morphine.

In *The Sussex Vampire* Holmes recognised the intense hatred of an older boy for his baby half-brother. He deduced that the older boy's South American stepmother was not a vampire, but was biting her baby's neck to suck out curare or a similar poison.

Artificial respiration is mentioned in *The Disappearance of Lady Frances Carfax* and the Holger-Nielsen method is described in *The Stockbroker's Clerk.*

Holmes described the exhilarating effect of self-injection of a seven percent aqueous solution of cocaine in *The Sign of Four.* In several stories Watson was concerned that Holmes might relapse in cocaine addiction.

**Discussion**

The Sherlock Holmes adventures may be read purely for enjoyment, but they also reflected the contemporary medical scene. Conan Doyle was familiar with the sedative and anaesthetic drugs of his era and described their criminal, therapeutic and recreational uses.

The lecture was based on:

Maltby R. Sherlock Holmes and anaesthesia. *Canadian Journal of Anaesthesia* 1988; **35**(1): 58-62

# December 1856 – Snow Comes to Cornwall

**Dr Declan Warde**

Retired Consultant Anaesthetist, Dublin, Ireland. mailto:djwarde@gmail.com

## Introduction

Dr John Snow (1813 – 1858), the pioneering anaesthetist and epidemiologist, recorded anaesthetics administered by him (approximately 5000 in total) in handwritten diaries. While entries made by Snow between February 1847 and July 1848 are missing, these casebooks are otherwise complete. The originals are held in the Royal College of Physicians in London.

Their condition deteriorating, they were transcribed by the late Richard Ellis over a period of nine years, and published in 1994.[1] Details of all anaesthetics given by Snow between March and early September 1847 were included in his first book, *On the Inhalation of the Vapour of Ether in Surgical Operations*,[2] and are therefore also available to students of his work.

Ellis, in his introduction to the 1994 book, wrote that while Snow's practice was almost entirely confined to London, he occasionally cared for patients elsewhere. This publication, and also Snow's first book were reviewed with specific reference to the locations at which he anaesthetised patients. Just fourteen of his entries related to places more than twelve miles from central London. Six were more than 50 miles from the metropolis, and of these, two were in Cornwall (Table 1).

**Table 1:**
Locations more than 50 miles from central London where patients were anaesthetised by Dr John Snow.

| Date | Location | Miles (from London) |
|---|---|---|
| 23.11.1848 | Weston-super-Mare, Somerset | 140 |
| 21.12.1848 | Keswick, Norfolk | 115 |
| 17.09.1854 | Summerville, near Manchester | 205 |
| 07.07.1856 | Hatherop, Gloucestershire | 81 |
| 20.12.1856 | Perran Wharf, Cornwall | 291 |
| 23.12.1856 | Penzance, Cornwall | 308 |

The two entries relating to Cornwall read as follows:

***Saturday 20 Dec.***

*Administered Chloroform at Perran Wharf, near Penryn, Cornwall, to Mr Henry Williams whilst Mr Coulson operated for ligature for haemorrhoids.*

***Tuesday 23 Dec.***

*Administered Chloroform at Penzance to a son of Mr Grenfell, about 18, whilst Mr Coulson removed an encysted tumour from the scrotum.*

**The Surgeon**

William Coulson, who operated on both patients, was christened on 15th September 1801 in Devonport, and was probably born there, but he had strong Cornish family roots and indeed always considered himself a Cornishman. Following an early education in Penzance and Brittany, he was apprenticed in 1817 to William Berryman, a Penzance surgeon. In 1822, he went to London, entered Grainger's School of Anatomy in Southwark and attended St Thomas's Hospital. He later studied in Berlin (where he also worked as a correspondent for *The Lancet*) and in Paris, and after passing the MRCS examination in 1826 became involved in the formation of the Aldersgate School of Medicine. He worked for many years in private practice (in fact, he was said to have had the most lucrative practice of any of the nineteenth century London surgeons) and also in various London hospitals. He was a Founding Fellow of the Royal College of Surgeons and in 1851 was elected to its Council, and also became Senior Surgeon at the newly established St Mary's Hospital, Paddington. He delivered the Hunterian Oration in 1861. Although his writings are now largely forgotten, he published extensively, especially on urology, in which he had a particular interest, but also on other subjects.[3 4] His *Lancet* obituary remarked particularly on his work ethic.[5]

William Coulson was never one of the surgeons with whom John Snow worked most frequently, but they did look after a number of patients together between 1849 and 1851. On July 9th 1851 Coulson, with Snow as anaesthetist, carried out the first operation to be performed at St Mary's, Paddington, a lithotomy by the perineal approach on a four years old boy.

A few months earlier, Snow had anaesthetised Coulson. He wrote:

***11 January 1851***

*Administered Chloroform night before last to Mr Coulson while Mr Childs made a crucial (sic) incision in a carbuncle of the wrist..., there was a wandering state of mind for about half a minute during recovery. No sickness or depression.*

The surgeon, George Childs, was Cornish, and had spent time as an assistant to Coulson before becoming established in his own right.

For some reason, Snow and Coulson do not appear to have worked together at all between November 1851 and August 1856, from which time they resumed their working relationship. Within a few months, they were caring for patients in Cornwall. By then, William Coulson had embraced his Cornish heritage. He had purchased Kenegie Manor, in Gulval, one mile east of Penzance, as a countryseat. It was a fine residence, with magnificent views,[6] and, indeed, is still there, now being part of a holiday complex. He became involved in local affairs. Gulval Church, parts of which date from the twelfth century, required restoration and repair, and in September 1856 he was among those appointed to a committee set up to raise funds towards this end.[7] He made what would, at the time, have been considered substantial donations to local causes, and was clearly highly regarded in the community.[8] In addition, Coulson served as Sheriff of Cornwall for one year from March 1863 - he was appointed by the Prince of Wales. Having completed his term as Sheriff, he presided over a meeting in July 1864 in furtherance and support of a monument to be erected to the memory of Sir Humphry Davy in Penzance.[9] He always intended to retire to Cornwall, but never in fact did so, dying 'in harness' in 1877.

**The Patients**

Who were the two patients cared for by Coulson and Snow during the latter's visit to Cornwall?

Perran Wharf is, or was, located about halfway between Truro and Falmouth, immediately adjacent to the village of Perranarworthal. Robert Were Fox and John Williams, a member of the Williams family of Caerhays and Burncoose, established Perran Foundry there in 1791. The Williams were one of the wealthiest and most influential families in Cornwall in the first half of the nineteenth century with Perran Foundry, just one of their business interests,

employing up to 400 men. It manufactured a wide range of mining implements and steam engines, including some of the largest and most powerful beam engines of the time. There was, in 1856, a family member, Michael Henry Williams, living close to and involved in the management of the foundry and it seems likely that he was the Henry Williams referred to in Snow's casebooks.[10 11]

William Coulson had a near neighbour in Gulval by the name of Pascoe Grenfell, who was also a member of the church restoration committee.[7] Grenfell had a son, Thomas, who was stated to have been 13 years old in the household entry for the 1851 England Census and would therefore have been about 18 in December 1856. He was almost certainly the patient anaesthetised by Snow on 23rd December of that year.

**Snow's Return Journey to London**

John Snow did not remain in Cornwall for Christmas – indeed, he was back working in London on Christmas Eve, as evidenced by a casebook entry for that day:

***Wednesday 24 Dec.***
*Administered Chloroform near Henrietta St. to Capt. Lane of Southampton, about 55, whilst Mr. W. Adams divided the flexor tendons of one of the fingers.*

The Royal Albert Bridge, designed by Isambard Kingdom Brunel, which spans the River Tamar between Plymouth in Devon and Saltash in Cornwall, was opened by Prince Albert in May 1859. It facilitated the first railway link between Cornwall and the rest of mainland Great Britain. It follows that in December 1856 Snow could not have completed his return journey from the county to London, entirely by rail. There was a train service from Penzance to Truro, and also from Plymouth to London Paddington, but the journey from Truro to Plymouth, a distance of about 60 miles, had to be travelled by coach.

The most authoritative source of information regarding train times in the 1850s is Bradshaw's Railways Guide, which was published monthly from 1839 to 1861. The National Railway Museum (NRM) in York has many editions of the guide, but not a complete set. The nearest editions to December 1856 in the NRM library are those for December 1855 and April 1856. The timetables for trains which might have been taken by Snow when travelling

back to London are identical in each and there was, in fact, minimal variation in train timetables from month-to-month at the time in any event (Timperley M, NRM, personal communication, 2015).

John Snow could have anaesthetised Thomas Grenfell early on the morning of 23rd December and, as Gulval is just one mile from Penzance rail station, then taken the 9 a.m. train from there to Truro. A horse-drawn coach left Truro each day in connection with the arrival of this train, arriving in Plymouth at 4.30 p.m., to connect with the 5.10 departure from Plymouth to London.[12] The average coach speed was about ten miles per hour – this was feasible as there were changes of horses at pre-arranged points (approximately every ten miles) en route. The 5.10 p.m. train from Plymouth, travelling via Exeter and Bristol, reached Paddington at 4.50 a.m. the following morning – thus affording Snow ample time, presumably after some rest, to anaesthetise Mr Adams' patient later on Christmas Eve.

**Why did Snow Travel to Cornwall?**

It seems reasonable to assume that John Snow was invited to Cornwall by William Coulson. The two had worked together in London on Wednesday 17th December 1856, and as there are no further London entries in Snow's casebooks between that date and Christmas Eve, they probably travelled shortly thereafter. However, Snow does not appear to have been particularly friendly with the surgeon, he had no known connection with Cornwall, he rarely took time off work, his health was indifferent (he suffered from renal disease, episodes of haematemesis etc.), and despite Cornwall's many attractions, it was winter-time, and the journey was arduous. The question arises as to whether he might have had a specific reason for visiting the region.

William Coulson's Lancet obituary,[5] refers to the fact that his father, whose first name was Thomas, had been a friend of Humphry Davy (1778 – 1829), and furthermore that his mother, Catherine, who died of breast cancer when William was just a couple of years old, was in fact a sister of Dr John Bingham Borlase, to whom Davy was apprenticed from 1795 until he left Penzance, his birthplace, in late 1798. Thomas Coulson had been born in Gulval in 1767, into a family of well-regarded tradesmen, so that when the surgeon purchased Kenegie almost a century later, he was genuinely returning to his roots. In

1791, Thomas married Catherine Borlase who came from a family well known in the far west of Cornwall. By 1795, he was working in the Plymouth Docks. In 1804 he became Master Painter in the Naval Dockyard at Devonport – this was a senior position, his letter of appointment having come directly from the Lords of the Admiralty.[13] He remained in contact with Davy for many years after the latter had left Cornwall, as evidenced by an affectionate letter sent to him from the then Professor of Chemistry at the Royal Institution of Great Britain (RI) in 1810.[14] He retired to Penzance in 1825, and lived for another twenty years or so.

Sir Humphry Davy, Baronet died in 1829. In 1836 his brother John, a noted scientist in his own right, wrote a biography of his illustrious sibling. John was just eight years old when Humphry left Penzance for Bristol, and Thomas Coulson helped him with his book. In it, he made a number of references to this assistance and the fact that William Coulson's father was intimately acquainted with his late elder brother. Part of what Thomas Coulson did was to provide, for John Davy, a handwritten account of Humphry's early life and studies. The original has survived, and is held in the RI.[15] In his account, Coulson stated, among other matters, that he had a clear recollection that the first advanced book read by the young Humphry Davy was Lavoisier's Chemistry, to which he applied himself with "*singular assiduity and success*".

While William Coulson may not have personally known Humphry Davy, although it is certainly possible that they became acquainted in London, it is clear that there were close family connections, which could have been recalled by various older relatives of Coulson's even at the time of Snow's visit to the Penzance area in 1856.

John Snow and Humphry Davy would not have known one another, Davy having died some years before Snow left the northeast of England for London. Indeed there appears to be just one reference to Davy in Snow's writings prior to his trip to Cornwall. This was as far back as 1848, when he briefly referred to the discovery of the safety lamp in "*On Narcotism by the Inhalation of Vapours*".[16]

However, less than four weeks after his Cornish visit, John Snow quoted, in his first paper on the use of amylene,[17] Davy's well-known prediction regarding nitrous oxide's potential for use during surgical operations: *"As nitrous oxide in*

*its extensive operation appears capable of destroying physical pain, it may probably be used with advantage during surgical operations in which no great effusion of blood takes place"*.[18] Snow went on to comment that this sentence from Davy's book had been "read by hundreds, and listened to at public lectures by thousands", for many years without further action.[17] It might reasonably be asked whether it was mere coincidence that Snow made written reference to what could be said to have been the famous Cornishman's contribution to anaesthesia, apparently for the first time ever, so soon after visiting his birthplace. Moreover, in the posthumously published "*On Chloroform and Other Anaesthetics*" the author wrote

> ". . . The *celebrated* Humphry Davy was the superintendent. This establishment was not very successful in the immediate objects for which it was instituted, but Davy made at this place his *masterly* researches concerning nitrous oxide gas . . ."[19].

**Conclusion**

It is tempting to speculate, especially when the Coulson – Davy 'links' are considered, that John Snow's visit to Cornwall in December 1856 was prompted, at least in part, by a desire to visit Humphry Davy's birthplace and to learn more about him. On the other hand, it may be that it was his time in Penzance that stimulated Snow's interest in the famous chemist and led him to refer to him in a favourable manner in his subsequent writings.

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# The Study which Never Was!

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An invitation to contribute to a book titled '*Landmark Papers in Pain*' drew to my attention a 1909 paper[1] (on alternative local anaesthetics to cocaine) which I had not known of. Reviewing the paper (by Charles Noble Le Brocq), and investigating its background, revealed an intriguing story although not the answers to all of the questions arising from it.

The period 1890-1905 was a time of considerable chemical research looking for less toxic and more effective drugs than cocaine, with a paper by Braun[2] usually considered the definitive account.[3] Braun established criteria (still valid) for evaluating candidate agents, and compared Alypin, Amylocain and Novocain (procaine). Although he gave the latter only qualified approval, it became the standard drug until lidocaine was introduced. Le Brocq's paper quotes and agrees Braun's criteria, although he may have confused rapid tissue penetration (a desirable property) with systemic absorption (not so beneficial). He compared 11 drugs with cocaine, although five were eliminated at an early stage because they were chemically unstable when heat sterilised in aqueous solution, and also physically incompatible with adrenaline.

This left alypin, beta-eucaine lactate, nirvanine, novocain, stovaine and tropacocaine for further study, with potency the next feature considered. The methods of its study are, with the results, said to be "*described in details elsewhere*", but the conclusions are given: stovaine was the most potent and nirvanine the least (so no further study), with the others intermediate in effect and all equivalent to cocaine. Unfortunately, my literature search has yet to identify any paper on potency published "*elsewhere*". Systemic toxicity, studied in a range of animals, was in the order alypin > cocaine > stovaine > tropacocaine > novocain > beta-eucaine, but only novocain was without any local tissue irritation. The overall conclusion was that novocain was the best drug.

This was a high quality study, came close to identifying the concept of Therapeutic Ratio and clearly identified novocain (procaine) as the drug of choice. However, part of the study is 'missing' and only two published citations

of the paper (both very minor) have yet been found![4 5] This 'mystery' was thought worth pursuing, and a start was made by looking up the author in Medical Directories and Medical Registers. Le Brocq was a Pembroke College, Cambridge graduate (BA 1900, MB BChir 1906) whose clinical studies were at St Bartholomew's Hospital, London (SHO 1906-7), these archives showing that he came from Jersey and had been at King Edward's School, Saffron Waldon. He is recorded as graduating MD in Cambridge in June 1909, but 'by proxy' (very unusual then) and the thesis is unavailable - not even its title is recorded. Then, after an impressive start to his career he appears, in modern parlance, to have 'dropped out', eventually being traced back to Jersey in late 1909.

The British Medical Journal paper was published under the auspices of "*The Therapeutic Committee of the British Medical Association*", but the BMA library can find no other record of the study. The paper is described as from "*The Pharmacological Laboratory, Cambridge*", but initial enquiry revealed that the Department of Pharmacology was not opened until 1919, a decade later! However, pre-World War I, a pharmacology laboratory, headed by Walter Ernest Dixon, was part of the Department of Physiology although there are no contemporary records. Dixon is described as the 'founder' of English clinical pharmacology, but his biographer notes that his work was so wide ranging that he is "*not remembered for anything*", and compares Dixon to the anonymous corpse in the World War II episode: "*The man who never was!*"[6] Thus there is circumstantial evidence linking Dixon (who had performed earlier, equally fascinating, but unknown work on local anaesthesia[7-9]) to the study even though Le Brocq does not acknowledge any senior colleague in his paper.

However, the 1908 AGM report of the BMA Therapeutic Committee lists Dixon as one of its members, and also includes this note:

> "The committee during the past year has had under consideration the relative value of the local anaesthetics considered as substitutes for cocaine, and the alterations it is desirable to make in a revision of the British Pharmacopoeia. The Researches on the first point are not yet completed and the committee consequently desires to postpone its report on this question".

I sense a statement made through 'gritted teeth', and it would not be the only occasion when slow progress with a project led to a breakdown in the

relationship between research student and supervisor. Just consider Le Brocq's summary CV: highly qualified, SHO at Bart's, and chosen for a major research project, but (all of a sudden) he is back on Jersey and the records of what he did are minimal!

Initially, Le Brocq was in private medical practice in Jersey, joining the medical branch of Jersey's Royal Militia and serving with the Red Cross, then the RAMC, during World War 1. He was on the first voyage of *Britannic* as a hospital ship, but there is no record that he was aboard when it was sunk. He returned to Jersey after the war, never married and lived with his war-widow sister for the rest of his life. He took on several salaried appointments, becoming Medical Superintendent of the Jersey Mental Hospital in 1927. From 1936 this was his only appointment, one that he held throughout the Nazi occupation, achieving the seemingly impossible by keeping a 'low profile' – not a single patient was deported during the war. Post-war correspondence regarding a possible national honour for this achievement was cut short by his sudden death in 1947, his funeral being attended by many Jersey notables including the Bailiff, the Queen's representative.

This information left one final strand to pursue, the mention that the study was performed to inform a revision of the *British Pharmacopoeia*. Comparison of the fourth (1898) and fifth (1914) editions reveals that the local anaesthetics entries are identical, and limited to cocaine – all of that work and not a bit of notice was taken of it! One despairs of the Pharmacopoeia providing no information on any of the newer local anaesthetics when detailed descriptions of the components of the British Empire were thought necessary! However, the final irony is that the editors of '*Landmark Papers in Pain*' can't even tell me how they learned of Le Brocq's paper in the first place!

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I am indebted to the staff of several archives (Pembroke College, Cambridge; Cambridge University; St Bartholomew's Hospital, London; the Jersey Archive) and libraries (British Medical Association; The Royal Pharmaceutical Society; the Jersey Library, home of the Jersey Evening Post archive) for much of my information. Other material was found in The Medical Registers, The Medical Directories, University reports in *The Times*, *The London Gazette*, UK Forces War Records, The National Archives (for Le Brocq's Medal Card) and Val Garnier's *Beyond the Call of Duty*. Jersey: Seeker Publishing, 2014. (ISBN 978-0-9927159-3-9).

Not all the information collected is immediately relevant to the story, and it is scattered across the quoted sources, but it may be of use to others who might wish to pursue my unanswered questions to summarise it here:

**Charles Noble Le Brocq**

Born: 12 October 1879 at St Mary's, Jersey – third of five children.

Father: Philip (1841-1908), farmer (and retired Master Mariner) of La Hougue Boëte Manor, St John's, Jersey.

Mother: Adela neé Noble (1844-1935) from Burslem, Staffordshire.

Siblings: Andrew Noble (1876-1896) died while at Pembroke College, Cambridge.

John Noble (1878-1925); a Miss MN Le Brocq (described as a niece so presumably his brother's daughter) is noted as having attended CN's funeral (no other children of CN's siblings mentioned).

Margaret Noble (1882-19??) attended CN's funeral; married Major RM Henman on 9 February 1917, but he died on 3 November 1918 and she would appear to have lived with CN until his death.

Ellen Noble (1887-1953) attended CN's funeral, married name Venables, living in Berkshire according to the Jersey Evening Post funeral report. An Ellen N Venables, born 1887, is recorded as dying in Wallingford in 1953.

School: King Edward's, Saffron Walden.

University: Admitted Pembroke College, Cambridge, October 1897; BA hons class 2 in Chemistry, 1900; passed Cambridge 'Medical' examination

(*British Medical Journal* 23 June 1901; page 1591); started clinical studies at St Bartholomew's Hospital in September 1901.

1905: Qualified MRCS, LRCP in July.

1906: MB BChir (Cantab) Thesis: The anatomy, physiology and pathology of the corpus luteum. Senior House Physician; St Bartholomew's Hospital from October.

1909: MD 'by proxy' in June; thesis not found and not even the title is recorded.

Elected a member of the BMA, by the 'Southern' Branch during the second quarter of the year, address given as Val Plaisant, Jersey (*British Medical Journal Supplement* 24 July 1909; page 118).

1910: Appointed Surgeon Lieutenant in Royal Militia of the Island of Jersey, *London Gazette* 8 January.

1911: Census records him (as Lebrocq) living in St Helier with sister, Margret Noble Lebrocq.

1913: Promoted Surgeon Captain in Militia, *London Gazette* 8 July.

1914: UK Forces Records note him as M.O. with Red Cross in Rouen.

1915: Appointed Temporary Captain in RAMC, *London Gazette* 28 October.

Medal record card shows him on *HMHS Britannic* on 30/31 December, but no other details of service found, nor evidence of him being on Britannic when it was sunk.

1916: Relinquished command, *London Gazette* 29 October. No other wartime *Gazette* entries found.

1922: Granted honorary rank of Captain in RAMC (with right to wear uniform) *London Gazette* 24 February.

1926: Appointed Medical Superintendent of the Mental Hospital (The Medical Directory has him as Surgeon to HM Prison Jersey and States School Medical Officer in 1926 edition, adding Visiting Physician to the General Hospital in 1927, but no mention of Medical Superintendent role until 1930. All four appointments are listed until 1936, after which only the Mental Hospital post appears).

1947: Died 30 August. Jersey Evening Post obituary notes that he was initially in Private Practice in St Helier, and had served as Schools Medical Officer and Police Surgeon before becoming Superintendent of the Mental Hospital. He was due to retire at end of September 1947.

Funeral: 2 September attended by Bailiff and other notables as well as family noted above.

Addresses: His father's as above (officially at least) until 1909; Egyptian Lodge, Val Plaisant, Jersey 1909-24; 11 Midvale Road, Jersey (no town specified) 1925-29; St Myrtles, St Saviour, Jersey 1930-42; King's Farm, St Saviour, Jersey 1943-47.

In the discussion of this paper at the Falmouth meeting, Dr Alistair McKenzie wondered if Le Brocq might have become addicted to cocaine. Self-experimentation was the norm at the time and his brief mention of the potency studies does refer to human subjects. Comparison of several drugs with cocaine would have meant many repeat injections, but if this is the explanation for the acute 'problem' it must have been a transient one given the rest of his career.

# The Importance of Being Nernst

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To physicists and chemists, Nernst is probably best known for being awarded the Nobel Prize for Chemistry for his discovery of the "Third Law of Thermodynamics". To the physiologists, Nernst provides the eponym for the numerical descriptor of the electromotive forces governing the production of current via the dissolution of electrolyte solutions.

For most of us, this equation represents an almighty Sisyphean anagram of constants and valency. And yet it is fundamental. It actually governs the electrophysiological conversation between cells of conductive tissue. Secondly, its evolution is interesting in its own right as a product of advances emanating from a group of scientists with the humility to appreciate each other's ideas in the development of the field of electrochemistry.

By making use of scientific postulates and discoveries made by those with whom he worked, Nernst persisted in investigating the forces governing the diffusion processes of solutions and the establishment of potential differences within voltage cells. Since its inception, it has been extrapolated to the study of electro-physiology. It forms the basis of an explanation of Galvani's discovery of "animal electricity" in 1780, simplifying the cell membrane to be considered as a component of a galvanic cell. The magnitude of this physiological concept is so great that it could be overlooked because it is so fundamental it becomes a "given". In taking such a concept for granted, we are also at risk of overlooking the elegance of its discovery.

Somehow, a group of individuals had to traverse the understanding of materials as solid and inert, through dissolution of compounds into their constituent parts, through movement of those constituent parts in another medium, through movement of those parts being responsible for carrying electrical charge and chemical phenomena, up to the effect of forces on those movements. This trajectory of thought governs how we understand electrochemistry now.

The importance of being Nernst is that in his persistence and appreciation of those around him, he had provided a footstep for Goldman, for Hodgkin, and Katz and hundreds of other physiologists to examine the generation and propagation of action potentials and factors affecting them.

**The growth of ideas**

Nernst's challenge was to determine an equation to calculate the electromotive force of a galvanic cell. At the time, the world of electrochemistry was a burgeoning pedagogy. Ostwald, in writing one of the first texts on electrochemistry[A] argues that a sound scientific education is based upon the understanding of the origin of each examined problem. Our understanding of electrochemistry developed through modulations of a series of theories; in some cases supporting them, in other cases breaking them down in the way of the iconoclast.[1]

Volta, in 1797, had purported that electromotive forces in the voltaic pile were created by the potential difference existing between the two metals in the battery, with the solution only providing a medium to conduct electricity rather than participating in any chemical reaction. In 1857, Deville coined the term "dissociation" as a nominal for the process observed over a range of temperatures, where a compound could exist as a mix of its compound form and constituent parts.[2] He demonstrated that abnormal densities observed in measuring molecular weights of certain compounds could be explained by the fact that the thing being measured was a mix of parts, whole as well as dissociated products. Clausius, in the same year, purported that a conducting solution must contain free ions as well as molecules,[3] although he held that the free ions would only be free for a very short period of time. There were two schools of thought at the time; one, physical (based on the metal) and one chemical (based on the solute).

These developing theories were the basis and encouragement of the Ionist program, which sought to disseminate the theory to both physicists and chemists that free ions can exist in solution, and that they were responsible for observed electrical and chemical phenomena.

A Ostwald W. *Elektrochemie: ihre Geschichte und Lehre.* Cited by Barkan DK. *Walther Nernst and the Transition to Modern Physical Science.* Cambridge: Cambridge University Press, 1991

It was Arrhenius in his thesis entitled "*Investigations into the galvanic conductivity of electrolytes*" who put forward the mechanism of dissolution of electrolytes into ions capable of carrying current in 1884. This thesis not only highlighted the existence of ions in solution and their capability to participate in chemical reactions, but also the association between electricity and chemical affinity.[3]

As the existence of ions emerged into this field of science, a new facet of study evolved around elucidating their behaviour. In 1887 Nernst had been working with Ostwald to determine the forces governing diffusion in liquids. He concluded that five forces must be acting – electrostatic, osmotic pressure, gravitational or centrifugal, para or diamagnetic and electromagnetic.[1] Arrhenius had put forward the link between dissolution of electrolytes leading to the formation of ions, which would, by carrying charge, conduct electricity. Nernst pushed forward the link between chemistry and electricity by postulating that these ions could only conduct if they could move freely in solutions. The movement of ions must be affected by the existence of certain forces, and the balance of these forces lead to the generation of a potential difference in the cell. By demonstrating the effects of the gas laws on these gradients, he firmly established the electro-chemical link in the galvanic cell.

It would be wrong to say that Arrhenius, or Ostwald, or Nernst, or van 't Hoff, or any one chemist, or physicist discovered the missing link, or named the process first. Developments were made by co-operation, or disagreement, or refuting, supporting, confirming, dismissing previous theories, and by repeated examination and experimentation. Boltzmann has noted that in the world of theoretical physics, development takes place

> "in jumps. Often a theory underwent development for decades, indeed for more than a century, so that it offered a rather lucid picture of a certain class of phenomena. Then new phenomena became known that stood in conflict with this theory, and attempts were made in vain to reconcile it with these phenomena."[1]

It was Nernst himself, who wrote in his Nobel lecture in 1921 that his position resulted from the fact that, as an individual, he was "*really only able, by climbing on the shoulders of his predecessors, perhaps to see a little further in some direction than anybody else before him*."[4] That solutions can dissociate,

participate and conduct is now "a given". The enormity of the change in understanding that led to its permanent place in electrochemistry was not a "jump" so much as a festinating march forward by a group of chemists and physicists who worked within a network, often under the auspices of Ostwald. The greatness of Ostwald, in turn, was that he was attempting to disseminate knowledge and theories of a new and developing discipline, by exposing previously refuted theories, but not in a critical or dismissive way. Even as a strong proponent of the ionist theories, he maintained that Volta, in dismissing the solute as participating in any reaction in the Voltaic pile, had simply interpreted "the phenomena such as they presented themselves to him in the context of his time."[1] Since they were consistent with phenomena and theories abounding at that particular time, they did not have a reason to be refuted until, as per Boltzmann, other phenomena were observed which cast previous theories into a different light.

Scientists, such as Boltzman, Stefan, Ostwald, Arrhenius, van't Hoff and Planck discussed their individual approaches to the developing world of physical chemistry. Although their views didn't always match, their discursive approach to science was fruitful. Nernst pays tribute to many of these men in his Nobel Lecture of December 1921:

> "New fruitful concepts appeared, through the interplay and extension of which most of the darkness has been to a large extent dispelled in a single stroke. Such means were Van 't Hoff's theory of osmotic pressure, Arrhenius' theory of electrolytic dissociation, and finally many new approaches to the treatment of chemical equilibria, which, brilliantly presented, are to be found scattered throughout the first edition of Ostwald's *'Lehrbuch der Allgemeinen Chemie'*."[4]

In doing so, he demonstrates his appreciation that his new way of thinking arises, which allowed him to "*see a little further*", developed from the swathe of ideas surrounding him. It is to his credit that he acknowledges this.

**Why is Nernst important to me?**

As a house officer I received a lecture from an anaesthetist about fluid therapy. This anaesthetist, with a throw away comment lacking all syntax, scattered seed into thick but fertile soil and demonstrated that I had no understanding of physiology at all, because I had failed to grasp that simple concepts are the

most useful. She said that fluids contain electrolytes, and that it was important to choose the right one since electrolyte imbalances can be serious. I knew this. I continued to amble along the verge that lies between being absolutely present in that lecture hall and an out of body experience. But then she said, "You know, all that Nernst stuff".

It wasn't so much of a Eureka moment as an Emmaus walk. When you make a realisation about something that has been present, familiar but not completely understood, it can feel uncomfortable, because now you have to see it differently. Now, you have to interact with it.

Arrhenius wrote that, "At first sight nothing seems more obvious than that everything has a beginning and an end, and that everything can be subdivided into smaller parts."[3] There isn't one element of my job that doesn't affect a resting membrane potential somewhere.

The mechanism of action of anaesthetics is imperfectly understood, if at all. It is a given that general anaesthetics alter the ability to generate and propagate action potentials involved in paths of conscious perception.[5] Much of what follows is a mix of the obvious and the extrapolated, but in short, if the areas of the brain that are associated with or responsible for wakefulness (whatever that is) and memory were to be held at their Nernst potential, precluding neurotransmission, then surely the patient would be held in a suspended state of anaesthesia? Not dissimilar to a "standby" button.

In 1978 Tanifuji and Eger attempted to determine the effects upon mean alveolar concentration (MAC) of altering the electrolyte composition of cerebro-spinal fluid (CSF) in dogs.[6] As per the Nernst equation, they base their hypothesis on the fact that the excitability of nervous tissue depends on the intracellular and extracellular distribution of sodium and potassium. Their findings were that hypernatraemia proportionately increased MAC, whilst reduction in CSF sodium levels decreased MAC. MAC was first determined (as a control) in six different groups of dogs. Each group then underwent infusion of a solution to alter potassium, sodium or osmolality. Their conclusions were that osmolality did not affect MAC, that alterations in serum potassium were not as easily translated to changes in CSF as changes in sodium and that CSF sodium correlated in some way with MAC. The study is flawed in many ways; for example, the same group of dogs was used to

demonstrate hyper and hyponatraemia and it could be argued that the initial electrolyte abnormality was permanently detrimental to neuronal function, thereby altering MAC. It is generally accepted that electrolyte aberrations are associated with "altered Glasgow Coma Scale (GCS)", and so any reduction in MAC associated with electrolyte abnormality could be attributed to general obtundation. Interestingly, however, the first sodium infusion demonstrated an increase in MAC rather than a reduction suggesting that neuronal pathways required more anaesthetic to quieten them – they were in some sort of "excited" state.

Excluding the refinements of permeability and inclusion of other ions (a very *in vitro* thing to do), increasing the concentration of sodium outside the cell is equivalent to increasing the denominator. By increasing the sodium ions outside the cell (from 149 to 181 in the study), the electromotive force would be increased. Increasing electro-motive force (EMF) draws it away from the resting membrane potential to one capable of triggering an action potential. Obviously this is a gross over-simplification, not least because it doesn't take into account permeability, concentration gradients and the inactive state of the voltage-gated ion channels. However, this study, flawed and laboratory-based as it is, links the electromotive force existing across the cell membrane to MAC requirement.

The importance of membrane stability is understood and accepted within the practice of anaesthesia. However, current postulated mechanisms of action of anaesthetics include inhibitory ion channels, novel potassium channels, excitatory ion channels as well as specific protein receptors,[7] but this is beyond the scope and pace of this article.

Therefore, to the anaesthetist, Nernst could be considered to be important because he provides a potentially quantifiable mechanism of action of anaesthesia, making it, somehow by proxy, slightly less mercurial. However, consider that the Nernst equation was not this man's most recognised contribution to science. The third law of thermodynamics was awarded a Nobel Prize. It is telling that this man, described by his students as "*a great physicist of rather small stature and even smaller humility*"[1] in his Nobel Lecture, deviates from discussing the Third Law of Thermodynamics with reference to its importance in chemical applications, but instead with

reference to "*the accidents of [its] historical development*". He, himself, recognises the transformation of ideas over time, moulded and developed by the people with whom you chose to share your understanding. It is the dissemination of knowledge and sharing of ideas that makes the man, in my opinion.

**Conclusion**

What is the importance of being Nernst? Is it that he pushed forward our understanding of electrochemistry? Or that he provides a potentially quantifiable mechanism of action of anaesthesia? You couldn't really say no to either of these things, but in my opinion it is that he formed part of a group of individuals who disseminated knowledge, ideas and understanding to advance a global understanding.

The store of wisdom does not consist
of hard coins, which keep their shape
as they pass from hand to hand;
it consists of ideas and doctrines
whose meanings change
with the minds that entertain them.

*John Plamenatz (1912-1975, Montenegrin political philosopher)*

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# Electroanaesthesia (Abstract)

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Electroanaesthesia describes the use of electric current applied to the cranium through surface electrodes to induce and/or maintain anaesthesia. Although a largely forgotten technique, with most anaesthetists having never heard of it, during the 1960s and 1970s thousands of patients were anaesthetised in this way, some with devastating consequences.[1]

Early reference dates back to the first century AD where Scribonius Largus, a Roman physician treated patients with symptoms of gout by instructing them to stand on electric rays; the resulting electrical current anaesthetised the affected limb. During the eighteenth and nineteenth, physicists from Austria, Russia and America investigated the use of electric current to narcotise fish and other larger animals. Benjamin Franklin, an eminent American politician, regarded in history as the First American, was reportedly a keen investigator.[2] During the early 1900s significant work was undertaken by Stephen Leduc, a French investigator. In 1902 Leduc actually instructed colleagues to subject him to electroanaesthesia through electrodes positioned over his forehead and spine.[3] Another pioneer was Louise Rabinovitch, a Russian physician who investigated the use of electric current for both general and regional anaesthesia, and also for resuscitation following cardiac death.

Following the introduction of electroconvulsive therapy (ECT) by Italian neurologists Cerletti and Bini in 1937, psychiatrists investigated the potential benefits of prolonging current exposure, developing electronarcosis.[4] Despite significant side-effects being reported this led to further investigation into the use of electroanaesthesia. A particularly interesting story is that of Walter Freeman, an American psychiatrist who became infamous for his favoured "ice-pick lobotomy" technique. Using just electric current to anaesthetise patients and often in an outpatient setting, Freeman subsequently severed the frontal lobe connections using metal instruments inserted via the supra orbital rim. Freeman reportedly performed this on thousands of patients including children and unfortunately for him this part played in history overshadows his significant involvement with the development of neuromuscular blocking drugs.[5]

In 1961 an American group led by James Hardy published the first reliable case reports of electroanaesthesia being used successfully for surgery. The group described two cases, both female patients, one who underwent a diagnostic laparotomy, the other a mastectomy, both progressing without complication.[6] The group subsequently performed further research into the effects of electroanaesthesia on personality change and brain injury, publishing alarming findings in 1964.[7] Undoubtedly significant work was undertaken in Russia during the same period but identifying this work and gaining access has proven to be difficult.

Electroanaesthesia had the potential to be the ideal battlefield anaesthetic technique. Following the withdrawal of the British Raj leadership of India in 1947, the Indian military undertook extensive investigation into the concept of electroanaesthesia. Brigadier Rama Rao, the consultant anaesthetist overseeing investigations in Bangalore, reportedly underwent electro-anaesthesia himself as part of the investigation.[8]

One of the last true advocates of electroanaesthesia was Aimé Limoge, a French electrophysiologist. Having developed his own "Limoge current" he reportedly anaesthetised tens of thousands of patients in France and North America during the 1970s.[9] In 2004, aged 72 years, he underwent an oesophagectomy and utilised transcutaneous cranial electrical stimulation peri-operatively. He subsequently wrote in *Anesthesia and Analgesia* that it resulted in a marked reduction in his post-operative epidural requirements.[10]

Electroanaesthesia is no longer in use per se but is an important part of the history of anaesthesia. Various modern techniques, including transcutaneous electrical nerve stimulation (TENS), cerebral electrotherapy, spinal cord and deep brain stimulators and electrical stunning techniques used in animals have undoubtedly derived in some part from this forgotten technique.

The lecture was based on:

Francis J, Dingley J. Electroanaesthesia – From torpedo fish to TENS. *Anaesthesia* 2015; **70:** 93-103

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# Why We Could Not Abandon Vancomycin?

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While reading the latest edition of The Renal Drug Handbook[1] one is amazed to discover that the dosing of Vancomycin is not clearly specified for patients on continuous haemofiltration, but just referred to as "other information" and guided by some studies from 2004-2005. It looks like nothing has changed in this respect from the 2009 edition of the same publication, although Vancomycin is routinely prescribed in intensive care and renal replacement therapies are frequently used in critically ill patients.

However, the drug was discovered more than 60 years ago and it is still present on the complementary list of antibiotics in the 19th World Health Organisation's Model List of Essential Medicines.[2] Furthermore, a PubMed search records that there are 26,131 articles containing the word "Vancomycin" and more than half of these are from the past five years. What could be the source of this paradox? These results justify exploring the history of Vancomycin.[3-7]

The name Vancomycin was granted by the marketing department of pharmaceutical enterprise Eli Lilly and Company (Indianapolis) and most probably related to the remarkable ability to "vanquish" otherwise penicillin-resistant *Staphylococcus* colonies. Its discovery is linked to Edmund Carl Kornfeld (1919 – 2012), the one who helped the Eli Lilly and Company to purchase soil samples originally from Borneo. How can one explain the link between the researcher, with a PhD in Chemistry at Harvard University (1944) and the jungles of Borneo? Kornfeld was a devoted Christian and, through his church, had links with the Christian and Missionary Alliance in South East Asia.[8]

In order to understand better his actions we must go back to the "golden era" of empiric antibiotic discovery. In 1928, Alexander Fleming succeeded in isolating penicillin from mould, an antibiotic that subsequently entered clinical practice in 1942. Fleming had also developed a methodology

involving inhibitory zones onto the agar plate colonies, allowing mass screening for micro-organisms producing antibiotics. Between 1940 and 1950 other antibiotics became available from similar sources: streptomycin, tetracycline, chloramphenicol, and erythromycin. However, in the late 1940s, an exponential increase in mortality was recorded with strains of *Staphylococcus aureus* highly resistant to penicillin and other antibiotics. This spearheaded the demand for new products with a larger spectrum against microorganisms.[8 9]

Eli Lilly and Company already had a botanical screening programme (quinine and reserpine had been discovered in their laboratories), and so in 1951 Kornfeld was able to write to the missionaries in Borneo Island, requesting them to "... *collect samples off the beaten track, away from towns and villages*." The one who enthusiastically answered was the Reverend William Conley (1917-2010):

> "I certainly hope there is something promising in our dirt out here, but if our attempts at gardening are any measure, I cannot say the prospects are promising."

The initial samples that had arrived at the company did not produce any remarkable discovery. Having to leave the mission the following year, Conley discussed this task with his successor, the Reverend William Bouw (1918-2006),[8 9] who came to Borneo accompanied by his wife, a schoolteacher, and their daughter. He was frequently entering more isolated territories from the interior of the island, being determined to convert Dayak head-hunters to Christianity.[10]

In 1953, from the samples collected by Bouw near Tengeng, the team of researchers isolated a previously unknown bacterium (05865). This was later named *Amycolatopsis orientalis* (previously: *Streptomyces orientalis*).

More than 500 species of Streptomyces have been described to date. They are aerobic, Gram-positive, filamentous bacteria, able to produce spores, predominantly found in soil. Streptomyces possess, additionally, a complex secondary metabolism. From these bioactive metabolites a great variety of compounds have been isolated, including more than 70% of antibiotics in clinical use today, as well as antifungal, anti-parasitic and immunosuppressant medicines.[11 12]

*Amycolatopsis orientalis* was found able to produce Vancomycin. "*One of the most striking properties of Vancomycin*", remarked by Lilly microbiologists, "*was that its bactericidal concentration was only slightly higher than the bacteriostatic one, making resistance to it difficult to develop.*" This lead to toxicity studies in animals in 1954. By 1955, Dr Richard Griffith, a research clinician, had observed pain and phlebitis on injection in human volunteers and had three cases of success in severe infections (severe Pneumococcal broncho-pneumonia, Streptococcal pharyngitis, erysipelas). One patient with a severe Staphylococcal foot infection approached the Eli Lilly Research Clinic after all other combinations of antibiotics had proved ineffective. Griffiths offered him the use of 05865. "*Anything that might save my foot*" was the courageous patient's reply. He luckily improved after seven days of treatment.[5 9]

During the next year, 100 ampoules containing Vancomycin were sent to clinicians to promote clinical trials. The efficacy in eradicating serious infections started to be paralleled by its toxicity issues.[13] At the same time the purification, choice of strain, and, improvements to the culture media were researched intensively. Vancomycin was finally approved by Federal Drug Agency in 1958.

The Eli Lilly Company donated to the Borneo Missionary Service $1,000, a sum which was used to build a school, while Kornfeld wrote a letter to Bouw informing him about the results of his research.[8] Bouw and family remained in Borneo until 1961, when due to political changes, missionaries had to leave the island.[10]

As regard the initial applications of Vancomycin, the issue of its toxicity became an obstacle to its widespread use, but resistance to synthetic penicillin derivates started to emerge a few years later and stimulated further purification of the product. For some decades, Vancomycin was mainly used in severe Gram-positive infections.[4 6]

Thereafter, in the early 1990s, resistance to Vancomycin was regrettably encountered, at first with *Staphylococcus* and later with *Enterococcus species*. It has been suggested that this had developed due to inappropriate use, causing either prolonged or suboptimal therapeutic levels. Subsequently, there was a surge in research evaluating indications, dosing requirements, monitoring drug levels, toxicity, and cost-effectiveness. New guidelines were developed for

special population groups and numerous reviews are trying to establish a framework for rationalising its use in intensive care, in parallel with measures to prevent infectious disease outbreaks.[14 15]

Resistance to Vancomycin gradually became a worldwide issue, and therefore pharmaceutical companies invested more in the discovery of improved glycopeptides. Because of the molecular complexity of Vancomycin and technical limitations of the period, the structure of Vancomycin was not fully elucidated until 1982 and its synthesis has only possible from 1999. By extensive research of selective chemical modifications, it has been concluded that resistance mechanisms could be overcome by using hydrophobic groups. Consequently, a new generation of semi-synthetic glycopeptides and lipoglycopeptides compounds has been developed: telavacin (2009), dalbavancin (2014), and, oritavacin (2014).[16] The phenomenon of bacterial multi-resistance is not only related to Vancomycin, but is regrettably a more widespread effect which brings up both clinical and economic issues. There are recent opinions that such a crisis might be solved by promoting exploration of natural sources rather than investigations for synthetic derivates. It has been assumed by some researchers that secondary metabolism is in fact the result of an evolutionary process during which bacteria had interacted with the surrounding environment. Structure-based phylogenetic analysis suggests that antibiotic resistance genes had developed a long time before the "antibiotic era". This bacterial biosynthetic diversity postulates a corresponding biological system (co-evolution) bringing about these in various products. Recent developments in bioinformatics led to whole – genome sequencing of bacterial genomes and recognition of biosynthesis gene clusters and cryptic (unknown) metabolic pathways. Combinatorial biosynthesis could initiate additional secondary metabolites with a variety of structures and possible clinical application, including antibiotherapy.[17-19]

But the problem of resistance is more complex to be solved only by a genetic approach and drug design. Prevention should include public education (hygienic habits, compliance with therapy), a multi-disciplinary approach involving clinicians, microbiologists and hospital pharmacists. On a larger scale, it would require legislative bodies, epidemiology, ecology and agriculture ("environmental resistome"). [14 17]

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# Anaesthetics and the Modern Trainee: Echoes in Time

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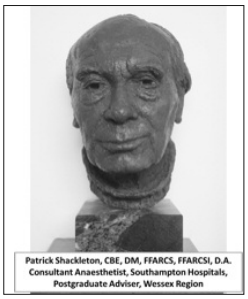

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In 1966 Dr Patrick Shackleton wrote in the Postgraduate Medical Journal an article entitled 'The education of the anaesthetist.'[1] It provides insight into the issues of anaesthetic training some 49 years ago and is as relevant today as it was then. Despite the hard work of many people and the ideas from within and outside of anaesthetics much of it rings true today and we could benefit from thinking about these areas for further improvement.

The Southampton Department of Anaesthetics has been in its current location in the central block of the Southampton General Hospital since it was built in 1977 and, at that time, the department was named after one of our early consultants, Robert Patrick Webb Shackleton, who had joined the team in 1955 and died in 1977. Among other things he is credited with being a significant influence in the setting up of the Medical School at Southampton founded in 1971.[2]

Within his lifetime the development of the anaesthetic specialty had moved from *ad hoc* learning of those with an interest to more formalised certification. It was not until 1922, when the journal *Anaesthesia and Analgesia* was first published that the change from practical experience to formal academic training, began. Eventually in 1932 and 1934 respectively Shackleton would have seen the founding of the Association of Anaesthetists of Great Britain and Ireland and the Diploma of Anaesthesia (conjoint under the auspices of the Royal Colleges of Physicians and Surgeons).

During his time as head of the department at Southampton he also encouraged formalisation and advancement of postgraduate medical

education. The Faculty of Anaesthetists of the Royal College of Surgeons of England was created in 1948.[4] The two-part conjoint Diploma of Anaesthesia examination was changed to the Diploma of Fellow of the Faculty of Anaesthetists of the Royal College of Surgeon of England (FFARCS) in 1953. From 1957, Shackleton organised evening tutorials for the examination for the Diploma of Fellow of the Faculty of Anaesthetics of the Royal College of Surgeons (FFARCS (Eng)) which had become a requirement for those seeking a full specialist status career in anaesthesia.

These extended to full day-release courses for all the trainees in the region. Shackleton then went on to become the regional postgraduate medical advisor. He would have no doubt welcomed the formalisation of training that we have seen as an independent Royal College of Anaesthetists which we might now take for granted as an umbrella to this large and still growing specialty. The conjoint Diploma in Anaesthesia continued and was taken by those wishing to become clinical assistants or general practitioners with a special interest in anaesthesia.

**Senior House Officers**

In his 1966 paper, Dr Shackleton states that anaesthesia should be taught as a postgraduate discipline starting at the senior house officer (SHO) level. He suggested they should have some experience of general medicine and ideally paediatrics or obstetrics before starting anaesthetic training. The introduction of foundation training in 2004 gave two years pre-specialty training, taking over from the one-year house officer jobs and did, to some extent, address this by offering a variety of training beyond the medical and surgical posts. The idea of increasing the speed of training and to "modernise the Senior House Officer (SHO) grade"[3] was the aim of Modernising Medical Careers in 2007 but it may have gone against this ethic. During this period the Senior House Officer title was replaced by Core Trainee (CT) and Specialist Registrar to Specialty Trainee (ST) with the old terms used in concordance with the modern terminology.

Although despite the intent also "*to improve patient care by improving medical education with a transparent and efficient career path for doctors*"[3] many trainees still move between training programmes or undertake trust posts as well as working overseas. This provides the modern trainee with career flexibility,

new clinical experiences outside the training pathway while adding to an already extensive *curriculum vitae*.

Shackleton claimed that SHOs should be working in "*...teaching hospitals under stricter supervision than he gets now*".[1] While this has improved vastly from his description of 300 senior house officers in 220 hospitals it reflects modern rota patterns in anaesthesia. Anaesthesia currently features a biannual nationally recruited cohort of anaesthetists starting in August and February allowing each trainee a programme of lectures as well as supervised lists.

During the novice period, (first three months) the trainee completes specific competencies more structured than in Shackleton's era through online e-portfolio work-based assessments. Various consultants who supervise the trainees on "*doubled-up lists*" sign these off.

A variety of attitudes may be taken by the 'supervisor' from allowing you to observe only, through to perhaps an undeserved confidence that leads to a coffee-room type supervisor. There is of course a balance to be established between staggering the starts such that there is not a glut of trainees all needing supervision against the critical mass needed to run a productive educational programme.

This supervision is useful but does have its disadvantages mainly by being with such a variety of senior trainees and consultant supervision, the approach used to deal with situations or problems can vary from day to day if not hour to hour. Given the vast number of consultants no one condition is treated the same way by each of those consultants. Therefore the trainee is confronted with "*Don't do it that way, do it this way*" on a regular basis. Trainees' practices eventually become an amalgamation of all the consultants' practices that teach them. It is perhaps useful here to discuss the approach that was taken at Southampton when the novice training was first introduced. Previously the department had only taken registrar and senior SHO level trainees who had started their training elsewhere. After an initial challenging situation where the first novice did not reach a level of competency so as to go on the on-call rota, a team of two consultants made a structured approach to a three-month training period and took the next novice on a limited rota that meant they were always with only these two consultants.

This reduced the early confusion many of us suffer working out the sequences and recipes of basic anaesthesia. From their description it was through a lack of being able to pass on the mantle that they went on to train more than forty novices over the next 28 years. Although I would suggest perhaps that this was also due to their obvious personal enthusiasm and commitment to training.

This system is difficult to maintain without the significant commitment and the consideration of rota structure and the personality of trainers. Some consultants simply do not have the appropriate case-mix, others openly admit that they do not have the tolerance to teach these fledglings.

Once completed the trainee joins the on-call rota and begins anaesthetising independently. Direct supervision gives way to more distant supervision as the trainees develop their skills. First they may have a consultant attached directly to their list whose involvement decreases, then within our hospital, by a named consultant who is not attached to any list. With approximately 17 trainees per training grade across Wessex and 3846 trainees across the country the variety of levels of supervision must offer a significant challenge to rota planning and stretch the consultant resources in smaller departments.

At our hospital the current CT2s then complete obstetric competencies and join the maternity on call rota in the Princess Anne Hospital. Being a large teaching hospital with a birth rate of around 6000 per year, this will yield the trainee with a plethora of epidurals, spinals and the occasional general anaesthetic. Other competencies including airway, ENT/maxillo-facial, orthopaedics, regional anaesthesia and the transfer of sick patients are signed off as experience is gained in these areas by a dedicated rotation lead or Educational Supervisor.

**Examinations**

Shackleton highlighted how two thirds of SHO candidates failed the Primary FFARCS exam in 1966. In the last few years it has had a pass rate not much higher than that with between 44% and 71 % at the multiple-choice questions (MCQ) and 53-67% at the structured oral examination (SOE). Now that it is taken as two exams, it is less clear if this would represent many trainees getting one part but not the other or a percentage of trainees having difficulties repeatedly with both parts. He cited four possible reasons, poor candidates, poor education, unrealistic exam or too heavy a workload. These factors may

echo the current anaesthetic training pathway and hence the primary exam will remain an obstacle to progression. The curriculum is broad, covering pharmacology, physiology, physics and statistics. As our knowledge of anaesthetics increases so will the breadth of the curriculum. Educational systems within hospitals even within our region vary in their intensity and content. It could be considered that people may be pushed into anaesthetics without full consideration of their choice and, as such, not be the best suited. The strive to streamline training with faster progression means far more inexperienced anaesthetists are forced to complete exams earlier in their career than previously. Previously trainees would be advised to undertake at least a year of work before considering the exam. They had longer at SHO level tending to do three years as an SHO. The exam must now be completed before applications into year three meaning they often start studying within three months of starting their job while they are still on a very steep learning curve and have probably just started on the on-call rota. Failure to pass the exam has lead to training extensions to allow core trainees time to complete the exams and apply for registrar training going against the plans devised with MMC.

Dr Shackleton stated that trainees as registrars are "*expected to pass their Final Fellowship during this period*"[1] and describes the development of their expanding responsibility. He described how this might be achieved as "gradual emancipation will be a planned affair"[1]. While trainees in years 3-7 (STs) still have to navigate this increasing responsibility with support for those more junior, they also have their own curriculum and assessment to complete.

The introduction of spiral training has meant that all Wessex trainees pass through our teaching hospital where they rotate through cardiac, neurosurgery, paediatrics and intensive care during their third and fourth years and again in their fifth to seventh year. Senior trainees who are post-finals also rotate through various specialties and act as a coordinator while on call.

Shackleton hoped the number of senior registrars would match the required consultant vacancies[1] with them needing to double the number to meet requirements in 1966. Our department has expanded nearly five-fold since the year 2000. This matching was part of the plan from MMC but this often appears to limit numbers, leaving many applicants without posts and rotas not sufficient to provide the desired level of cover.

**Consultants**

The consultant remains the pinnacle of the anaesthetic hierarchy with overall patient responsibility residing with them. Southampton General Hospital boasts around 100 anaesthetic consultants covering paediatrics, neuro, general theatres, cardiac, thoracic and obstetrics. Shackleton recognised the need for consultants to continue learning along with trainees. He would perhaps be pleased with the introduction of revalidation which ensures increased documentation of what may have been happening in a more *ad hoc* fashion. He advocated the need for consultants who want to teach and ideally those who are good at it, to be given the time to do so.[1]

I would suggest that those who do not want to and perhaps recognise their limitations in doing so are allowed to develop their skills in other ways. Consultants now have allocated sessions for non-clinical work including teaching. This is at risk with the new consultant contracts and the increasing time needed for documentation and revalidation.

Southampton has regular education sessions with morbidity and mortality meetings, trauma meetings and rolling half-days. Pre-final trainees have a teaching program and revision courses throughout the year. Trainees are encouraged to attend 7.30 a.m. educational meetings, adding to an already long day, however, offering a valuable learning opportunity and a bacon sandwich.

Teaching techniques have changed over the years as well. Dr John Fraser-Jones was at medical school during the war and subsequently trained as an anaesthetist. During his training, which was not in Wessex, he set up a tray of equipment which was effortlessly dispatched across the room by the supervising consultant for being incorrectly prepared. Fortunately this teaching strategy is no longer practised however the trainee faces other challenges. There were some interesting techniques that are likely to be frowned upon now. This included consultants playing tricks on the trainee they were supervising, such as removing a bodok seal to show a trainee what might occur. Modern consultants are under increasing scrutiny along with trainees regarding patient safety and may suggest why these techniques are no longer used.

**Summary**

Shackleton could not have envisaged all the changes to anaesthetic training back in 1966. In 1986 propofol was introduced to anaesthetic practice as a soya oil emulsion and has since revolutionised anaesthetic practice. Arguably the most common anaesthetic delivered today is propofol, fentanyl, ondansetron and a laryngeal mask airway which came on to the market in 1987 compared with thiopentone for induction which is generally only used in obstetric anaesthesia today. Propofol has allowed total intravenous anaesthesia to develop expanding the repertoire of the modern anaesthetist even further. Additionally new airway devices are being developed for single or repeated use and goal-directed fluid-therapy is in vogue with the use of cardiac output monitoring devices.

Despite all of these advances the words of Shackleton echo the plight of the modern anaesthetic trainee

> ". . . it would seem to me possible to fulfil our obligation to the next generation which is to make them better anaesthetists than their present teachers."

Can the next generation of anaesthetists truly to aspire to the training vision proposed by Shackleton?

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# Postcards from the Fronts World War 1: Anaesthesia and Surgery

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This paper is largely visual and serves to remind us of World War I (WW1) and the spread of anaesthesia and surgery.[1] When considering WW1 we generally consider British forces and our Allies rather than the opposition. World War 1 showed a proliferation of medical postcards. Many showed ward scenes but a number had images of the fronts, anaesthesia and surgery. The paper lists some of these fronts and with postcards, illustrated them. It is important that we do not forget that there were other fronts than the Home, Flanders, Gallipoli and the Middle East. Other fronts were in the Balkans, East and West Africa as well as South West Africa. There were naval battles which needed medical interventions in hospital ships. There was also the Russian front. On these fronts were the opposing forces of which there are few postcards of surgery and anaesthesia. There is a paucity of cards from the Middle East, the Balkans and Africa. One interesting fact coming from this period is the use of nurses as anaesthetists and their training. The story of Australian and New Zealand nurses has been shown in the television series 'Anzac Girls' including the order to stop the Australian nurses giving anaesthetics.[2]

A selection of postcards is shown below:
Figure 1: The Queen's Hospital "Frognal" Sidcup. Septic Theatre.

Figure 2: Northern General Hospital, Leicester. (Now a University of Leicester building) 1918

Figure 3: Operating Theatre, Royal Victoria Hospital, Netley. Annotated in pencil 'This was the table I was done on'.

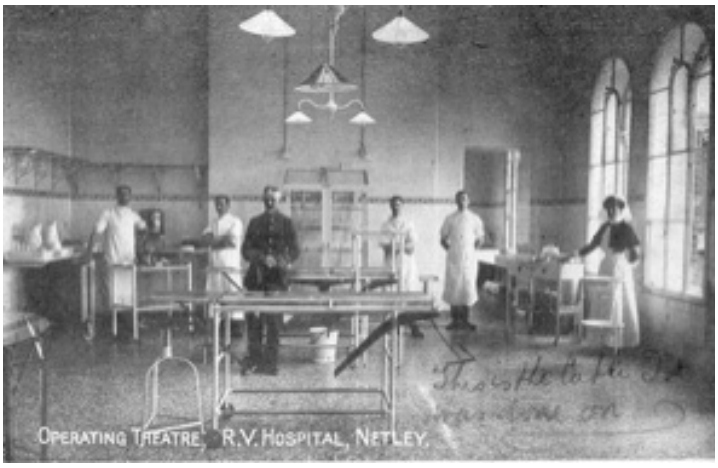


Figure 4: Operating Room. HMHS "Garth Castle".

Figure 5: Russian Operating Theatre. Professor Pavlov.

Figure 6: Russian Field Hospital. Leg Amputation. Amputated Limb is on the Floor.

Figure 7: Budapest Operating Theatre 1914.

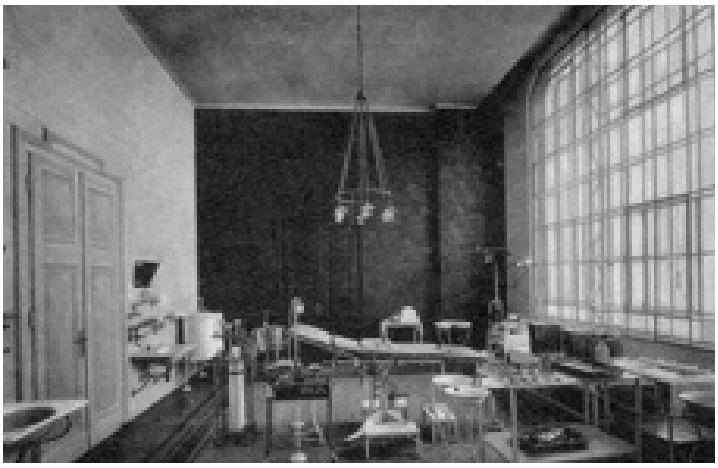

Figure 8: France. near Verdun. Fort de Vaux Operating Theatre.

Figure 9: Operating Theatre, German Military Hospital Train.

Figure 10: German Operating Theatre.

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# Maxillo- facial Surgery in the First World War: Surgery, record keeping, and anaesthesia. Part 1

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Dr Aileen Adams and I became interested in the problems we are going to describe when we were at a conference at the Royal College of Surgeons, "Hunter to Helmand", in the autumn of 2014.

## Surgery and record keeping

Facial injuries became a very common problem in the First World War. High velocity shrapnel, from high explosive shells, combined with trench warfare made head injuries much more common than in previous wars, and in 1915, soft hats were replaced by steel helmets with a curved out brim, to deflect incoming shrapnel missiles. The lower half of the face was still exposed, and horrific injuries occurred. These became a major surgical and anaesthetic problem. During the war, 60,500 soldiers had head or eye injuries compared with 41,000 who had one or more limbs amputated.

The work of one surgeon and two artists will be discussed.

## Harold Gillies 1882 - 1960

Harold Gillies, a New Zealander, trained at Cambridge and St Bartholomew's Hospital, London (Barts), and was a near contemporary of Rubens Wade at Barts. They must have known each other as medical students. Gillies trained as an ENT surgeon, and at the start of the war he joined the RAMC and went to France and worked with an American-French dentist called Valadier, who was attempting to repair fractured jaws caused by gunshot wounds by using tissue from another part of the patient's body.

Gillies also went to Paris to see the surgeon Morestan doing a skin graft on a face and visited as many surgeons as he could to learn facial surgery, even using a German textbook.

Gillies returned to England wanting to open a hospital for facial injuries. This was initially at Aldershot, later moving to Sidcup. In order to get the soldiers with facial injuries fast tracked to him, he bought some luggage labels, addressed them to himself and took them to the War Office to be sent to France. No one was more surprised than he, when soldiers started arriving bearing the labels.[1] These soldiers had been travelling for up to 12 days, and had multiple problems. Wounds had often been roughly stitched together, and by the time they arrived in Gillies unit, had started to heal in the wrong place, so they had to be undone. They could not swallow, and could not speak clearly, if at all. Suffocation was a real danger. The victim of a shattered face would travel safely if huddled together in an overcrowded train sitting upright, but as soon as they were laid down they would choke to death. This happened over and over again.[1] By the time they arrived, they were malnourished so had to be built up with soup and egg flip. After meals they were sluiced down with an enema syringe to prevent sepsis. There were no antibiotics, and some of these injuries must have been very smelly.

Gillies wanted to restore these faces, totally dehumanised by these injuries, as nearly as possible to normal, rather than just do a quick repair on them, and decided that there is no road to the restoration of faces save by pure surgery, the replacement must be as near as possible to what has been lost, bone for bone, skin for skin. He used skin flaps, as have been used since the time of Susruta, but pioneered the use of tubular pedicle grafts, which always meant multiple operations. One patient escaped, complete with a tubular pedicle graft, and made his money as an elephant man, only being recovered ten years later. Filatov, a Russian surgeon developed closed-pedicle grafts independently, during the same period.

One of Gillies maxims was

"*Never do today what can honourably be put off until tomorrow*".[2] After the war he continued to work at Sidcup. By Armistice Day he had treated 5,000 patients, and by 1925 he had done 11,500 reconstructions.[2] In 1920 he wrote his book "*Plastic Surgery of the Face*"[7] which he was allowed, exceptionally, to dedicate to the Queen, because of the really good work he had done for the soldiers.[1]

He was knighted in 1930, and in that year invited his distant cousin Archibald McIndoe to join him. This was one of the most spectacular surgical partnerships of the twentieth century.

When Gillies was made President of the British Association of Plastic Surgeons, McIndoe wrote in the British Journal of Plastic Surgery;

> "A dynamic if unorthodox teacher, he impresses by paradox, invective, cajolery, and teasing raillery. He is an indifferent public speaker, an incorrigible practical joker . . . and the best plastic surgeon in any country. His hosts of friends praise him for his achievements, damn and curse him for his unpredictability, his incurable lateness and fiendish sense of humour".[3]

Gillies continued to practice plastic surgery all his life, and he died aged 78.

**Henry Tonks 1862 - 1937**

I first became interested in Henry Tonks when he was quoted to me in an art class so I found his biography by Joseph Hone.[4] This 6' 4" artist was a much older man, by now at least 53.

The name Tonks is a corruption of the Dutch Toncques.[4] He always drew, but trained initially as a surgeon, at Brighton and then at The London, qualifying in 1886. He was houseman to Frederick Treves [4] who said that Tonks did not have the right temperament for a surgeon. He obtained the FRCS in 1888, but gave up any idea of being a surgeon saying that he "*Could not act so near a man's life*" so he taught anatomy to medical students, drawing on the walls of the anatomy rooms. At the same time, he became assistant professor at the Slade, and rapidly gave up surgery in favour of practising and teaching art.

As a teacher he could be frightening. From all that I have read about him, I think he was very gruff because he was shy. He was respected by all students, and feared by many.[5]

He taught drawing the figure as a series of directions. Proportion, touch, direction and sight-size were important points in his teaching, and he was a great believer in repeated measuring. Always paint across the form because this was in keeping with the fall of light. "*Two men paint the same model; one creates a poem, the other is satisfied with recording facts*".

He often confessed that he had no idea what the figure looked like to anyone who was unacquainted with anatomy.[5] As a student he did a lot of post-mortem drawing.[4] Each patient had a double interest, that of the disease that brought him there, and his possibilities as a model and how Tonks could express this.

**War art**

At the start of the war, Tonks went to France as an orderly, and the description of how he felt is quoted in his biography by his friend Hone, and is very moving.[4] He realised that he was not up to being a doctor any more.

His first war picture was *Saline infusion*[6] done at the Red Cross Hospital in Arc-en-Barrois, 1915. It has been likened to a pieta, with the bed representing the Cross, but I think this is over-egging it. I think it is a sensitive picture done by a man who is witnessing and wants to record great suffering. A lot has been written about intravenous saline, but actually I think that this could be saline irrigation of a wound. The composition is remarkable, diagonals expressing the patient's suffering, with the sympathetic person of the left, but the right side is much stiller, the doctor doing what he has to, whilst witnessed by the nurse in the background. The light comes from top right, to emphasise the anterior planes, and thus the contorting, of the patient.

A British ambulance unit was sent out to Italy organised by the British historian G. M. Trevelyan, and Tonks was invited to join this. Trevelyan, rather pompous, was most concerned about discipline, and thought that Tonks, Sargent and Dakin could go and dig latrines. "*Sir,*" replied Tonks, "*I have joined the Red Cross and I am willing to do any mortal thing, but you have strangely misjudged the position of Dakin, a most distinguished surgeon*".[4]

Despite his misgivings about his ability as a surgeon, in 1916 he received a temporary commission as a lieutenant in the Royal Army Medical Corps, and went to Aldershot to assess who was fit to return to the Front. Gillies was a keen amateur artist, and realised that drawing these wounded people before and after surgery was a valuable way to record the surgery. His great friend, the golfing correspondent at the Times, tipped him off that the great Henry Tonks had been posted to Aldershot. Thus started the series of drawings of patients for Gillies before and after operation that are now so famous.[7] These drawings are real injuries to real people, showing them dribbling, and unable

to see or eat, not stylised commemoration of heroic injury, and totally unsentimental. Tonks said that a good drawing was one that conveyed a palpable sensation of the subject. They were useful to Gillies to show what he had started with.

> "I am doing a number of heads of wounded soldiers who had their faces knocked about. A very good surgeon called Gillies is undertaking what is known as the plastic surgery necessary. It is a chamber of horrors, but I am quite content to draw them, as it is excellent practice".[8]

There are also flap drawings among these portraits which are more like dress patterns than a drawing.

That Tonks had trained as a surgeon and done drawings in the post-mortem room is key to why these paintings are so good. Another artist, Daryl Lindsay, recalling his first operation, said, "*How was I going to translate what looked like a mess of flesh and blood into a diagram that a student could understand?*"[9] We have no idea where Tonks did the pastels, was it in his office or at the bedside? They are not war art in the conventional sense; he refused to allow them to be exhibited at the Imperial War Museum, saying that "*They are rather dreadful subjects for the public view*". They are not pictures for spectatorship, to an audience of anaesthetists they probably say something different than they do to any other – "How does one anaesthetise them?" Remember, we are pre-Magill.

The pastels occupy a middle ground between portraiture and medical record, and blur the line between art and surgery. Tonks wrote; *The sick man returns to what he was without the trappings he has picked up on his way*".[10]

They have what John Hunter called *"A kind of necessary inhumanity*." Which is now called clinical detachment.[11] Using these pictures, we can view the works dispassionately within an art framework to assess the progress of the subjects.

Now, however, I think that they are part of the 2015 universal theme "*Lest we forget*".[12] They were recently exhibited at the Hunterian Museum at the Royal College of Surgeons.

Why did Tonks use pastel? Why not oil as has been used in a much more recent exhibition from Barts? Tonks said that pastels were both rapid and delicate. Pastel is immediate, quick to apply, straight out of the box, can be layered and altered quickly. These pictures are all between A3 and A4 size, so

the materials to do them could be easily transported in a briefcase. The great disadvantage is that pastel has poor archival properties. If a pastel drawing, or painting as they are now called, is carelessly stored it will smudge, and bang the reverse side of the paper often enough, and it will all come off leaving a dirty bit of paper. A paper conservator has treated these, in 2009, partly because they were not done on acid free paper.[13]

Tonks left Sidcup before the end of the war, and he and Sargent were sent to France as official war artists. Formerly, war artists were servants of the state, but also active soldiers, many were killed, and their work was supposed to be propaganda, they were still required to paint the heroic, and were causing a lot of trouble to the authorities by painting it the way they saw it, and much of the work was censored. At the end of the war this attitude changed, and it was during this time that Tonks painted "*Dressing station*"[14] and Sargent painted "*Gassed*".[15] They are both, like so many war paintings, designed, studio paintings done from sketches, and both have a foreground, middle ground and background. He said of himself that he found the main construction of a painting very trying, but his chief pleasure was in pushing the values up and down.

"*Gassed*"[15] is a huge painting, which I find curiously unmoving, perhaps the football game in the background contributes to this. I am much more moved by Nash's works, which are about total devastation of the landscape.

In the Tonks painting, the background of ruined buildings, initially dominates over the foreground and middle ground. This must be intentional. All the compositional lines in the lower part of the picture point towards the damaged buildings. The largest area of light, next to the darkest dark, is at the back in the buildings. I do not know why he did this, except that a lot of the most moving First World War paintings have an emphasis on damaged land and buildings, such as those by Nash.

After the war, Tonks went to Russia with the British Expeditionary Force. He then returned as Professor of Art to the Slade.

In his article, Wander Years, published in 1929, he discusses his transition from surgeon to Professor of Drawing, but does not mention the pastels.[10]

**Kathleen Scott 1878 - 1947**

At the end of the war, a sculptor, Kathleen Scott, worked with Gillies, who wrote,

> "A plaster cast of the face is made and thereon the sculptor, aided by early photographs if available, models the missing contours. With radiographs to confirm that the loss is not merely displacement, the surgeon now has data for adequate diagnosis. Realisation of contours comes only by close cooperation with the sculptor".

He could then plan areas of bone graft using cartilage from the ribs and map skin grafts with tin foil.[16]

No models made by her remain. However, her granddaughter, Louisa Young has written her biography,[16] and two novels[16 17] about the period. Some models of the period remain in the Val de Grace in Paris.

We are grateful to Brian Morgan FRCS, Andrew Bamji FRCP and Louisa Young for help with this project.

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# Maxillo-facial Surgery in the First World War: anaesthesia before Magill. Part 2

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The First World War had a very high incidence of head and neck wounds, at least five times higher than in the Second World War, largely because of the demands of trench warfare.[1] In response, the new field of facial plastic surgery arose that was first developed by Harold (later Sir Harold) Gillies.

Gillies' first specialised unit was set up in 1916 at the Cambridge Military Hospital (CMH) Aldershot, where he was given a ward for treating facial injuries. This soon proved inadequate and it was transferred to the Queen's Hospital, Sidcup the following year. It remained the centre for facial surgery until 1925.

Gillies took on the facial injuries that other surgeons regarded as hopeless and he devised methods of treating them with tissue grafting and skin flaps that were revolutionary at the time. The anaesthetic problems were equally formidable. Many patients arrived at hospital malnourished, the airway was often deformed, rigid and obstructed, and operations caused further bleeding into the airways. Ether, chloroform and nitrous oxide were the only agents available and endotracheal intubation was in its infancy and rarely used. Although tracheostomy and laryngostomy were long established, both were difficult in these circumstances, and neither was often used in wartime surgery.[1] Surgeon and anaesthetist got in the way of each other and there was difficulty in maintaining an aseptic field. Whatever inhalation method was used the surgeon tended to have to breathe the expired anaesthetic gases. There were limited methods of delivering gases and vapours and concentrations were difficult to control.

Whilst it is Sir Ivan Magill's name that is usually associated with anaesthesia for major maxillo-facial surgery, he did not arrive at Sidcup until 1919, after the end of the war, and he had had almost no experience as an anaesthetist. The same applied to Stanley Rowbotham who took up duties about the same

time. The unit had already been running for three years, and this paper looks at the contributions of the anaesthetists who worked there during those first years. As in civilian practice at the time, the army did not have specialist anaesthetists, but general duties officers who also gave anaesthetics part-time, having had limited training. Gillies soon made it clear that experienced and skilled anaesthetists were essential for the cases he was treating and that he needed staff to work with him all the time.

Three people have particularly left their mark: Colonel JFW Silk, and Lieutenants, later Captains, Rubens Wade and John Clayton. Silk was there in 1916 for a relatively short time, Wade and Clayton joined soon after and stayed until after the end of the war. Whilst all three contributed it is significant that when Gillies published his definitive book *Plastic Surgery of the Face in War Injuries* in 1920 it was Rubens Wade he asked to write the chapter on anaesthesia.[2]

**Colonel JFW Silk (1858-1943)**

J Frederick Silk was the senior of the three anaesthetists and the first to arrive at Gillies' unit. He was already well known in London anaesthetic circles. Born in 1858, he qualified in medicine from King's College in 1878, obtaining his London MD in 1881. He then went to Leeds for two years where he gained experience in anaesthesia. On his return to London he was appointed honorary anaesthetist and lecturer at Guy's Hospital Dental School and later to King's College Hospital. During the pre-war years he made a name for himself as one of the leading anaesthetists of the time, with a particular enthusiasm for teaching and advocating that all doctors should receive some training in anaesthesia. He was a founder member of the Society of Anaesthetists and its fourth President in 1899; he made numerous contributions to this Society and to the Royal Society of Medicine (RSM) Section of Anaesthetics that followed it, though surprisingly he never became President of the Section. He designed an ether inhaler and also what became known as Silk's tube, a catheter passed nasally alongside an insufflation tube to remove the expired gases. By 1914 he had already published a textbook "*Modern Anaesthetics*."[3]

When war broke out Silk joined the Royal Army Medical Corps (RAMC), although he was actually over-age, and became consulting anaesthetist, first to

Eastern Command and in 1915 to Malta Command. In 1916 he was sent to Gillies' new unit at CMH Aldershot. As Lieutenant Colonel and a senior officer he did not stay long in a clinical post and shortly afterwards handed over to Rubens Wade.

**Captain Rubens Wade. (1880-1940)**

A comprehensive account of Wade's life and work was presented by Wilkinson as long ago as 1997 at the Fourth International Symposium on the History of Anaesthesia in Hamburg in a paper which seems to have been totally neglected, as no further reference has been found to it since then.[4] Wilkinson spells Wade's first name incorrectly as "*Reubens*". His paper is summarised here.

Twenty-two years younger than Silk, he was born on 15th February 1880 in the Lake District, the son of Thomas Wade, an artist, no doubt why he was given his unusual first name. He studied medicine at Cambridge and St Bartholomew's Hospital (Bart's), qualifying MRCS LRCP and MB BChir (Cantab) in 1906. He over lapped with Harold Gillies at Bart's though no definite record of them associating has been found. After house officer posts at Bart's and the Great Northern (now the Royal Northern) he moved to Bedale in Yorkshire and set up in general practice with a Bart's colleague, Dr Eddison. Three years later he moved south to Farnham in Surrey. Presumably it was during this period that he became interested in anaesthetics, as this was commonly combined with general practice at the time. When war broke out Wade joined the RAMC and was sent in 1916 as an anaesthetist to CMH Aldershot, where and at Sidcup he worked with Harold Gillies until he was demobilised in 1920 when he returned to London.

Wade was becoming increasingly deaf and he felt this inhibited his practice as a general practitioner, hence after the war he decided not to return to general practice but to continue as an anaesthetist. He had attachments to Bart's, the Great Northern and the National Dental Hospital, retaining these until his death aged 60 in 1940. He was obviously highly thought of; in Wade's obituary Gillies paid tribute to him as a wonderful colleague and skilled anaesthetist, who would not tolerate inefficiency in himself or others. Gillies felt he was not sufficiently well known partly because of his quiet and retiring nature and perhaps his deafness.[5]

**Captain John Cecil Clayton**

Little seems to be known about the third doctor, John Clayton, who qualified in 1901 in London and became Honorary Anaesthetist to several small hospitals in London including the Royal Ear in Soho. He served in the RAMC alongside Wade, working with Gillies at Aldershot and at Sidcup. He too made a significant contribution.[6] After the war, he returned to London to several honorary appointments including the Royal Ear and Queen Mary's Hospital Stratford and for a period in Bristol. He died in 1943.

**Anaesthetic techniques**

The techniques available to them were very limited. Tracheal intubation was in its infancy. Mosher's speculum, originally devised for operations on the nasal septum, was the nearest thing to a laryngoscope, a simple straight speculum without illumination. Mosher, an American surgeon devised it as an aid to resection of the nasal septum and he later developed it as a laryngeal speculum.[7]

Inhalation anaesthesia was usually by open drop methods on a gauze mask. Where the anaesthetist was required to work from a distance various supra-glottic airways had been devised that could be attached to inhalation devices.[8] [9] A popular one in England was Hewitt's, an oral airway that could have a metal insert attached to anaesthetic tubing. Kuhn had devised an endotracheal tube that was very popular in Germany. It consisted of a metal spiral tube with an s-shaped cross-section, with an introducer and a funnel for administering ether by gauze mask. It worked well, once inserted, being virtually uncrushable, though it had to be inserted by touch and was rather bulky and tended to get in the way of the surgery.[9]

After his time spent at CMH Silk called a meeting at the RSM to discuss military anaesthesia. This was well attended, an account was published soon after in *The Lancet* [10], and later in the *Proceedings of the Royal Society of Medicine*.[10] Whilst dealing with anaesthesia in the Armed Services as a whole, it included a discussion about the particular problems posed by maxillo-facial injuries. After further experiences Wade[12] and Clayton[13] themselves published more detailed accounts in *The Lancet.* Wade was the author of the chapter on anaesthetics in Gillies' book published in 1922.[2] Consequently they have told us much about how they attempted to deal with their problems.

Silk's advice to Wade was that endotracheal intubation, difficult and demanding as it was at the time, was not necessary in the majority of cases, something that seems astonishing today. His preferred method of dealing with the shared airway was to operate with the patient sitting bolt upright with the tongue held well forward; he passed a catheter via the nostril to the pharynx, with its tip situated just above the epiglottis, and inserted loose gauze packing around this.

Wade and Clayton stayed with Gillies much longer than Silk and they refined these techniques and developed further methods. Wade in his publications described several methods of dealing with different problems.[2 12] For operations on the nose and the upper part of the face he used a small-sized Hewitt's oral pharyngeal airway with a bent piece of metal inserted to connect the anaesthetic tubing. He reported that a suitable metal tube could be made from an empty rifle cartridge. For operations on the mouth a naso-pharyngeal tube was inserted, using a blunt-ended tube passed into the pharynx with the tip sited just above the larynx. With either airway the pharynx could be packed lightly with gauze to absorb blood and secretions. Both these techniques could be used either with the patient supine or, as Silk had advocated, bolt upright, and Wade used both positions. The anaesthetist sat at the side of the patient to have access for maintaining the airway under the towels. Unsurprisingly these various airways sometimes got dislodged. Wade said he occasionally scrubbed up with the surgeon so as to be able to control the airway better, leaving administration of the anaesthetic to an assistant.

Wade also reported using Kuhn's tube as a tracheal airway, which was more secure. He referred to this tube in his publications as Kahn's tube but it is certain he meant Kuhn. Mosher's speculum could be used to introduce it.[7] Magill's first laryngoscope has an almost identical blade to that described by Mosher but is illuminated and mounted on a handle. The concept of to-and-fro breathing through a single wide-bore tube had not been worked out at this time the tubes were not airtight as they were used for insufflation, so blood could be inhaled and cause frothing. Also expired gases tended to flow back into the surgeon's face. However later they did use endotracheal anaesthesia more and more, as they developed their skills.

Intravenous agents had not been introduced at this time. The usual agents

used for Gillies' patients were chloroform or ether, or a mixture of the two, usually in air and/or oxygen, occasionally with nitrous oxide, starting with open drop method on a gauze mask. Once an oral or nasal airway had been introduced maintenance was usually using Shipway's warmed ether apparatus; this delivered agents to the patient via rubber tubing from vaporisers by intermittent compression of a bulb. Either air or oxygen could be used as the carrier gas.[8]

Clayton used similar though not identical techniques to Wade's. He did not like chloroform, preferring to use ether alone with a wide-bore naso-pharyngeal tube of his own design when a Hewitt's airway was not suitable. He also designed an airway circuit that was simpler than Shipway's, being just a long tube leading to a funnel acting as an open gauze mask.[13] Another method they used often in the early days was rectal oil-ether, or oil-ether-paraldehyde. This seems to have worked well; although it kept apparatus out of the surgeon's way, it did not solve the problem of maintaining a clear airway. Less vomiting than inhaled ether followed it, but recovery was much slower. Wade said he had given rectal ether on some 200 occasions and only once did he have anxiety due to difficulty with the airway. Eventually however they gave this technique up, presumably because they became more skilled with inhalation methods.[12]

Wade, writing after two years experience, describes how many operations lasted three hours or more, but that nearly all the patients had been in good condition at the end and suffered no serious after-effects.[12] It is perhaps surprising that deaths or serious problems on the table did not occur, a tribute to the care and skill of these anaesthetists. Their chief worry seems to have been about the incidence postoperatively of what they called "ether bronchitis".

A large volume of work was carried out in Gillies' unit, Clayton's statistics showed that in one six-month period he gave 500 anaesthetics for facial and jaw injuries, 400 minor and 100 major plastic cases,[13] whilst the total number until the Armistice was about 5,000 patients and some 11,500 reconstructions.

Writing in Gillies' textbook Wade displays a gentle sense of humour. One can hear him sigh when he says, "*plastic operations are unavoidably long*" and when describing some of the difficulties, for example;

> "The surgeon must perforce trespass upon the territory usually regarded by the anaesthetist as his own . . . An arrangement must be come to also by which the surgeon is spared the disability of disputing the possession of the parts."

One thing that is quite clear is that surgeon and anaesthetist planned their operations together in advance, which is surely why they had such good results. Gillies also worked with the skilled sculptor Kathleen Scott (later Lady Kennett), widow of the Antarctic explorer; she made casts and models of patients' faces so that he could experiment with various methods of tissue grafting.[14]

**Dr (later Sir) Ivan Magill and Dr E S Rowbotham**

Magill and Rowbotham arrived at Sidcup in 1919; both having served as regular duties officers and neither had much experience of anaesthesia. They over-lapped with Wade for about a year. This paper has aimed to show what they inherited from the earlier anaesthetists. However, it was Magill who took a major step forward with his ingenuity in devising a complete armamentarium for tracheal anaesthesia, including laryngoscope, forceps, tubes, circuits and the single tube to-and-fro breathing system. This undoubtedly was responsible for developing tracheal anaesthesia from a specialist skill to one that could be readily achieved by every anaesthetist.

**Acknowledgment**

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# The Legacy of the Anaesthesia 'Events' at Pearl Harbor, 7th December 1941

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This paper is an expanded version of a lecture first presented at a joint meeting of the Australian & New Zealand College of Anaesthetists and the Royal Australasian College of Surgeons in Singapore in May 2014. A précis of that lecture was subsequently published in the History Supplement of *Anaesthesia & Intensive Care.*[1] Actual text from that paper cited here is in 'italics or as indented paragraphs', and is reproduced with the permission of the Editor of *Anaesthesia & Intensive Care*, to whom I gratefully extend my sincere thanks.

> 'For the past 73 years, since the Japanese military attack on the US naval base at Pearl Harbor on 7th December, 1941, most anaesthetists have been taught that the sodium thiopentone (Pentothal') anaesthesia caused hundreds of perioperative deaths in the 1178 casualties of the battle'.[1]

It is believed that about 1,000 of these required emergency surgery in the subsequent 24 - 48 hours.

When I was a medical student attached to the Anaesthesia Department at the Royal Adelaide Hospital in 1971, my consultant said to me:

> "Lad, if you go on to do Anaesthesia, you must use this thiopentone with great care and diligence because the Yanks killed more of their own at Pearl Harbor than did the Japanese in their attack in 1941."

When I asked how did he know this, he replied that he was told that when he was a trainee in Belfast in 1949! That story has been told to thousands of anaesthesia trainees all over the world, including the USA, and is succinctly reviewed by Prof. Selma Calmes in the video presentation 'Pentothal and Pearl Harbor' on-line at the Wood Library-Museum website.[2]

In 1992, the year after the 50th anniversary of the attack, Dr Frank Bennetts, a consultant anaesthetist in Kent, and an active member of the History of Anaesthesia Society, published in the U.S. Anesthesia History Association's Newsletter a review of thiopentone anaesthesia since its introduction into specialist practice in 1934, entitled: 'Thiopentone, Chicago to Pearl Harbor',[3] which included much detail about its use at Pearl Harbor.

> 'Then, in 1995, after reviewing US military documents released under the US Freedom of Information Act (1946), he published what has become the most definitive paper on the Pearl Harbor anaesthesia events[4]. That paper acknowledged that censorship by the US military of the extent of thiopentone morbidity/mortality was possible, because no actual numbers of such complications have been revealed by the military authorities, notwithstanding that few detailed records of anaesthesia were kept. The only official figures cited were from one civilian-military hospital, the Tripler Army Hospital, which is about five miles from Pearl Harbor and which employed some civilian surgeons whose anecdotes and accounts were not subject to strict military policy.'[1]

Bennetts concluded: "*. . . it is clear that the rumoured death rate from this cause has been greatly exaggerated*." I suspect that the death rate which Dr Bennetts was referring to, was the anecdotal one alluded to me in 1971, and which was also told to him as cited in his 1992 paper.[3]

I disagree with his conclusion that the *rumoured* death rate was greatly exaggerated, but accept the fact that the actual number of true anaesthetic deaths will never be known because few, if any, detailed records were kept, and because there was no clearly defined classification of anaesthetic deaths, as there is today. Many such World War II (WW2) fatalities were classified as 'having died of their wounds', or 'during surgery'.[5]

In 1941, the hazards of using thiopentone in severely shocked patients were unknown to the military nurse anesthetists and others who were responsible for administering anaesthesia at Pearl Harbor.

> 'Cardiovascular collapse and respiratory arrest together with a shortage of oxygen supplies, lack of resuscitative skills and equipment and knowledge of thiopentone's pharmacology and dosage, along with a dearth – possibly none – of trained, skilled, physician anaesthetists clearly resulted in several tragedies'.[1]

But just exactly how many will never be known.

> 'Some spinal anaesthetics too contributed to the peri-operative mortality, and the available local anaesthetics, procaine and tetracaine, were quickly restricted to infiltration only – mainly in burns patients'.[1]

A year after Pearl Harbor, Admiral Gordon Taylor RN, said: "*Spinal anesthesia is the ideal form of euthanasia in war surgery";* and Dr F J Halford, a senior surgeon at Pearl Harbor, added: *"...and let it be said that intravenous anesthesia is [also] an ideal method of euthanasia."* [5] That paper in *Anesthesiology* in January 1943 prompted a four page Editorial entitled: 'The question of intravenous anesthesia in war surgery'.[6] The 'question' discussed the overall safety of thiopentone and outlined in great detail the extreme dangers it heralded in shocked patients, and under conditions of war. The 'warnings' were based on '. . . partial reports of military experience . . .' and not on '. . . thorough trial under both laboratory and clinical conditions in civil circumstances. . .' Moreover, it is cited that the 'question' required discussion and an answer because '. . . it had occupied the minds of physicians and surgeons since the attack on Pearl Harbor, and partly as a result of the happenings there.' Other papers in that and in many other 1940s issues of *Anesthesiology* and in many other journals during 1942-43 carried similar messages. But nowhere are those 'happenings' quantified.

It is not surprising therefore that during (and after) that *infamous* day in 1941 the nurse anesthetists, surgeons and others responsible for anaesthesia quickly reverted to using and requesting 'drip ether' as the preferred anaesthetic technique. A review of endotracheal anaesthesia techniques used in the US military in 1945 in Italy cited only 10% included thiopentone.[7] Indeed, even in 1950, in the Korean war, the US Military's nurse anesthetists continued to use 'drip-ether', as depicted in some five episodes of the TV series M*A*S*H.[8] In that war too, US anaesthesia equipment was not standardised and could not be shared with the British and other allied medical teams.[9] That is not to say that thiopentone was not used in small intermittent doses, but its use in full induction-doses was unlikely because after Pearl Harbor, the hazards of its use in shocked patients were quickly appreciated by physician anaesthetists, who began to use smaller, intermittent doses.[6 7 10] Moreover, after Pearl Harbor, the Mayo Clinic's use of thiopentone declined markedly, whereas the

drug's popularity continued to increase in UK hospitals and throughout the world as more physicians took up anaesthesia as part of their medical practice (See Table 1.).

Table 1. Prevalence of thiopentone usage 1941-1951. From Dundee JW (Ed). *Thiopentone and other thiobarbiturates*. Edinburgh: E.S Livingstone, 1956; 10-12.[11]

| | Mayo Clinic | UK Hospitals |
|---|---|---|
| End 1941 | 30% | 9.5% |
| End WW2 | 24% | 25% |
| End 1951 | 52% | 76% |

This decline at the Mayo Clinic is very significant because it was in the early 1930s that the US anesthesiologists Prof. Ralph Waters in Wisconsin and Dr John Lundy at the Mayo Clinic in Rochester NY, initially researched thiopentone and introduced it into clinical practice.[12] They demonstrated clearly thiopentone's many advantages over ether and other thiobarbirurates.[11-13]

Ironically, Prof. John Dundee, in his 1956 '*Thiopentone and other Thiobarbiturates*' textbook and in his other 37 publications on thiopentone, did not comment on this marked decline in its use at the Mayo clinic, whilst the drug's popularity soared elsewhere, especially in Britain where all anaesthetics were administered by doctors.[11 14]

In 1942, the US National Research Council established an Anesthesia Committee to oversee physician training and to improve anaesthesia in the European Theatre of Operations. This committee, which was chaired by Prof. Ralph Waters also included Prof. Henry Beecher, Drs John Lundy and Ralph Tovell had far-reaching powers to recruit and train doctors as anesthetists for the US Military.[10 13]

By 1943, this committee had begun to address the lack of 'trained anesthetists' and scarcity of appropriate equipment such as portable, closed respiratory/ventilation systems which were major contributors to anaesthetic mortality and morbidity.[3 7 14 19] The committee dragooned many young US doctors into three-month training courses, some of which were conducted in Britain for Allied Forces under the auspices of Prof. Macintosh and other British colleagues.[10]

It is important to appreciate that in 1941 Anesthesiology was not recognised as a medical discipline in the Surgeon General's Office in the US military, and had minimal medical status throughout the US until after Pearl Harbor and WW2.[15 16 17] Rather, nurse anesthetists were employed almost exclusively at Pearl Harbor, although some doctors with some anaesthesia experience were involved. Official training of nurse anesthetists began only after the foundation of the National Association of Nurse Anesthetists in 1931 and was only really standardised and recognised in the late 1940s.[18 19]

The American Board of Anesthesiology was constituted in 1939 and, by the end of 1941, there were only about 100 certified, physician anesthetists in the whole of the US, with less than 50 in the military, whereas in England, the Diploma of Anaesthetics of the Royal Colleges of Surgeons and Physicians had begun in 1934, and anaesthesia was practised only by doctors.[A] Undoubtedly, these significant differences between the US and Britain, and other countries, in the status, recruitment and training of personnel responsible for anaesthesia services contributed to the 'anaesthesia events' at Pearl Harbor.

In the US, back in 1937, Prof. Ralph Waters, who was one of the principal educators of nurse anesthetists, had attempted to convince surgeons of this long before Pearl Harbor, when he wrote:

> "Anesthesia received little aid or stimulation by surgeons who frowned upon medical men to improve the status of anesthesia. This attitude placed anesthesia into the hands of young assistants and nurses or technicians."[16]

Halford, in his classic paper in *Anesthesiology* (1943), just a year after Pearl Harbor, stated that the army needed 'anesthetists' and appealed to any 'trained/qualified men' to apply for a commission and join surgical teams.[5] That appeal, in *Anesthesiology* was clearly directed at doctors – not nurses.

Today, in the US, specialist physician anaesthetists are referred to as 'anesthesiologists', whilst nurses and others who are not specialists are 'anesthetists'. (The term 'anesthesiologist' denoting a physician anaesthetist, came into common use only in the 1940s, when more doctors adopted Anaesthesiology as a career; [17 20 21] whereas, in most of the rest of the world, physicians had always been the principal practitioners of anaesthesia.) During and after the War many doctors concurred with Halford's plea and within a

A Smith Bradley E. Personal Communication. March 2014

few years appropriate anaesthetic training courses were established, and in due course, many of those so trained gained specialist/consultant recognition and status.[13 22-24]

> 'These WW2 tragedies, especially those at Pearl Harbor, were a wake-up call for surgeons and the medical profession generally throughout the world to improve Anaesthesia. Finally, in the US, it had become clear that no longer was it appropriate for any junior doctor, nurse or technician to administer 'sophisticated' anaesthesia for many surgeries, and especially to critically-ill patients.'[1]

This had been known for many years in thoracic and neurosurgery, at specialist clinics such as the Mayo, and in many other countries.[16 21-23] Nevertheless, today some 17 nations have large contingents of nurse anesthetists, who, in some regions still practise independently.[B]

As the WW2 progressed, portable, closed-system breathing circuits enabling the safe administration of ether with either oxygen ± air ± nitrous oxide ± ether using spontaneous or assisted ventilation became more widely available. The types of apparatus used are well illustrated in the WW2 review documents published by the US Army Medical Department.[24]

Through the 1940s and after WW2, it was quickly recognised that the profession required appropriately trained anaesthetists with the knowledge and skills to use such drugs as thiopentone and the sophisticated equipment developed, especially by the British. The Royal Colleges of Surgeons established Faculties of Anaesthetists, and universities in Australia soon introduced post-graduate medical diplomas in Anaesthesia, following the example of the 1934 D.A. in England.

Specialist recognition was enhanced throughout the developed world, in the British Empire and especially in Britain by the establishment of the National Health Service in 1948. Until then most practising anaesthetists were general practitioners, many of whom had gained a post-graduate diploma – the D.A. But by the mid 1950s, once Anaesthesia had been recognised as a medical speciality, education, research and development progressed rapidly, and examinations for Fellowship of the Faculties, not just Membership, began in 1953 as outlined in Table 2 overleaf.

B Vanzundert A. – Personal Communication. June, 2015

Table 2. Significant Developments in Anaesthesiology after Pearl Harbor (adapted from Table 1. of reference 1)

**Education and Specialist Recognition:**

1946 Journal *Anaesthesia* (the eighth anaesthetic journal)
1947 Diploma of Anaesthetics Course, University of Sydney
1948 Faculty of Anaesthetists, Royal College of Surgeons of England
170 Foundation Fellows elected - some from Australia
1948 Diploma courses FFARCS Eng and University of Melbourne
1948 National Health Service in Great Britain
1952 Faculty of Anaesthetists, Royal Australasian College of Surgeons
1953 Faculty of Anaesthetists of the Royal College of Surgeons in Ireland
1953 Diploma of FFARCS examination

**Drugs, Equipment and Techniques**

1941 Trilene®; Caudal epidurals
1942 Curare (purified d-tubocurarine); Carlen's tube
1943 Macintosh laryngoscope
1945 Tuohy needle and first use of 'ureteric' epidural catheters
1947 'Balanced' anaesthesia with pethidine
1948 Lignocaine; methadone; 'copper kettle' vaporiser
1949 Suxamethonium (Scoline®); Chloroprocaine
1950 Hypothermia (for cardiac and neurosurgery)
1952 Intermittent pressure ventilation with bag ventilators and endotracheal intubation
1954 Mapleson breathing systems; halothane

Following the British model, university and teaching hospitals in Australasia began to establish teaching departments of anaesthesia in the 1950s, whose roles included resuscitation and critical care, soon to be known as Intensive Care, which, along with Emergency and Pain Medicine subsequently became specialities in their own right. These specialities began as Faculties within Anaesthesia, just as Anaesthesia itself had begun as a Faculty within Surgery.'[1]

Having reviewed more than 100 publications by surgeons and others in the years following WW2, and visiting and corresponding with many colleagues and others in the US, I am convinced that the thiopentone mortality rate was considerably higher at Pearl Harbor than the 'official' WW2 rate of 1:450 cited in a review of casualties published by Beecher in 1955.[19] That rate included similar anaesthetic mortalities from many other theatres of the war, including Italy and North Africa, and, arguably, was one of the first attempts to accurately define and classify anaesthetic mortality.[19 20]

During a visit to Pearl Harbor and the USS Arizona Memorial in November 2014, I met with two of the nine surviving US Navy veterans, neither of whom could tell me anything about any anaesthesia 'events', except that one of them, when I asked if he had had 'the ether' when he had shrapnel removed from his head, said: "No. I had an injection." Then he pointed to his right cubital fossa. He said all went well with the surgery, but the next day the surgeon told him he had 'died' during the operation, but that they had resuscitated him. Thus he had received an intravenous anaesthetic, almost certainly thiopentone, but had suffered no sequelae.

> 'In summary, the significance and legacy of the anaesthetic events at Pearl Harbor were that surgeons, the medical profession generally, and health authorities, recognised the need for appropriately trained and skilled, specialist practitioners of anaesthesia. Today's modern speciality of Anaesthesia, or Anaesthesiology, as I suggest we should refer to it, was born soon after Pearl Harbor and WW2, and the 'Ether Century' began to expire, although ether did continue to be used into the 1970s for many simpler surgeries in less developed centres, principally by GP anaesthetists.'[1]

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Note: Many other references, communications and sources of accounts of events at Pearl Harbor reviewed for this presentation, but not cited, are available on request to the author.


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# From Society to Section: what the ladies said and did

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In Britain in the late nineteenth - early twentieth centuries, women faced prejudice in their efforts to qualify as doctors. The opposition continued after they had qualified when they applied for posts and when they tried to join medical societies.

Elizabeth Garrett Anderson's membership of the Metropolitan Counties Branch of the British Medical Association in 1873 was announced in the *BMJ* and passed without comment, but opposition began when Frances Hoggan joined in 1875. Hoggan's membership was initially accepted but was subsequently declared invalid on a technicality, and pressure was put on Anderson not to attend meetings. After the ban was lifted in 1892, the first woman to be elected, in 1893, was Mary Scharlieb[1] who was subsequently elected as a member of the Society of Anaesthetists in 1895.

The Glasgow Obstetric and Gynaecological Society had admitted ladies in 1893, as had the Forfarshire Medical Association.[2] The Society of Anaesthetists and the Anatomical Society were probably the first London-based specialist societies to admit women to their full memberships in 1894.[3 4] Of more significance than which was the first society to admit women is the fact that in 1893-94, after years of resistance, a number of societies now chose to do so.

The Society of Anaesthetists had been founded in 1893, largely on the initiative of Frederick Silk[5] who worked as an anaesthetist at several London hospitals, especially King's College Hospital where, as anaesthetist and lecturer on anaesthetics, his name was particularly associated with his work to improve education and training in anaesthesia.[6] The original rules of the Society restricted membership to "*Duly qualified Medical Men, holding or having held office as Anaesthetists at a recognised Public Institution*".[3] In June 1893, the Provisional Committee, which had been paving the way towards the

foundation of the Society, received applications for membership from Mrs F May Dickinson Berry, Mrs Caroline Keith and Miss Eveline Cargill. All three held appointments as anaesthetists at hospitals in London and so, apart from their gender, all three met the membership criteria. The secretary was instructed to reply that the Committee was not empowered to decide on the eligibility of ladies for membership and that their applications would have to be referred to a Special General Meeting.[3] In October 1893 Dudley Buxton proposed that the wording in the membership rules be changed from "*duly qualified medical men*" to "*duly qualified medical practitioners*" and the committee agreed to circulate this proposal to all members. On 21st December 1893 the second meeting of Council, which had now replaced the Provisional Committee, received the formal nomination papers for Mrs Berry. These were submitted to the next general meeting and Mrs Berry was elected on 18th January 1894. A retrospective decision was made to include her name and those of six others (all men) in the list of forty 'original' members.[3] Mrs Keith was nominated by Buxton and Berry and she was elected in March 1894 but Miss Cargill, who by this time had resigned her post as assistant anaesthetist at the New Hospital for Women and moved to Cheltenham, was not elected until 1895.[3]

Fifteen ladies joined the Society during its sixteen-year existence. As the Society was being wound up in 1908 Silk wrote of the decision to elect ladies that

> "Some criticisms were evoked, but the course has been fully justified, and ladies have contributed in no slight measure to the success of our meetings."[5]

From this statement it is evident that not all the men were happy about the admission of the ladies. The use of the litotes 'in no slight measure' also introduces a note of ambiguity. So how far were the ladies made welcome and to what extent did they contribute, or were they allowed to contribute, to the activities of the Society?

Between 1898-1899 and 1907-1908, when women constituted 10-12 per cent of the membership, they held three of the 27 (11 per cent) posts as elected members of Council and three of the 18 (17 per cent) posts as Auditors.[7] However no lady ever held the post of President, Vice-President, Honorary

Secretary or Treasurer. This might be attributable to the ladies having, on average, qualified more recently than the men, but during the whole period of the Society's existence no lady ever presented a paper at one of its meetings, though Miss Aldrich Blake and a visitor, Mrs Stanley Boyd, presented very brief case reports in 1900 and Miss Clapham presented a case report in 1904, the year before she joined the Society. Attendance registers from 17th November 1898 to the last meeting on 28th April 1908,[8] during which time ladies accounted for 12 per cent of the membership, show that they accounted for 11 per cent of those attending meetings but only 3.6 per cent of those who joined in the discussion. As these ladies were no wallflowers or shrinking violets, I am therefore inclined to suppose that they were careful not to press their opinions in a Society where not all the men were well disposed towards them.

I turn now to the position of the ladies during the negotiations which took place when the Society was seeking to amalgamate with the Royal Medical and Chirurgical Society and with other societies to form what became the Royal Society of Medicine. Negotiations began in 1905 and it was clear from an early stage that the Amalgamation Committee had decided that ladies could be admitted as members of the proposed specialist Sections of the new society but that they could not be admitted as Fellows. Unlike the Fellows, the members of individual Sections would have no voting rights and would not be eligible to stand for any of the offices in the new Society.[9] Lady members of those societies which, like the Anaesthetists, the Gynaecological, the Obstetrical and the Laryngological, Rhinological and Otological, had by this time given full membership rights to the ladies, were therefore to be disenfranchised by the proposed arrangements. The difficulty arose because Fellows were to have the right to attend the meetings of any Section, even if they were not elected members of that Section. To have elected lady Fellows would, it was argued, have 'inconvenienced' those Sections which did not accept them as members.[9]

In October 1905, the Society of Anaesthetists sent a synopsis of the proposal and a ballot form to all of its members. Replies were received from 56 of the 94 (60 per cent) members. Forty-five of those who replied (80 per cent) were in favour of amalgamation but most (44) expressed one or more reservations.

In particular, 36/56 (64 per cent) wanted ladies to be eligible for the Fellowship.[3] However 36 per cent did not make this a stipulation. At this time there were 11 ladies who were members. They would have had a strong incentive to express an opinion in favour of ladies being eligible for the Fellowship and, if we assume that all or most voted in this way, it follows that at least half of the men who voted did not consider this to be an important stipulation. Clearly there were still some men who had reservations about the presence of ladies within the Society.

The Obstetrical and Gynaecological Societies still appeared firm in representing the rights of their women members. Thus on 6th December 1906 the honorary secretaries of the Obstetrical Society wrote that

> "The Obstetrical Society has, since 1902, opened its doors to qualified medical women, and could not in honour consent to their exclusion from any of the privileges which they at present possess."[9]

Nevertheless the Amalgamation Committee showed no sign of giving any ground whatsoever on this question. On 1st February 1906 Mary Scharlieb, who was not only a member of the Society of Anaesthetists but also a Fellow and Council Member of both the Obstetrical and Gynaecological Societies, wrote to Sir Thomas Smith, an eminent surgeon and former secretary of the Royal Medical and Chirurgical Society[10] who was known to be favourably disposed towards women doctors.[11] She explained that as women were to be excluded from the Fellowship they would only be able to attend the meetings of those sections of which they were elected members, whereas male Fellows could attend meetings of any section. Moreover, women would have no voice in the management of the new Society. She suggested that this was a retrograde step for those women who were currently members of the Obstetrical, Gynaecological and Anaesthetic Societies. She ended her courteous and succinct letter by offering to call upon Sir Thomas if she could provide any clarification or additional information, "but I will not trouble you to give me a personal interview unless you think some good can come of it."[9]

There is no record of Sir Thomas's reply. However Dr. Scharlieb cannot have found it satisfactory because later in February hers is the first of twenty-three signatures, including 10 of the 12 who were members of the Society of Anaesthetists at the time, on a further letter to Sir Thomas. The signatories

recognise "*the injustice of forcing women on Sections which do not desire their presence*." They therefore propose that women be admitted as Fellows but with an interim proviso that

> "women Fellows should not have the right, by reason of their Fellowship, to attend the meetings of those Sections representing Societies which do not admit women members: this limitation to remain in force for each individual Section until altered at the desire of its Members."[9]

This very reasonable proposal was signed by some of the most eminent women practitioners of the day. They included two who were later to become Dames of the British Empire, Mary Scharlieb herself and Dame Louisa Brandreth Aldrich-Blake and names like May Thorne, May Dickinson Berry, Flora Murray and Louisa Garrett Anderson. Sir Thomas's role in the proposed amalgamation has not been discovered but he probably advised the ladies to write to Arthur Latham, the senior of the two secretaries of the Amalgamation Committee because the letters came to rest in the archive of the Royal Medical and Chirurgical Society, as did two letters written by Louisa Garrett Anderson to Latham. The first is a covering letter to accompany what was probably a copy of the letter which the ladies had written to Sir Thomas. In the second letter Garrett Anderson thanks Latham for his prompt reply. Latham's response is not in the folder but Anderson thanks him for the reassurance that the charter of the new society would be drawn up in a way that would not prejudice the future inclusion of ladies in the fellowship.[9] For the present, therefore, their efforts were all to no avail. Of the 23 signatories, ten were members of the Obstetric Society, three were members of the Gynaecological and three were members of both societies and yet both of these societies now appears to have conceded defeat on the issue of women Fellows, only a few months after the Obstetrical Society insisted that it could not "*in honour*" consent to their exclusion from the Fellowship.

In early May 1906 the Amalgamation Committee met with representatives of the Laryngological Society, the Otological Society, the Laryngological, Rhinological and Otological Society and the Society of Anaesthetists.[12] The minutes show that of these four societies only one, the Society of Anaesthetists, still held strong views on the question of women Fellows. The

Society's representatives reported that their members insisted that women be admitted to the Fellowship at once; but they were told once again that, as Fellows could attend the meetings of any Section, to do so would "*inconvenience*" those Sections which did not admit women. So the ladies' own very reasonable compromise proposal appears to have been ignored.

The Amalgamation Committee insisted that those ladies who were members of a Section would have "*the material privilege of joining the Library*" and

> "it was hoped that the increased privileges [unspecified except for the Library] accorded to women under the new scheme would compensate them for not being allowed to become Fellows for the moment, especially as the new Charter would be so drawn as not to prevent their admittance in future."

So the ladies were expected to accept the present proposal with the promise of jam at some unspecified time in the future.

The Amalgamation Committee remained steadfast in its position and, six months later, on 20th November 1906, Joseph Blumfield who was the senior of the two honorary secretaries to the Society of Anaesthetists, wrote on the Society's notepaper to the Secretary of the Amalgamation Committee:

> "I regret to inform you that the above Society, at a small meeting, decided to send no representative in answer to the request contained in the Report of the Organising Committee of the Amalgamation Scheme."[9]

Blumfield was an enthusiastic proponent of amalgamation and his disappointment is evident in his letter which was a rather tortuous way of saying that the Society had rejected the Amalgamation proposal and would not be sending a representative to future meetings. His letter was written five days after the Attendance Register records a Special General Meeting which was attended by ten members. However there is no record of this meeting in the Minutes of the Society and we can only speculate on what may have taken place. The sparse attendance perhaps indicates that many members had assumed that a vote in favour of amalgamation was a foregone conclusion and had not bothered to attend, leaving the opponents to carry the day. The meeting had certainly not been ambushed by a large attendance of ladies because all those present were men and all lived in London.

In the event there were fifteen founding Societies at the inaugural meeting of the Royal Society of Medicine on 14th June 1907.[13] Buxton and, in all likelihood, some other male members of the Society of Anaesthetists had in fact become Fellows of the RSM at its inception in June 1907 by virtue of having been members of other societies which had joined at the outset. Buxton had been nominated by the Council of the Royal Medical and Chirurgical Society as one of the fifteen inaugural members of the Council of the Section of Medicine.[9]

On 27th January 1908, just over a year after the "small meeting" at which the Society of Anaesthetists had voted against amalgamation, Blumfield gave notice of his intention to propose that the Society join the RSM. This he did on 6 March 1908.[3] That there had been continuing contact behind the scenes with the RSM is shown by a letter written on 12th May 1908 by Buxton to John MacAlister, the long serving secretary of the Royal Medical and Chirurgical Society and then of the RSM. Buxton began his letter:

> "I did not answer your letter as I was anxious to see whether I could not induce the Society of Anaesthetists to amalgamate with the R.S.M. . . . This has now been accomplished, and a vote in favour of an amalgamation was taken last Friday [i.e. when Blumfield made his proposal on 6th March] . . . I hope it will be possible to arrange for this on lines similar to those pursued in the case of other Societies."[14]

So although Buxton had been instrumental in changing the Society of Anaesthetists' original rules to permit the admission of women and had nominated Mrs Keith as the second woman member of the Society, he and others were now prepared to accede to terms on joining the RSM which did not include lady Fellows in the foreseeable future.

The last meeting of the Society of Anaesthetists took place on 28th April 1908 and the first meeting of the new Section of Anaesthetics of the Royal Society of Medicine was held on 6th November 1908. Correspondence in the Society of Anaesthetists archive showed that members would have been fully aware that, for the indefinite future, ladies would be admitted as Members of Sections but not as Fellows. The Society asked that, when the Fellowship was opened to ladies, the thirteen existing lady members should be elected as original members without entrance fee.[15]

It was not until late 1909 or early 1910 that the RSM sought the opinions of its Sections on the admission of women Fellows.[9] On 14th January the Council of the RSM resolved to ask its Fellows at the earliest opportunity to agree to women becoming eligible for the Fellowship. In February, fifteen nominations were received from ladies of whom three, FM Dickinson Berry, MAD Scharlieb and M Thorne, were former members of the Society of Anaesthetists. Two more former members, E Bolton and J Turnbull, were nominated in March and one more, LB Aldrich-Blake, in July.[14] Of the thirteen lady members at the time when the Society had been dissolved; six were now Fellows of the RSM. Seven were not. Perhaps they had moved on to other fields of interest or perhaps the snub was still too fresh in the memory. Incidentally, the bye-laws restricting the admission of ladies to the Fellowship were not changed until May 1910, after the first two batches of ladies' nominations had been received.[9]

The first ladies to give papers at the Section of Anaesthetics were Miss AM Browne and Miss JH Turnbull who presented case reports in 1911, three years after the Section had been formed.[16] The first substantive paper by a lady was delivered on 6th December 1912 by Mrs May Dickinson Berry. She had recently visited North America and drew particular attention to the almost exclusive use there of ether, to the lightness of anaesthesia in comparison with British practice and to the use of nurse anaesthetists and interns to give the majority of anaesthetics.[17]

Mrs Dickinson Berry was also the first lady to hold the post of Honorary Secretary, being junior secretary in 1910-11 and senior secretary in 1911-12. The first lady to become President of the Section was Katharine G Lloyd-Williams in 1956-57, 63 years after the Society had been founded.[18] By contrast the first lady to become president of the Scottish Society of Anaesthetists (Dr Winifred Wood) was elected in 1931, seventeen years after that Society had been founded.[a]

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# 'A Munificent Gift' Lord Nuffield's Gift of the Both Respirator to the Empire

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H.C.T.

The biggest stimulus to the development of mechanical apparatus for artificial respiration was poliomyelitis. Epidemics occurred every few years, mostly affecting children hence the name infantile paralysis. The first commercially available tank or cabinet respirator, the 'iron lung' as the popular press were soon to call it, was developed in 1929 by an engineer, Philip Drinker, a paediatrician Charles F. McKhann and physiologist, Louis A. Shaw at Harvard University.[1 2] Drinker was appointed to Harvard School of Public Health to teach commercial illumination and ventilation and the idea came from apparatus he had designed for ventilating cats. This was part of a project to develop a treatment for coal gas poisoning. However, his first patient was an eight-year old girl whom he successfully treated on 12th October 1929. She survived several days before succumbing to pneumonia, the fate of many iron lung patients.

Drinker gave a demonstration of his cabinet respirator in London in 1930. Amongst those attending was Sir Robert Davis, the director of Siebe, Gorman & Co.[3] who were based in Lambeth. The firm were best known for their development and manufacture of mine rescue and deep-sea diving equipment. Sir Robert purchased the respirator that Drinker had bought with him and made arrangements for more to be manufactured by Siebe, Gorman. Over the next few years Sir Robert arranged for the Siebe Gorman respirator to be lent to hospitals free of charge.

In 1937, a severe polio-epidemic struck Australia, with Victoria particularly being badly hit when the epidemic started in June. The Superintendent of the Fairfield Fever Hospital in Melbourne, Dr FVG Scoles, set aside 230 beds for polio victims. At the start of the epidemic, there were a handful of Drinker respirators in the whole country. These had been imported from the USA at

the cost of £2,000 each (£89,000 in today's money) and had to be returned to the USA for servicing, so they were an expensive option. The State of Victoria had two, a Drinker respirator at the Fairfield and the other at the Children's Hospital manufactured by the Acme Vacuum Cleaner Company with the collaboration of a Toronto Hospital.[4] It had been purchased in 1935 by Dame Jean Macnamara, a paediatrician and expert on polio, with the idea that more could be manufactured locally in the event of an epidemic. The power source was a vacuum motor. The Management Committee turned to Professor Aubrey Burstall, an Englishman, who had recently taken up the Chair of Engineering at Melbourne University. He based his machine on the Acme model, improving the fan and the pulsator mechanism. His fan was so powerful it could run up to six respirators. The body of the respirator was made of plywood.[5] Originally, six where constructed. This was later increased to 23. Up to a maximum of 47 patients were treated at one time with patients having to 'hot bed'. A further 36 respirators were distributed to regional centres in Victoria. Of the 1,275 patients treated, most under the age of 14, 140 had respiratory paralysis of which 106 required respirator treatment with a mortality of 35%.[5] Burstall went on to design a jacket. Holes were drilled around a tank respirator then a large number of jackets could be run off one respirator. Burstall was to claim that over 200 of his cabinet respirators were made and used all over Australia. The author can find no evidence of this.

The South Australia Government were later criticised for their lackadaisical attitude to the epidemic. They felt that they could stop the spread of the disease across the state border by restricting the movement of school children on the grounds that they were the vectors of the disease. However the first cases were reported in September and there was a full-blown epidemic by November.[6] The numbers were nowhere as great as Victoria's.[7] At the start of the epidemic, the Metropolitan Fever Hospital had two tank respirators and the Adelaide Children's Hospital one. By May the following year the epidemic had faded. From the 1st November 1937 to the 30 June 1938 there had been 341 cases of infantile paralysis with 21 deaths, (6%.),[8] and 283 patients had been treated at the Metropolitan Fever Hospital. Dr Scoles had given advice on the management of the epidemic. Later several doctors from the Metropolitan visited the Fairfield to examine the facilities being used to handle such a large number of cases.[9]

The shortage of respirators soon became apparent and the Hospital Board obtained permission from the South Australian Government to have some manufactured locally[8] and they approached a small local company, Both Equipment Ltd. This company had been founded in the early 1930's by Edward T Both and his wife to develop and manufacture both scientific and medical equipment for Adelaide University.[10] They were later joined by Edward's younger brother, Donald. The Company rapidly produced a cheap and reliable respirator made from plywood and driven by a bellows-type pump. Working day and night with the help of some young volunteers, they produced six machines to cope with the needs of the Metropolitan Fever Hospital. Later, three more were made and distributed to Mount Gambier, Port Lincoln and Port Pirie.[8] In 1938, Edward Both and his wife sailed for England on a world trip to sell his portable ECG machine. By April, they were living in a rented flat in Maida Vale.

The same fluctuating pattern of polio epidemics was being seen all over the world with the United Kingdom being no exception. There was a particularly severe epidemic in 1938. The population of the United Kingdom was 41.5 million and around 4,500 cases where reported of which less than one percent would suffer respiratory failure. At the start of the epidemic there were very few tank respirators and slightly more Bragg-Paul belts.[11] This was a compression belt originally designed in 1935 by Sir William Bragg, Nobel Laureate for physics, for a friend with progressive muscular dystrophy. The idea was taken up and improved by an engineer, RW Paul,[12] using an electric motor to drive the respirator. It has been suggested that there may have been as few as five tank respirators in the entire country but this seems unlikely. Starting in January 1938, the national and regional press had numerous articles on charitable donations for individual hospitals to purchase their own respirators. Some of these were single donations from local benefactors or manufacturing firms. Then there were charity events, darts matches, cricket matches and dances.

On the 8th July 1938, the BBC put out a national appeal for an 'iron lung' or 'Bragg-Paul belt' to help a nine-year old boy in the Ipswich and West Suffolk Hospital.[13] He was being kept alive by a team of seven doctors and six porters carrying out artificial respiration. Unfortunately, he died shortly before the

arrival of an iron lung accompanied by two doctors from the London Hospital.

Six days later Mr Harry Day, the Labour MP for Southwark Central rose and asked the Minister of Health, Mr Walter Elliot, a Unionist representing Glasgow Kelvingrove, whether his attention had been drawn to the appeal broadcast by the BBC on 8th July for a Bragg-Paul Belt or an 'iron lung' to save the life of a boy.[14] One was not found in time and the boy died. Would the Government be prepared to fund the setting up of several centres in Great Britain where these machines could be obtained at short notice? Mr. Elliot replied

> "I am aware of the incident referred to and regret that a respirator could not be found in this case. A certain numbers of respirators are already available at hospital centres and my medical officers in their visits of inspection are prepared to advise local authorities on the question of providing them in suitable centres."

Another person who heard the appeal was Edward Both in his rented flat in Maida Vale. In an interview with his wife, printed in the Australian Women's Weekly in August 1941, she said that her husband had immediately started construction of one of his cabinet respirators using clamps and chairs in the flat.[15] He contacted Sir Charles McCann, who at the time held the two posts of Trade Commissioner and Agent General for South Australia. He suggested that Both contacted the London County Council's Medical Service whose Medical Director was Sir Frederick Menzies. His obituary described him as the greatest medical administrator this Country has ever had.[16] The author does not believe that he knew about Both, or if he did, he left it to his Medical Officers.

London was ringed by seven fever hospitals set up by the Metropolitan Asylums Board in the 1870's to deal with the outbreaks of smallpox. They were taken over by the London County Council (LCC) in 1930 when polio had become the main threat. It is almost certain that Both ended up meeting Dr Andrew Topping the Medical Superintendent of the South Eastern Convalescent and Fever Hospital at Dartford. Both was asked to make a respirator for the LCC to trial. He hired a small garage in North London to do this. The trial was so successful he was asked to make more and soon demand came from around the country.

Around this time, Professor Robert Macintosh was asked to give a lecture on artificial respiration.[17] He thought it would be more interesting for the audience if he showed a film of all the available machines for artificial respiration that were available at the time. He instructed Dr CLG Pratt, a physiologist and Richard Salt, the senior technician in the anaesthetic workshop, to make this film. Pratt was a physiologist attached to the Oxford Anaesthetic Department. He had come from the Oxford Physiology Department because most of the anaesthetic research at the time involved animal experiments and the department did not have its own facilities. Pratt and Salt designed and built the necessary apparatus for the animal experiments. Macintosh told Topping about his intention to make a film and Topping introduced Macintosh to Robert Both at the LCC's Western Fever Hospital. Macintosh commented that Dr. Topping was very modest about his knowledge and experience of artificial ventilation.

In the first week in November, the Medical Research Council (MRC) received a letter from the Minister dated 2 November[21] in which it was suggested that an investigation into the relative merits of positive and negative methods of artificial respiration might be a suitable subject for the MRC. The MRC moved swiftly and set up a Committee and within a few weeks the Respirators (Polio-myelitis) Committee had been formed with Professor LJ Witts, the Nuffield Professor of Medicine, as chairman. Members included Professor RG Girdlestone, Dr PM Tookey-Kerridge, Dr RG Henderson, Dr Norman F Smith, Dr CLG Pratt, Dr Andrew Topping and Mr Edgar Schuster.

They had hardly time to have their first meeting before the whole direction of the Committee was changed.[24]

In October 1938, on one of Lord Nuffield's regular tours of inspection of the units that he funded, he was shown the film on mechanical artificial respiration by Pratt that had stimulated his interest.[18] Not long after, Lord Nuffield was interviewed in the Times in which he announced that he would give an 'iron lung' to every hospital in the Empire who requested one. The estimated cost of production was £98 each (£4,200 in today's money). He planned to make about 5,000 and the work had already started at the Car Works in Cowley, Oxford, he intended to give a total of £50,000 (approximately 20 million pounds in today's money) to the project. He

realised then that the use of artificial respiration extended way beyond the treatment of infantile paralysis. However, successful treatment depended on rapid access to a respirator. Production was already underway with the plan to start with a 1,000 that should be ready within the next three months. Manufacture will continue until every hospital in the Empire that requests one had one. He realised that the demand for the respirator will be greatest during epidemics and for a lot of the time the respirator would be lying idle. The hospitals must realise that it may be required at a moment's notice.

The respirator to be produced was Mr Both's model that had been made for the South Australian polio epidemic. The medical officers of the LCC had already received it enthusiastically. A local company, Messrs D and J Fowler who now had offices in London, had made the respirator in Adelaide. They collaborated with Lord Nuffield on the building of the respirator. The Both Respirator was made of plywood and driven by a ¼ hp electric motor driving a bellows unit. It could be worked manually. Hospitals wanting a respirator should apply with a simple application addressed 'Respirator' The Nuffield Institute of Medical Research, Oxford. Messrs Fowler will be asked to set up a maintenance program costing £1.0.0 per year.

Both went on to America around the turn of the year arriving back in Australia in March 1939 and was heralded with the name given to him by the American Press as the 'Edison of Australia'.[25] Over the next decades he went on to invent a wide range of apparatus and machinery. These included

1. Instruments for the production and testing of armaments including an electromicrometer and electro-crack detector used to check the bore of a gun for flaws,
2. Cloth-cutting machines for army uniforms,
3. Three-wheeled battery-operated vehicles,
4. Development of guided torpedoes,
5. The 'visitel', an instrument that could transmit designs or drawings over long distances by wire or radio being a forerunner of the facsimile machine,
6. An electric tennis scoreboard for use at the Davis Cup competition in Adelaide in 1952 when Australia defeated the U.S.A. 4-1 and in the Melbourne Olympics four years later, an automatic pen recorder,

7. The 'Humidicrib',
8. Foetal heart monitors,
9. Blood-drying apparatus
10. Nail detector for preventing damage to saw blades in reclaimed timber,
12. Ultra-centrifuge[26]

Both died in 1987.

**Biographical notes on the Members of the Respirators (Poliomyelitis) Committee.**

Professor LJ Witts (Chairman), the Nuffield Professor of Medicine, University of Oxford.

Professor RG Girdlestone, the Nuffield Professor of Orthopaedics, University of Oxford.

Dr PM Tookey-Kerridge, a lecturer in physiology and biochemistry at University College, London whose main research interest was the development of apparatus to help deaf children speak.

Dr RG Henderson, Principal Assistant Medical Officer at County Hall, where he ran the clinical laboratory for the LCC. He had come down from Scotland in 1935 to take the position of Deputy Medical Superintendent at Park Fever Hospital, Hither Green, one of the LCC's fever hospitals. He had visited Drinker's Department in 1932 when the Senior Resident at Aberdeen City Hospital. On his return, he had constructed an 'iron lung' with the help of John Mitchell, the City Hospital Engineer. Four weeks after completion on the 1st August 1933 he treated his first case successfully.[20]

Dr Norman F Smith (Secretary), Medical Officer of Health at the Ministry of Health.

Dr CLG Pratt, physiologist attached to the Department of Anaesthetics, University of Oxford to assist with the experimental animal-work.

Dr Andrew Topping, Medical Superintendent of the South Eastern Convalescent and Fever Hospital at Dartford.

Mr Edgar Schuster. His scientific career started with first-class honours in natural sciences at Oxford. His first research post was linked to the science of

eugenics. At the outbreak of World War 1 he was commissioned into the Royal Garrison Artillery. He served in France and Salonika. He was seconded by the army to the Medical Research Committee, the predecessor of the Medical Research Council. This was based at National Institute for Medical Research at the Maida Vale Hospital. Here his interest in biomechanics 'blossomed'. He published twelve papers on various types of apparatus; including a pump for sampling expired gases[21]. This work was carried out at the suggestion of Dr Lovatt Evans.[A] He then worked with HH Dale,[B] building the Dale-Schuster pump, an early type of cardiovascular bypass pump.[22] He left the Medical Research Council and moved to Oxford. Here he continued to develop medical apparatus in a shed in his garden. His only demand was that the University Department paid for the raw materials for the work that he had undertaken. This generosity may have been due to the fact that his father was an eminent banker. After the Second World War, he helped with the development of the first Radcliffe positive-pressure ventilator.[23]

In the second part of this paper, the author intends to describe the not always favourable reception for Lord Nuffield's gift and the Respirators Committee Report.

A Later Professor Sir Charles Lovatt Evans.
B Later Professor Sir Henry Dale, Nobel Prize Winner.

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# Sir Frederic Hewitt, Appendicitis and Edward VII

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This paper is presented because there is no record in the *Proceedings of the History of Anaesthesia Society* about the life of Sir Frederic Hewitt, apart from the article in Volume 16 of the *Proceedings* by the late Douglas Howat.[1]

Figure 1. Sir Frederick Hewitt

Sir Frederic Hewitt was one of the most famous anaesthetists of the late Victorian and Edwardian eras. He probably did more for anaesthesia at that time than any one else. He was also famous for administering an anaesthetic to Edward VII (1841-1910)[2] who had an appendix abscess and was operated upon by Sir Frederic Treves (1853-1923).[3-5]

## Edward VII and his abdominal pain

Numerous doctors had been consulted about the King's abdominal pain and discomfort, which had started on 13th June 1902, and it was 12 days before the King was due to be crowned in Westminster Abbey on 26 June 1902, Queen Victoria having died on 22 January in 1901.

## The Doctors

Sir Alfred Fripp (1865-1930) Surgeon in Ordinary to Edward VII was the first doctor to be notified but was not called into consultation. He was not well-liked by his colleagues, because his appointment as Surgeon-in-Ordinary to the King was the same day as the President of the Royal College of Surgeons was appointed to a similar position, so Sir Alfred Fripp had very few friends among his colleagues in the world of London consultant surgeons.[2]

First of all the doctors to be consulted was the King's Physician in Ordinary, Sir Francis Laking (1847-1914) who diagnosed appendicitis, then known as perityphlitis.

Laking then consulted the senior physician to His Majesty, Sir Thomas Barlow (1845-1945) of University College Hospital and then Sir Frederic Treves, the famous surgeon and Serjeant-Surgeon to the King (1853-1923).[2 3]

Before a final decision to operate was made, Lord Lister (1827-1912), and Sir Thomas Smith, formerly senior surgeon to St Bartholomew's Hospital (1833-1909) were consulted. They were both Serjeant–Surgeons to the King but Lister was aged 75 and Smith aged 70. [2 3]

**Pre-operative problems**

The King did not want to have an operation saying that he must keep faith with his people and would go to Westminster Abbey to be crowned He was eventually persuaded by Sir Frederick Treves who famously said, "*Then, Sir, you will go in your coffin.*"[2] Ellis stated that Sir Frederick said, "*Then, Sir, you will go as a corpse.*"[3] After this the King agreed to have the operation.

**The Operation**

The King walked into the room prepared as an operating theatre by Nurse Haines wearing his oldest scruffiest dressing gown, much to the shame of Queen Alexandra, who was known for being very particular as to what she wore.[4 6] Nurse Haines had set all the instruments required for the operation on a billiard table. The King then laid himself down on the table as Dr Hewitt (as he then was) prepared his anaesthetic equipment.

**The King was not a good anaesthetic risk.**[2] He was elderly, (he was 60, not elderly by the standards of today). He had chronic bronchitis, exacerbated by smoking before breakfast at least two cigarettes and one cigar and by dinnertime he had smoked 20 more cigarettes as well as 10-12 very pungent cigars. He was overweight (obese) having an enormous appetite, a gourmand and a gourmet (Dinner at 8.30 p.m. usually consisted of 12 courses) and a liking for too much alcohol.[7 8]

There was real difficulty with the anaesthetic. Hewitt began to induce anaesthesia with a mixture of two parts chloroform, three parts ether, using a Skinner's open mask, changing to a Rendle's closed mask after a couple of minutes.[9]

During the induction of anaesthesia, the King threw his arms about and became blue and purple in the face. Fortunately the King had a beard. This

was grasped and pulled forwards together with his mandible by Dr Hewitt and the King began to breathe again.[2] An example of the jaw thrust, a common occurrence with ether, but not with chloroform.

Queen Alexandra was present at the same time and throughout the induction of anaesthesia, but Sir Frederick Treves was not inclined to proceed with the operation while she was present and did not like to take off his coat, roll up his sleeves and put on an apron. He eventually persuaded Queen Alexandra to wait in an adjoining room with her son, Prince George, and two daughters.[4]

Treves was then able to proceed with the operation, made an incision in the right iliac fossa and pus was found at a depth of four and a half inches.[6 7]

The operation was a success and when the King woke up, after the effects of the chloroform??? had worn off. Typical surgeons' idea. His first words were "*Where is Georgie?*" (i.e. Prince George. Later George V).[4] The next day he was sitting up in bed and smoking a cigar.[2]

After a period of convalescence the king was eventually crowned in Westminster Abbey on 9th August 1902.[2]

In the Honours list, published shortly after the Coronation, both Treves and Laking were created Baronets, Lister was made a Companion of Honour, but Dr Hewitt was made an MVO, (Member of the Royal Victorian Order).[3 9]

**The life of Frederic William Hewitt**

He was born in London in 1857, the eldest son of George Hewitt, an agricultural chemist, and Elizabeth Hewitt. He was educated at Merchant Taylors' School from 1869-1974 and then went to The Royal School of Mines for two years and subsequently won a scholarship to Christ's College in Cambridge, where he was very popular and contributed to the college life. He then became a medical student at St George's Hospital where he won prizes for both medicine and surgery. He qualified in 1882 with the Conjoint Diploma of MRCS, LRCP and graduated in 1883 with the Cambridge Degree of MB, BChir and was awarded the MD in 1886.[10]

His original intention was to practice in London as a physician, and join a colleague, Marmaduke Sheilds who was a surgeon, in rooms at Portman Square, but an eye defect which had begun to trouble during his second year at Cambridge, probably some type of retinopathy, became much worse, and so he decided to take up anaesthetics.[10]

**Appointments**

Appointments soon followed. He was appointed anaesthetist at Charing Cross Hospital in 1884, some two years after qualification, to the Dental Hospital (later the Royal Dental Hospital) in 1885 and to the London Hospital in 1886.

Hewitt rapidly became known as an outstanding anaesthetist and teacher, writing many papers, and delivering many lectures on improving apparatus and techniques in anaesthesia. [9]

**Publications**

Hewitt's first paper was published in *The Lancet* in 1885;[11] it was the first of many describing apparatus for the safe administration of nitrous oxide anaesthesia and he demonstrated by detailed experiments the value of combining it with oxygen. There were numerous other papers and lectures.

**He published three textbooks**

1. *Select Methods in the Administration of Nitrous oxide and Ether* in 1888.
2. *Anaesthetics and their administration*. The first edition was published in 1893. Of the second edition in 1901, I have a copy.[12] When I was a registrar at the London Hospital from 1954-1956, (now the Royal London), in the full–duty room for anaesthetists there was a copy of "*Anaesthetics, and their administration*", which had belonged to Ashley Daly, a consultant anaesthetist to the London Hospital, Brigadier in the RAMC and adviser in anaesthetics to the army. This book was never opened or used so somehow it came into my possession. This was 60 years ago and nobody has noticed!

   This was the second comprehensive textbook of its kind, the first being Dudley Buxton's "*Anaesthetics, their uses and administration*" which was published in 1888. The textbook became popular, and was published until 1922, six years after Frederic Hewitt's death, the fifth edition being edited then by Henry Robinson. Hewitt's textbook was essentially a practical handbook for medical students and doctors. The second edition published in 1901, that I have, contained additional chapters on the history, physiology and theory of anaesthesia.

3. *The Administration of Nitrous Oxide and Oxygen for Dental Operations*, 1897.

**Modifications of and design of New Equipment**

The most important were

1. Modifications to Clover's portable regulating ether inhaler
2 The oral airway. The publication of Sir Frederic W. Hewitt's description of his artificial airway was in 1908. Hewitt's airway was the first known oral airway and laid the foundations for the numerous other airways that were later developed. Oral airways made anaesthesia safer and significantly reduced the trauma associated with earlier attempts at managing the obstructed airway.[13]

Figure 2. Hewitt Airway.[13]

**Further Honours**

In 1901 he was appointed anaesthetist to Edward VII and knighted by George V in 1911 for his services to Medicine.[10]

**Conclusion**

He is commemorated by a lectureship at the Faculty of Anaesthetists in the Royal College of Surgeons, the first lecture being given by Dr George Edwards in 1950. Since 1991 the lectures have been held by the Royal College of Anaesthetists.

Frederic Hewitt's work was one of the major factors together with Dudley Buxton and Frederick Silk in establishing anaesthesia as a subject requiring the full attention of specially trained medical men and women.[14]

He died in Brighton of cancer of the stomach in 1916 and was buried in Brighton and Preston Cemetery. The History of Anaesthesia Society paid for the restoration of his grave and stone.

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# The Development of Echocardiography in Clinical Assessment

**Robert Pring**

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The origins of clinical echocardiography date back to the 1950s and are credited to Carl Helmuth Hertz and Inge Edler. Edler was a cardiologist working in Malmö, Sweden, and Hertz had been involved with the development of RADAR and non-destructive ultrasound during the Second World War.[1]

During the assessment of patients with mitral stenosis using the time motion or M-mode approach, Edler, known as the '*Father of Echocardiography*', identified a moving signal with cardiac motion approximately 6-8 cm from the anterior wall of the chest and 2-3 cm from the rear wall of the heart, and the first recognised transthoracic image obtained from echocardiography was produced on 29th October 1953.[1-3]

According to Acierno and Worrell[4] many of the early echocardiography examinations were conducted on dying patients. Upon completion of the exam, Edler marked the direction of the ultrasound beam on the patient's chest. After the patient died, he would pass an ice pick into the chest in the same direction the beam had been directed during the exam. On post-mortem examination of the patient, he found that the anterior leaflet of the mitral valve had been transected by the ice pick and not necessarily the anterior wall of the left atrium. These findings were backed up by Edler's experiments on calf hearts.[2]

The first method of assessing left ventricular function and measuring the ejection fraction was derived from using M-mode. This is called the Teicholz method and references the shortening fraction, is now widely seen to be inaccurate in patients with regional wall motion abnormalities.[5 6]

An M-mode echocardiogram was not a "picture" of the heart: it was a diagram that showed how the position of its structures changed during the course of the cardiac cycle. In the early 1970s, Reggie Eggleton put a Sunbeam electronic toothbrush to an innovative use and gave the world its first

commercially successful two-dimensional echocardiogram, which enabled the visualization of actual images of the heart.[2]

Eidem and colleagues[5] highlighted, that using the two-dimensional imaging made available by the ultrasound development attributed to Eggleton, quantitative left ventricular ejection fraction (LVEF) assessment was greatly improved. Previously obtained assessments were more often determined in a qualitative fashion or by using the Teicholz method, but now assessment of changes in ventricular volume during the cardiac cycle was possible.

The geometric model most commonly used to measure LVEF is the modified Simpson's biplane method. By using the apical four -chamber and two-chamber views of the left ventricle (LV), this geometrical model calculates LV end-diastolic and LV end-systolic volume.[5 6]

Christian Doppler (an Austrian professor of mathematics and geometry) was the first who examined the effect of the observer's motion relative to the source of an ultrasound wave, known as the Doppler effect.[1 7] Regardless of the development of Doppler echocardiography from the early 1950s, the major discovery in Doppler ultrasound in 1970s was its success in quantifying pressure drops across valvular stenosis (Goldberg et al., 1985).

In the early 1980s, colour-flow imaging was developed based on the Doppler concept to visualize blood flow non-invasively. Doppler remains a quantitative clinical diagnosis technique and has been the main clinical modality for non-invasive assessment of diastolic filling patterns.[1 7]

The next significant development in echocardiography is that of contrast imaging.[1] It is especially useful for evaluating intra-cardiac shunts. Initially, it was done by injecting agitated blood and saline through a peripheral vein because microbubbles are smaller than saline bubbles and they cross the pulmonary capillaries, but the inability to control the intensity of the contrast effect was the major problem of this technique. This problem was solved by the development of stable contrast agents that were suitable for opacifying the right-sided cardiac chambers and improving left ventricular endocardial border definition, as well as the image quality in patients with poor image views.[1 6]

According to Chambers[8] there is always a trade-off between attenuation and resolution. Lower frequency transducers, as required for transthoracic imaging, have good penetration, but relatively poor resolution. The transoesophageal (TOE) approach has the advantage that the oesophagus is

separated from the base of the heart and aorta by at most 0.5 cm of tissue. This means that attenuation of ultrasound is small and a relatively high frequency transducer can be used, mounted on a modified gastroscope.

The first experimental probes with the potential utility for TOE were established in the 1970s. It was first performed in 1980 by putting a two-dimensional transducer on a fibreoptic endoscope. After that, a phased-array ultrasound transducer was attached to the tip of a flexible gastroscope and TOE entered its modern era[1]

TOE continues to be the preferred method of assessment in patients with endocarditis, congenital disease, transient ischaemic attack/stroke/peripheral embolism, mechanical mitral valves as well as for the critically ill patient and those requiring intraoperative cardiac function assessments.[8]

Maleki and Esmaeilzadeh[1] mention that the idea of three-dimensional (3-D) echocardiography began to develop in the 1960s, however, the first 3-D scans of the heart were reported in 1974. These early 3-D echocardiograms were obtained using the reconstruction technique where ECG gated images are obtained from varying transducer locations of definite positions and using different software programs, each image is located into its proper three dimensional spatial positions in cardiac cycle, and then using specific image processing techniques the structure can be reconstructed as a 3-D object.

Because 3-D echocardiography can be used to evaluate cardiac structure geometry in multiple spatial planes, accurate assessment of changes in right ventricular volume during the cardiac cycle and in complex congenital heart disease is now possible.[1 5]

The advantages of 3D echocardiography over 2D echocardiography include improvements in visualization of complex shapes and relations between cardiac structures, calculation of cardiac volumes, mass, and function, imagination of colour Doppler flow fields, and assessment of valvular abnormalities and dysfunctions.[1]

In summary, it's worth noting that in 60 years cardiac assessment has gone from trying to guess what structures are being imaged to not only identifying structures but analysing and providing detailed reports on haemodynamic and structural function. Although there are significant advancements in the quality of image acquisition and transducer configurations, in order to produce accurate quantitative reports the sonographer must be highly skilled in operating the various modes of echocardiographic assessment.

Anaesthetists are recognising the need to be echo proficient and there has been an increase in BSE (British Society of Echocardiography) accredited anaesthetists throughout the United Kingdom, especially as high-risk anaesthetic patients need greater assessment.

The most recent evidence of a technological advancement in echocardiography is the study held in North Western India at a sight of pilgrimage called Sirsa on 9th March 2012. A project run by the American Society of Echocardiography (ASE) helped expedite care in impoverished, underserved communities. Images of 1,040 pilgrims were uploaded by 'cloud' and were reported on in five countries by 75 cardiologists with all reports received by the ASE sonographers within eight hours.[9]

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# How Illness in World Leaders has affected History – Anaesthetic and Medical Considerations

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My paper considers how illness in World Leaders has affected history, although I will concentrate on the medical and anaesthetic considerations. My information comes from the internet as well as books by Jerrold Post[1], Dr David Owens[2], Dr Bert Park[3] and Dr Hugh l'Etang[4].

**Grover Cleveland 1837-1908**

President Cleveland was the only President of the United States to serve two non-consecutive terms from 1885-1889 and 1893-1897. In 1893, he complained of some soreness of the roof of his mouth but it was a critical time economically with his fight to maintain the gold standard and he could not afford to show any signs of weakness. The operation to remove a verrucous carcinoma was carried out on a chair fastened to the yacht, Oneida, in New York Harbour, under general anaesthesia and required the removal of part of his upper jaw and hard palate. He received a dental prosthesis enabling him to speak properly without a change in appearance. When the story leaked, it was strenuously denied.

**King Edward VII**

King Edward VII had an appendicectomy on 24th June 1902 at Buckingham Palace. He was 59 years old, bearded, a smoker with obstructive sleep apnoea. The anaesthetist was Sir Frederick Hewitt and the surgeon Sir Frederick Treves, both being knighted before the operation. The story is that before the operation the surgeon was given lunch at the palace and the anaesthetist had to go off and find himself a sandwich, "*plus ça change, plus c'est la même chose*". Ether was administered and the king turned purple whereupon Sir Frederick Hewitt grasped his beard, tugged it and the obstruction was relieved. The operation was a success. *(Editor's Note: see Dr. Horton's paper; page 116)*

**King George VI**

On 23rd September 1951 King George VI had a pneumonectomy at Buckingham Palace. Clement Thomas was the surgeon and Robert Machray was the anaesthetist assisted by Cyril Scurr who had to attach a wire between the oscilloscope and a cold-water tap in an adjoining room. He survived the operation but died five months later.

**Sir Anthony Eden**

Until 12th April 1953, Sir Anthony had lived a charmed life, but then his luck ran out. Unlike two of his brothers, he survived World War I. He was charming and handsome and much admired by the ladies. He even had a hat named after him and he had been a successful foreign secretary.

On 12th April 1953, Basil Hume, a 60 year-old surgeon, performed gall bladder surgery on him. He was Eden's own choice, against others advice, because he had previously removed Eden's appendix successfully.

Hume was not an expert at biliary surgery and had to delay the operation for an hour while he composed himself.

The three-hour operation was a disaster; Eden's common bile duct was damaged and his health was permanently ruined. Had it not been for this botched procedure, he would probably have become Prime Minister in June 1953 after Churchill had had a severe stroke. He underwent many subsequent operations, three being in the USA. He was often taking a combination of amphetamines and barbiturates. He was taking these drugs during the Suez crisis of 1956 but also had a fever of 106 degrees Fahrenheit due to cholangitis. This probably affected his judgement.

**Bipolar Disorder**

Bipolar disorder was originally called manic-depressive psychosis. It is a mental disorder characterised by periods of elevated mood (hypomania) and periods of depression. A more minor variant is known as cyclothymic personality disorder. World leaders with bipolar disorder include Winston Churchill, Abraham Lincoln, Teddy Roosevelt and Lyndon Baines Johnson.

**Sir Winston Churchill**

Churchill was prime minister from 1940 to 1945 and 1951 to 1955. He was a moderate to heavy drinker and smoker. He suffered with bipolar disorder and would avoid edges of platforms in case he jumped impulsively into the path of a train. In 1931, forgetting that in the USA, they drive on the right he was hit by a taxi in New York City.

His hypomania together with his powers of oratory enabled Britain to stay in the war during the dark days of 1940. Probably a saner prime minister like Halifax would have given in. To Churchill, America and FDR was the key to survival, and Churchill had the advantage of an American mother. Churchill's sinking of the French Fleet at Mers el Kebir in July 1940 made Roosevelt realise that Britain wasn't going to surrender, and he agreed to lendlease which before the sinkings he had refused. Churchill's great fear was the U boat sinking of British shipping starving Britain into submission. Lendlease, the convoy system, Bletchley Park and Pearl Harbour saved Britain. In December 1941 shortly after Pearl Harbour (which gave him his first decent night's sleep since becoming prime minister because he knew Britain was safe). He probably had a heart attack in the White House.

He had a severe stroke in June 1953 which affected his speech and walking ability. Anthony Eden, the heir apparent, was sick after his gall bladder operation in April 1953. The public was told that Churchill was suffering from exhaustion.

He had a mild stroke in December 1956, and a severe stroke in January 1965 from which he subsequently died.

**Narcissistic Personality Disorder (NPD)**

Narcissistic personality disorder is defined as an excessive preoccupation with power, prestige and vanity. Those affected are unable to see the damage done to themselves and others. They have exaggerated feelings of self-importance, a sense of entitlement, and a lack of empathy. It affects one percent of the population and was formerly known as megalomania.

Sufferers included the three men who were responsible for the most number of unnatural deaths in history. In order of deaths, Mao Tse Tung, Stalin and Hitler. Napoleon also had narcissistic personality and Putin probably has it.

**Vladimir Putin**

Mr Putin was born in Leningrad in 1952 when both his parents were 41. They were survivors of the 872-day siege of Leningrad, in which up to two million people died and in all of history is unequalled in terms of the resistance and refusal of the Russian people to surrender. Both his elder brothers died. He had a very difficult upbringing in conditions of hardship, unimaginable to westerners. NPD often has roots in childhood where family life is marked by trauma and emotional chaos. This may account for his narcissistic personality disorder and bullying personality.

**Hilary Clinton**

Hilary Clinton had a life-threatening cerebral venous sinus thrombosis (CVST) following a fall whilst secretary of state. She previously had had a deep vein thrombosis. She is probably thrombophilic and probably on warfarin or rivaroxaban. Should she run for the presidency?

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# Books on Anaesthesia, Resuscitation and Pain 1901-50

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I have compiled a bibliography of over 650 books and pamphlets on anaesthesia, resuscitation and pain for the half-century 1901-1950. This is a sequel to my bibliography of books and pamphlets on anaesthesia 1847-1900, which I produced in 2002,[1] and have continued to update. Books on resuscitation and pain were rare in the nineteenth century, but gathered momentum in the first half of the twentieth century – hence the expanded title.

The format (as before) is Microsoft Access, which enables the user to generate a choice of reports from the table. I have listed the items in chronological order with the authors of each year in alphabetical order. There is a designated column for the holdings in the Association of Anaesthetists of Great Britain and Ireland (AAGBI) Library, the Wellcome Library and the British Library. The Oxford Radcliffe and the Royal College of Anaesthetists libraries (which were listed previously) [1] have too few holdings for 1901-50 to warrant inclusion. There is a fourth column for the holdings of 'other libraries': the Oxford Nuffield Division of Anaesthetics, the Oxford Radcliffe, the National Library of Medicine in Washington, the Wood Library-Museum (now in Schaumburg, Illinois), the Woodward Library at the University of British Columbia, Vancouver and a few other libraries.

Foremost in the sources of data has again been the facsimile of Rosemary Faraday's *Bibliography of Anaesthesia 1846-1950* (thesis for FLA at the Nuffield Department of Anaesthesia, University of Oxford in 1966).[2] The necessary painstaking scrutiny of this commendable work did reveal several errors! Other sources have included the references in numerous textbooks and the library catalogues of the Wellcome Trust,[3] the Association of Anaesthetists of Great Britain and Ireland (AAGBI) and the British Library.[4]

In an attempt to be concise, I have excluded (as a dedicated row) subsequent printings which were *not* new editions. I also excluded catalogues of surgical

instruments and manufacturer's product leaflets, dissertations and reprints of *Journal* articles, unless for a landmark paper where reprints were widely circulated.

The period 1901-1950 was important in the history of anaesthesia. It saw major advances in anaesthesia, resuscitation and pain management, many stimulated through the necessities of two World Wars. Also in this period anaesthesiology became established as a medical specialty.

Notable in the bibliography are the many series of famous textbooks. Some of these were begun before 1901, e.g.

Sir Frederick W Hewitt's *Anæsthetics and their administration* began in 1893, with a second edition in 1901 and ran to a fifth edition in 1922;

Dudley Buxton's *Anæsthetics, their uses and administration* began in 1888, with a fourth edition in 1907 and ran to a sixth edition in 1920.

However, the majority of these notable series began in the period 1901-50. First, the London anaesthetist Dr Joseph Blumfield produced *Anæsthetics: a practical handbook* in 1902; it ran to four editions.

Also in 1902 the Edinburgh anaesthetist, Thomas Davey Luke published *A Pocket Guide to Anæsthetics for the Student and General Practitioner*, which ran to four editions. Luke also produced *Anæsthesia in Dental Surgery* in 1903; the third edition was co-authored with JS Ross, who really produced the fifth edition in 1924 as Luke died in 1922.[5]

Heinrich Braun, a surgeon in Leipzig was the man who improved local anaesthesia by adding adrenaline to cocaine (1902) and pioneered procaine (1905). Furthermore in 1905 he produced the classic *Die Lokalanästhesie* which had ran to eight editions by 1933; it was translated into English (by P Shields) from the third edition in 1914. From 1919 it was titled *Die ortliche Betaubung*; from 1933 (the year before Braun's death) the book was edited by Arthur Läwen.[6] The counterpart of Braun's book for dentistry was produced by Guido Fischer, a German dentist. He published *Die lokale Anästhesie in der Zahnheilkunde* in 1910; it ran to eight editions, being translated into English from 1912 (second edition) as *Local Anæsthesia in Dentistry*. From 1920 it was titled *Die ortliche Betaubung* – exactly the same title as for H Braun's book! This is just one example of the pitfalls to look out for.

In 1916 Paluel Joseph Flagg of St Vincent's Hospital, New York published *The Art of Anaesthesia*, which ran to seven editions.

J Stuart Ross, the Edinburgh anaesthetist who had co-authored with Luke, produced *Handbook of Anæsthetics* in 1919. He was joined by Harry Prescott Fairlie, a Glasgow anaesthetist, as co-author for the third edition in 1929 and fourth edition in 1935. The book was continued with a different title and authors for editions five to seven.

Christopher Langton Hewer was a notable anaesthetist at St Bartholomew's Hospital, London. In 1932 he launched *Recent Advances in Anæsthesia and Analgesia*, which ran to a sixth edition by 1948. This series is still running (now titled *Recent Advances in Anaesthesia and Intensive Care*).

Robert Reynolds Macintosh, the first British Professor of Anaesthesia (Nuffield Chair at Oxford) published with FB Pratt (later Bannister) *Essentials of General Anæsthesia* in 1940; it ran to a fourth edition in 1947.

To get back to Ross & Fairlie's handbook, this was continued as the fifth edition in 1940 by Robert James Minnitt of Liverpool. He was joined by John Gillies of Edinburgh for the sixth edition entitled *Textbook of Anaesthetics* in 1944, with a seventh edition in 1948.

Finally I must mention J Alfred Lee's *A Synopsis of Anæsthesia* which was launched in 1947, the year in which Lee was appointed a Consultant Anaesthetist at Southend Hospital.[7] The first Chapter was on the History of Anaesthesia. A second edition came in 1950 and the series continued the section on History of Anaesthesia; hence I believe this very popular series engendered interest in the history of anaesthesia. Later Lee was joined by a co-author Dick Atkinson (both became Presidents of the History of Anaesthesia Society). Atkinson was then joined by co-authors Rushman and Davies. The series is still running – the 2005 edition titled *Lee's Synopsis of Anaesthesia* was co-authored by N Davies and J Cashman – unfortunately the history section has been removed.

The expansion of the bibliography behoves me to remark on landmark books on pain. Notably the Welsh cardiologist, Sir Thomas Lewis published *Pain* in 1942. The following year the American neuroscientist, William Kenneth Livingston produced *Pain Mechanisms; a physiological interpretation of causalgia and its related states*.

Regarding landmark books on resuscitation, credit must be given to the American surgeon, George Washington Crile. In 1903 he published *Blood Pressure in Surgery: an experimental and clinical research*. This was followed in 1909 by *Hemorrhage and Transfusion: an experimental and clinical research*. Crile served with the 'American Ambulance' in France early in the first World War (WW1).[8] In 1921 (with Rowland) he provided *Physical Interpretation of Shock, Exhaustion and Restoration: an extension of the kinetic theory*. Another American who served in World War II, Henry Knowles Beecher published in 1949 *Resuscitation and Anesthesia for Wounded Men: the management of traumatic shock*.

Some authors changed their names. Thus in 1893 RJ Williams changed to Probyn-Williams,[9] in 1916 J Blumfield changed to Blomfield,[10] and in 1941 Freda B Pratt by deed poll assumed the surname of Bannister.[11]

I believe this bibliography, in addition to that for 1847-1900, will provide a useful tool for researchers in the history of anaesthesia. The Microsoft Access® system is a rational database – information held in different tables can be joined together by means of "Queries". These also allow the researcher to select only the fields which are relevant and to specify the values in which interested, by using criteria. One can also save queries so that they can be executed again and again to retrieve the current records. Disadvantages of Microsoft Access® are that it cannot be used on a MAC® computer, and the latest e-mail security may not allow one to attach an Access® database.

It may not be necessary for researchers to obtain a physical copy of a desired book, because there are current digitisation projects:

- Wood Library-Museum

- UK Medical Collections Group (UKMCG@jiscmail.ac.uk) – part of a wider UK Medical Heritage Library project.

However, I suspect that while digitisation will be done for well-known books on anaesthesia, this will probably not happen for the lesser-known books.

Of course this bibliography will be in continual need of updating: more items may be discovered and library holdings will change. Anyone who wants a copy may have one. The difficulty of sending as an e-mail attachment may necessitate posting a disk, for which a postage and packing charge will apply.

For the future, I may produce a sequel *Books 1951-2000* and also a prequel *Books & pamphlets prior to 1847*.

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# From Berlin's Charité Hospital via Paris to Bristol's "Pneumatic Institute" - and beyond: (Abstract)

Under-recognised Continental-European influences on early oxygen therapy, related research and technology

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The German capital Berlin is well-recognised "hallowed ground" for the general history of late-enlightenment medicine. Notable institutions and names linked to the city are e.g. the Charité University Hospital (est. 1710) and its present-day, world-class Medical History Museum; Christoph Wilhelm Hufeland (1762-1836), Robert Koch (1843-1910) and Rudolf Virchow (1821-1902). The history of "modern" German anaesthesia started here in February 1847, pioneered most importantly by Johann Friedrich Dieffenbach (1792-1847) and Johann Christian Juengken (1793-1875). Other notable pioneers include e.g. Adolf von Bardeleben (1819-95; morphine premedication: 1870), Carl Ludwig Schleich (1857-1922; infiltration anaesthesia: 1892), Curt Schimmelbusch (1860—1895; ether-mask: 1890) and Heinz Wohlgemuth (1863-1936; pioneer of anaesthesia-oxygen technology: 1900). A special significance of Berlin-based physicians and events for the complex histories of anaesthetic professionalisation, regional anaesthesia and of nitrous oxide (with or without oxygen) - anaesthesia can also be identified. Until after World War II, Berlin was also a – so far clearly under-recognised - "hotbed" of early oxygen therapy and its related anaesthesia- and medical technology: A dedicated "centre" had been founded already in 1771 and run for several years by Prof. Christian Selle (1748-1800), Royal Physician at the Charité Hospital. International interactions, notably with France, and a consistent, remarkable role of the likewise well-connected Jewish Community of Berlin can also be identified. More than 15 years later, the famous Bristol Pneumatic Institute was founded in 1798 by Thomas Beddoes (1760-1808), Humphry Davy (1778 – 1829) and James Watt (1736-1819) [the so far assumed "No 1" major dedicated

"centre" for therapeutic applications of oxygen and other gases]. Later Berlin-based clinicians, authors and technicians pioneering oxygen were e.g. Ludwig Waldenburg (1837-1881), Ernst von Leyden (1832-1910), Max Michaelis (1869-1936), Heinrich Brat (1867-1909) and Franz Reuleaux (1828-1905). The physiologists Adolf Loewy (1862-1937) and George Meyer (1860-1923) (also pioneers of airway management and resuscitation) and particularly Nathan Zuntz (1847-1920) (probably the internationally most influential early physiologist on respiration, artificial pressure ventilation, respirator technology and resuscitation) influenced profoundly the British physiologist John Scott Haldane (1860-1936). He was later credited in Anglo-American literature to have "founded" oxygen-therapy. Examples for early Berlin-based producers of oxygen and related technology were the "Berliner Sauerstofffabrik ELKAN", the "Berliner Sauerstoff-Centrale", the "Oxygenia GmbH" and "Inhabad". Some of these firms existed until the early 1950s or 1960s, but were after 1900 increasingly eclipsed and mostly taken over by still existing international market-leaders, based in Germany, like "Dräger" and "Linde".

# The Tenacious Terrier and his Tubes (Abstract)

**Dr Peter J Featherstone**

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Addenbrooke's Hospital, Cambridge

This paper examines the work of anaesthetists in British maxillofacial units during the Second World War, through the eyes of Major Harold Thornton of the Royal Army Medical Corps. A 'magnificent anaesthetist' with 'terrier-like tenacity',[1] Thornton played a pivotal role in the development and testing of the first polyvinyl chloride endotracheal tubes.

1. Obituary. H L Thornton. *British Medical Journal* 1987; **295**: 1494

A full paper is to be published in *The Journal of Anesthesia History*.

# Organiser's Acknowledgements and thanks for the Falmouth Meeting

**Dr John Pring**

President, History of Anaesthesia Society 2014-2016

I'm sure you'll agree with me that James Instance's lecture was a splendid way to bring our meeting here in Falmouth to an end!

My first contact with the Falmouth Coastguard Station, sitting up there on Pendennis Point, was in March 2010 when my son Philip who has looked after the computer and projection part of this meeting, rowed the Atlantic from the Canaries to Antigua, and having been capsized just a couple of miles from the finish activated his emergency position indicating radio beacon (EPIRB) which sent a message up to a satellite, which then bounced it down ... to Falmouth coastguard station! My first contact with James was at the Penzance Sailing Club's Dinner and Dance when he was guest speaker. I used to work with a lady gynaecologist in Redruth who would occasionally ring me to ask if I'd do a case at the local private hospital. She never asked simply "Can you help me with a case on . . . ?" but usually told me "I've got a case on . . . - X can't do it, and Y's away and Z's busy so I'm ringing you!" James, I assure you, choosing our Guest Speaker wasn't like that this year! For many years I used to go skiing with a pilot friend and we'd often ask each other questions about the other's work. It's nice to hear of experiences outside our sphere of activity - and today's Guest Lecture was well delivered, full of interesting facts, entertaining and, from the time of that yacht club dinner and dance, well worth waiting for! On behalf of the History of Anaesthesia Society I should like to warmly thank you for travelling all this way today (!) and giving such an entertaining presentation. It is customary to give the speaker an honorarium, £100, sorted out in advance of the meeting. I mentioned this in my last visit to the coastguard station whereupon James immediately said "Make the cheque out to 'The Mission for Seafarers'!" Now, I don't want anyone to accuse the History of Anaesthesia Society of not appreciating such a generous and spontaneous offer, so on the basis of "what you can do, we'll match" I'd like to present you with a cheque to the 'Mission for Seafarers' for £200!

Turning to our meeting now, "20 speakers - 20 papers" doesn't sum things up adequately. "20 excellent papers, fluently delivered by 20 different speakers" is better. As I mentioned in my Presidential Address yesterday the speakers have all put in a lot of hard work. I've noted all the times of the presentations and am both amazed and very pleased about the superb time keeping.

I hope you've enjoyed the Falmouth Hotel and its location. My contacts here have all been very helpful, and the other staff helpful and polite. I hope you enjoyed the Dinner - and again apologies for 'forgetting' that the Nankersey Male Choir would be coming along to entertain us!

I hope too that the ladies enjoyed their visit to Heligan and that the river trip added on was exciting! Now you're back I can tell you that had there been more time available we had abseiling and bungee jumping lined up for you as well!

It has been nice to see old friends here again - and to make some new ones, which I think is a feature of these History of Anaesthesia Society meetings. Thanks to the trainees who've come along and presented papers - we look forward to seeing you at the next meeting in Oxford. I've enjoyed setting up this meeting - and now **I** look forward to lunch!

# Dr Zoltan (Lefty) Lett - 1916 to 2014

**Obituary**

Dr JR Lo, Retired Consultant Anaesthetist and Intensivist, London

Zoltan Lett was born in Budapest on 24th November 1916 when the Great War was raging. His studies in medicine in Prague were interrupted when Czechoslovakia was invaded during World War II – he had to complete his course of studies in Oxford, UK, finishing his internship at University College Hospital, London. Zoltan enlisted in the RAMC and served in North Africa and in Burma for which he was awarded the Burma Star.

After the war, he trained in anaesthetics and obtained his Diploma in Anaesthetics (DA) and then gained the Fellowship of the Faculty of Anaesthetists of the Royal College of Surgeons (FFARCS). A chance meeting in 1954 with Dr KC Yeoh, then Director of the Medical & Health Services of the Hong Kong Government who was on leave in the UK, led to his recruitment to join the public health service in Hong Kong as the first Consultant Anaesthetist in the public healthcare sector, and also as a part-time lecturer in anaesthetics in the Faculty of Medicine of the University of Hong Kong. Zoltan continued his association with the University and was the Reader in Anaesthetics when he retired from the University in 1983.

Lefty, as Zoltan was known to his friends, supported Dr. Horacio Ozorio (who designed the eponymous endotracheal tube connector) in the founding of the Society of Anaesthetists of Hong Kong (SAHK) to promote anaesthesia as a specialty. He was Chairman and then President of the SAHK for many years. Being a key person in anaesthetics in the University, the public sector, and the SAHK, Lefty was in a good position to promote the specialty and develop good clinical practice amongst colleagues. His many links with the international anaesthetic community were legendary. His perseverance in developing training in anaesthesia and access to specialist Fellowship

qualifications from the UK (FFARCS) and Australasia (Faculty of Anaesthetists of the Royal Australasian College of Surgeons, FFARACS) for Hong Kong anaesthetists helped to fulfil the needs of Hong Kong, and in particular the public hospital expansion programme from the 1960s onwards. His dedication and contribution to anaesthetics, especially in the public sector, was immense and lasted well into his eighties.

Lefty also founded the Hong Kong Society of Critical Care Medicine (HKSCCM) in 1984 and was its inaugural Chairman. When the Hong Kong College of Anaesthesiologists (HKCA) was founded in 1989, Lefty was a promoter and founding Fellow. Lefty was closely associated with both the SAHK and HKCA even after his complete retirement from clinical practice in 1996. He was an Honorary Member of SAHK and an Honorary Fellow of the HKCA. The SAHK celebrated its 60th anniversary and the HKCA its 25th anniversary just as Dr. Lett passed away.

Lefty's contribution to anaesthesia and the profession was recognised not only locally, but also internationally. He received an emeritus Professorship from the University of the Philippines for help with the World Health Organisation Diploma in Anaesthetics training programme in Manila; an Honorary Life Membership from the Philippine Society of Anesthesiology; the Pask Certificate of Honour from the Association of Anaesthetists of Great Britain and Ireland for services to anaesthesia in Hong Kong (1978) and an Honorary Fellowship from the British Medical Association (1979). He was also a Fellow of medical Colleges around the world, including the Australia and New Zealand College of Anaesthetists and the International College of Surgeons.

Dr. Zoltan Lett devoted practically his whole professional life to Hong Kong and has been labelled as the "Father of Anaesthesia" in Hong Kong by many for his contribution to the development of anaesthesia as a specialty in Hong Kong. Lefty remained clinically active until his eighties and continued to take part in scientific meetings in all parts of the world until a stroke confined him to living at a home in Bexhill-on-Sea in the UK. He is fondly remembered as a kind, humble, and approachable colleague, mentor and friend. He touched many people's hearts and lives, and his kindness, generosity and dedication will live on.

Lefty passed away peacefully on 15 November 2014 in his nursing home, just nine days short of his 98th birthday, with Angela his only daughter by his side. Two grandchildren and a great grandchild also survive him.

We give thanks for the life of Lefty and may he rest in peace.