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THE HISTORY OF ANAESTHESIA SOCIETY PROCEEDINGS

Volume 38

Proceedings of the Autumn Scientific Meeting

NEIMME, Newcastle upon Tyne

10th November 2007

Contents of Volume 38

oooOooo

We sadly report the deaths of the following members of the Society: Prof T Cecil Gray, Dr Bill Pallister.

HISTORY OF ANAESTHESIA SOCIETY

2007 Autumn Scientific Meeting, The North of England Institute of Mining and Mechanical Engineers, Newcastle upon Tyne

10 November 2007

Organiser: Dr Gary Enever

The Organiser is very grateful for the assistance of Ms Barbara Sladdin, Secretary to the University Department of Anaesthesia.

The Society would like to thank the following for generous support:

The Newcastle Hospitals NHS Trust
The North of England Institute of Mining and Mechanical Engineers
Pajunk Medical Technology UK

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The Society acknowledges with thanks the photographs taken by Dr Geoff Hall-Davies.

HISTORY OF ANAESTHESIA SOCIETY

Council and Officers – November 2007

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EDITORIAL

The venue for the Newcastle upon Tyne meeting was unique! The North of England Institute of Mining and Mechanical Engineers (NEIMME) boasted a Victorian style lecture theatre with fine wood panelling and photographs of past officers.

The organiser, Dr Gary Enever, began the morning's proceedings, speaking on the Newcastle days of George Stephenson, John Snow and Mortimer Glover. This was followed by a 'reverse antiques road show': A-Z items of old apparatus and documents. The members were able to view these antiques over coffee in the magnificent library, and could venture over a foot bridge into the Newcastle Literary and Philosophical Society.

To resume the lectures Dr C Vallis, Medical Director of the Great North Run, gave an interesting presentation on the history of long distance running. Next Dr Adrian Padfield spoke on the problems of converting video copies of original film footage to DVD. The audience was then treated to a film on epidural anaesthesia; this had been made in 1959-60 at the Teesside Hospitals Group by Dr Malcolm White, sponsored by Reckitt & Colman. It featured the technique of epidural needle & catheter insertion (including cervical), and had been shown at the Royal College of Surgeons of England and in Newcastle and Teesside.

After a buffet lunch in the library there were three presentations by trainees: two on obstetrics and the third on the Australian flying doctor service in the 1930s. Another refreshment break prepared the members for a presentation by Mr Bill Bell, NEIMME. He gave a fine demonstration of mining safety lamps, claiming that Stephenson's lamp had preceded Davy's, and then led an interesting tour of the library. On return to the lecture theatre the antiques were identified. Finally the judgement of the trainees' papers was announced: all were joint winners, earning free registration, a book and one year's HAS membership. This concluded a most enjoyable meeting.

Alistair G McKenzie
Hon Editor

FUTURE EVENTS

2008 26-28 June. HAS Summer Meeting, York
Contact: Dr Paul Goulden (paul.goulden@midyorks.nhs.uk)

2008 31 October. HAS Autumn Meeting, London
Contact: Prof JAW Wildsmith (jaww@doctors.org.uk)

Speakers at Newcastle

Dr D Wilkinson

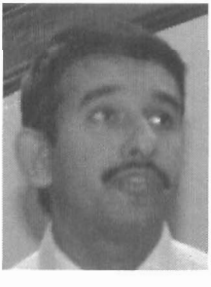
Dr G Enever

Dr C Vallis

Dr A Padfield

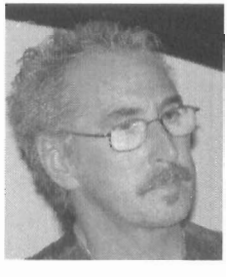
Dr GMJ White

Dr Indira Kannan



Dr N Venugopal

Dr A Lloyd



Mr Bill Bell

Members and guests attending Newcastle upon Tyne meeting

Dr Neil Adams	Bury St Edmunds	Dr Kenneth Macleod	Huntingdon
Dr P Barrow	Newcastle u Tyne	Dr A McKeever	London
Dr Moyna Barton	London	Dr Alistair McKenzie	Edinburgh
Mr Bill Bell	Newcastle u Tyne	Dr Colin McLaren	Wiltshire
Dr Colin Birt	Rochford	Mrs Iris Millis	London
Dr John Blizzard	Chelmsford	Dr D Morland	Newcastle
Dr Elizabeth Bradshaw	London	Dr Adrian Padfield	Sheffield
Dr Henry Connor	Hereford	Dr Yash Pole	Manchester
Dr Ian Corall	London	Dr John Pring	Penzance
Dr Peter Drury	Liverpool	Dr Miles Rucklidge	Lancaster
Dr Christine Earlam	Cheshire	Dr J Stoddart	Newcastle
Dr Gary Enever	Newcastle	Dr MWM Stratling	Dinas Powys
Dr Ann Ferguson	Broadstairs	Dr Alistair Trench	Dunblane
Dr Anne Florence	Liverpool	Dr Chris Vallis	Newcastle
Dr Paul Goulden	Dewsbury	Dr Naveen Venugopal	Newcastle
Dr Geoff Hall-Davies	Redditch	Dr David White	Beaconsfield
Dr Jean Horton	Cambridge	Dr Malcolm White	Cleveland
Dr Indira Kannan	Newcastle u Tyne	Prof Tony Wildsmith	Dundee
Dr Andrew Lloyd	Newcastle u Tyne	Dr David Wilkinson	Bishop's Stortford
Dr S Lobaz	Newcastle u Tyne		
		Mrs Patricia Willis	London

Guest Lecturers:

Mr Bill Bell, Newcastle upon Tyne

Dr Chris Vallis, Newcastle upon Tyne

COAL, CHOLERA AND CHLOROFORM – MINING AND ANAESTHESIA IN THE NORTH EAST

Dr G Enever
Consultant Anaesthetist, Royal Victoria Infirmary, Newcastle upon Tyne

Coal

The North East of England stands on a vast field of coal. In general, anywhere you dig down, you will eventually hit a seam. Those who owned the land owned what was under it, and became hugely wealthy. By the mid eighteenth century, Newcastle began its transition from a quiet provincial town into a great city. In 1753, a fine new Infirmary opened on Forth Banks.

Coal brought wealth, attracted industry, increased the population. And it brought opportunities for ordinary people to advance from their humble roots, to achieve anything their imaginations and intelligence would allow.

George and Robert Stephenson

George Stephenson was born to a colliery worker in Wylam in 1786, and lived in a tiny cottage with his parents and many siblings. His father had many jobs, but became a fireman in a local pit, stoking the early stationary steam engine used for hauling. At the time, coal was pulled in large wicker baskets underground by men or ponies, then hauled up and put onto trucks. These trucks were then pulled along wooden waggonways by horses to the staiths, standing high above the Tyne. The coal was tipped into keels, small boats that would sail the coal to the waiting ships below the low medieval bridge in the centre of Newcastle.

George also got work with the engines, and moved from fireman to engineer over the subsequent years. He was appointed to a senior post in Killingworth in 1812, and moved to a cottage (Figure 1) in West Moor with his son Robert. By then he was building his own stationary engines, and was working on many projects. One was a lamp that would be safe in the presence of firedamp (methane gas), a constant and deadly danger in the North East pits. He demonstrated his invention to the Newcastle Literary and Philosophical Society in 1815. Another invention was a steam engine that would move along rails to haul wagons to the staiths. His first attempt, "My Lord", was build in the sheds of West Moor Colliery, behind his cottage. George Stephenson was not the first to build a "locomotive", but he was the most successful.

George's son Robert was schooled initially in Longbenton, near the house of William Hardcastle, the local surgeon. He was then sent to an academy in Newcastle to finish his education. His talent was like his father's, engineering. He was soon managing an Engine Works in Forth Street, a works that built famous engines like the "Rocket".

In 1824, Robert left Britain in the company of one Charles Empson, an art dealer and his good friend. They travelled to South America, and spent three years in the jungles of Columbia, working in gold and silver mines, and collecting works of art. They returned in 1827, having lost most of their accumulated wealth in a shipwreck off New York harbour. When they arrived in Newcastle, William Hardcastle, doctor to the Stephenson family, had taken in Empson's 14 year old nephew as a surgeon's apprentice. His name was John Snow, and like Empson hailed from York. It seems unlikely to be a coincidence that Snow came to Hardcastle, and it may be his uncle had a hand in arranging and even paying for his apprenticeship. At this time George Stephenson had moved from mining to railways: he supervised the building of the Stockton to Darlington line in 1825 and proceeded to the Liverpool to Manchester line in 1830.

John Snow

But what of John Snow? Born into a poor family, his parents had sacrificed much for their eldest son. They had raised enough money for him to receive an education, and he had rewarded them by working hard and showing great talent. He was a small youth with a broad Yorkshire accent (that would hinder him in later life), and great intelligence. He lived in Hardcastle's house at the bottom of Westgate Street, opposite St Johns Church.
He learnt to make pills and potions, to make poultices and roll bandages. He visited with his master, in the City and in the country, to the big houses and the miner's hovels. And only a few yards from his door, he had access to the Newcastle Literary and Philosophical Society. This gave the young Snow the ability to listen to intellectual debate on a wide range of subjects, and to read in the library that contained many books on science and engineering, as well as the arts.

That these experiences were crucial to his intellectual development is in little doubt. His later ability to grasp the concepts of inhalational anaesthesia, and to develop his highly effective devices for it's delivery so readily, bears witness. Without his time in Newcastle, Snow would almost certainly have not been prepared to become the world's first anaesthetist. It is quite possible that Snow would have been influenced by the Stephensons, father and son. Robert's

Figure 1 Stephenson's cottage, West Moor 2007

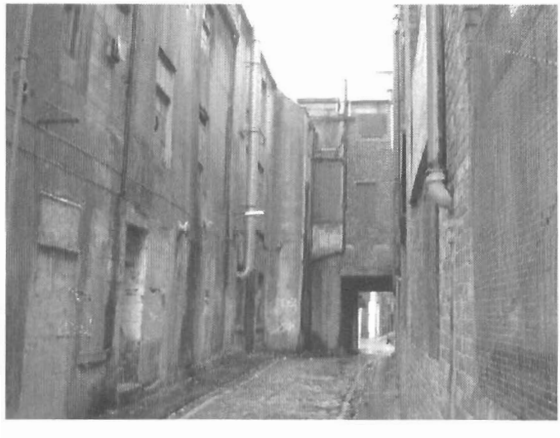


Figure 2 Bell's Court 2007

engineering works, that built many famous steam engines, was only a short distance from Hardcastle's house, in Forth Street. However, his uncle, Charles Empson, had left Newcastle during his apprenticeship, to move eventually to Bath.

Snow's introduction to cholera

Tyneside is also responsible for exposing Snow to the other driving force in his life, the disease of cholera. Cholera had arrived in Britain at the end of 1831 via the port of Sunderland. It soon spread to the surrounding area, and in early 1832, Snow was sent by Hardcastle to manage the outbreak at the mine in Killingworth, a village to the east of Newcastle. His observations on the way the disease appeared to spread stayed with him. In later life, as a physician in London, his ideas and investigations lead to the concept that cholera was a disease contracted from contaminated water. Snow is hailed as not only the first true anaesthetist, but also the first epidemiologist.

In October 1832, Snow became one of the first intake of students to Newcastle's first medical school, situated in rooms in Bell's Court (Figure 2), off Pilgrim Street. The rooms belonged to the Fife brothers, prominent Newcastle doctors. He did not stay long, as his apprenticeship finished and he was forced to move on to take up new posts, first in Burnopfield, south of the Tyne, and then in Pateley Bridge back in Yorkshire. Eventually he arrived in London to complete his medical education, carrying his knowledge of engineering and cholera with him.

Robert Mortimer Glover

Whilst Snow was scraping a living in London in the 1840's, another young man, two years Snow's junior, was doing quite well for himself. Robert Mortimer Glover had been born in South Shields in 1815, his father a wealthy merchant. He had been sent to study in Edinburgh, and in 1840 received his MD, for his work on bromides. His name is found on the faculty list of Newcastle Medical School for 1842, as a lecturer on chemistry and therapeutics. He was interested in the use of halogenated compounds, and had done many animal experiments. These included the injection of chloroform, and observing the effects (usually death!). His interests, and his contacts in Edinburgh, make his correspondence with James Young Simpson no surprise. According to Bellamy Gardner, Simpson wrote to Glover on his new use of Chloroform. It is said that Glover immediately persuaded one of his class to be chloroformed as a demonstration – possibly the first chloroform anaesthetic in England.

Certainly, Glover became a chloroform "expert" in Newcastle. Whether he gave many anaesthetics for surgery is uncertain. However, when an unfortunate young lady, Hannah Greener, died suddenly under chloroform, he and Mr John Fife were called upon to perform the autopsy. They found congested lungs, but an otherwise apparently healthy young woman. Suggestions were made that the brandy and water used as the primary mode of resuscitation might have caused death by asphyxia. There were suggestions of spasm of the pulmonary vessels, and even failure of the heart. Debate over the mode of death associated with chloroform was to rage for the next century.

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The John Snow Society Website: www.johnsnowsociety.org

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Defalque RJ, Wright AJ. The short, tragic life of Robert M. Glover. *Anaesthesia* 2004; **59**; 394-400
Smith K. *Stephenson Power: The Story of George and Robert Stephenson.* Newcastle: Tyne Bridge Publishing, 2003
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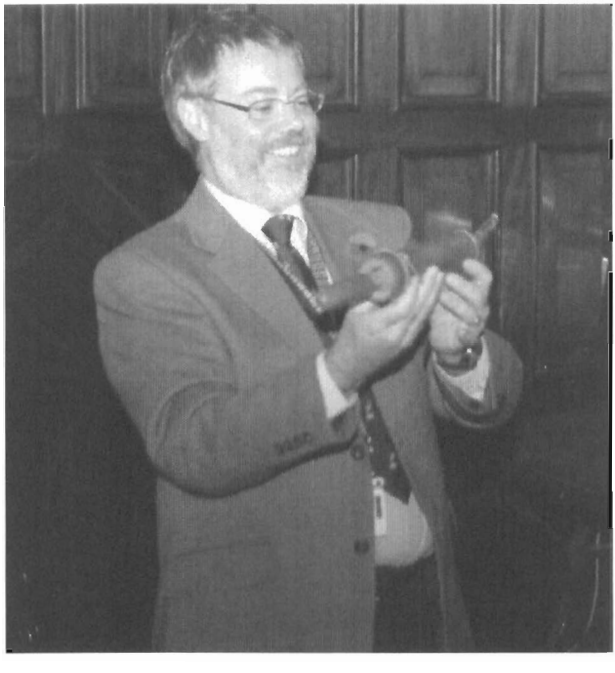
REVERSE ANTIQUES ROADSHOW

Notable among the A-Z of items were the following.

Ayers' T-piece (original)
"Blood circulator" – probably just a vibrator
Chloroform drop-bottle - ? Skinner's
Drip-feed apparatus
Enema syringe
Facemask made of *glass* with gauze
Hewitt's inhaler
Laryngoscope (Magill)
Manuscript of Charles King book on anaesthetic apparatus with advisory notes from M Armstrong Davison
Needles (spinal and other) and tubing
Oropharyngeal airway (Phillips)
Pask lecture to RCS 1953
Respiratory therapy apparatus with interchangeable vials
Skinner's wire frame mask



OLD FILMS

Dr A Padfield
Honorary Consultant Anaesthetist, Sheffield

The following is a list of some videotapes copied professionally from early films, held by AAGBI, which may be of interest to members of the Society.

V 1 *See V5* **1941** Production of analgesia by means of self-administered trichloroethylene. Made to accompany papers: RSM odontology section 13min
UMATIC

V 2 **1943** Lifejackets experiments. Applications of anaesthesia in physiological practice. Original film donated by AAGBI to National Film Archive. Mute Rushes. Videotape damaged. 17min
Cf V202

V 4 **1916** Material from Imperial War Museum Shot sheets &
See V8 **-1943** catalogue entries from IWM in file script box copy by Studio Film & Video Laboratories Ltd from archive file held at IWM. 29 min

V 5 **1938/41/43** Production of analgesia by means of self-administered
See V1 trichloroethylene; made to accompany papers: RSM odontology section;
Also V202 Lifejackets; Alcohol; Morphia. 6 films on one tape. (40 min)

V 6 *Cf V5* (no date) Alcohol as a total anaesthetic. 2 cases of I-V morphine narcosis 9¼min

V 7 *Cf V6* " 1) Alcohol. 2) Morphine; 2 cases of morphine narcosis 7¼min

V 9 **1945** The Technique of Anaesthesia: No.1 Signs and Stages 22min

V 10 **1944** Ditto: No. 2 Open Drop Ether 30min
Featuring Sir Geoffrey Organe (series supervisor)

V 11 **1944** Ditto: No. 3 Nitrous Oxide, Oxygen and Anaesthesia 24min
Featuring Sir Geoffrey Organe (series supervisor)

V 12 **1945** Ditto: No. 4 CO2 Absorption 24min
Featuring Sir Geoffrey Organe (series supervisor)

V 13 **1944** Ditto: No 5 Endotracheal Anaesthesia 25min
Featuring Sir Ivan Magill

V 14 **1944** Ditto: Nos. 6 & 7 Intravenous Anaesthesia 60min
Featuring Sir Geoffrey Organe (series supervisor)

V 15 **1944** Ditto: No. 8 Spinal Anaesthesia 33min
Featuring Sir Geoffrey Organe (series supervisor)

V 16 **1945** Ditto: No. 9 Respiratory and Cardiac Arrest 15min
Featuring Sir Geoffrey Organe (series supervisor)

V 17 **1945** Ditto: No. 10 Operative Shock 16min
Featuring Sir Geoffrey Organe (series supervisor)

V 18 **1945** Ditto: No. 11 Handling and care of Patients 25min
Featuring Sir Geoffrey Organe (series supervisor)

V 24 **1944** Gas-air analgesia; Midwifery 13¾min

V 41 UMATIC **1938** Stillwaters: Ethyl chloride film made at Great Ormond Street. Chloroform film features Dr Herbert Charles. Mute compilation of technique of induction of ethyl chloride. *(=V123?)* 17 min

V45 *=V46* **11/2/42** Hadfield Spears Mission; from silent unedited British Army red film. Taken on Gazala line, Western Desert. Shows French Foreign Legion in action & front line Free French field hosp with 2 female nurse anaesthetists and a female doctor of Hadfield Spears Mission at work.
*Original: IWM A 192/6.*** 5 min 20s

V 47 **1947** The signs of anaesthesia & nasotracheal intubation. J U Human 15 min
=V48&V49 "

V 50 **28/3/44** Thyroidectomy: Victor Goldman & Cecil Joll at
=*V51&V126* " Royal Free 9¾ min

V 66 **1988** Using film to teach. Excerpts from American films **1929** onwards. 32min
Features R. Waters, A. Guedel…

V 78 **1930** The ever open door: History of Edinburgh Royal Infirmary. University of Edinburgh Archives. 32 min

V 83 **1935** Endotracheal intubation. 6¼ min

V 123 **1938** Technique of ethyl chloride induction for dentistry
=*V124* in children: Harold Sington. Made at Great Ormond Street.
10½ min

V 145 **1930** Anesthesia History Association presents: Archive Fragments.
(USA) **1947/50**/62 Inc'g: 1) The Model Anesthesiologist (Parody). 2) Demonstration of Hyperbaric Spinal Anesthesia. 3) with parody on Spinal Anesthesia (see 1). 4) Paediatric Anesthesia. 5) Paediatric Anesthesia Clinic. 6) Paediatric Anesthesia from 1945-1955. 7) GA with Vinethene. 55 min

V 173 **1944/5** Extracts from Westminster ICI 1944/45 series. 43min

Local anaesthetic techniques:

V 177 **1934** Peroral endoscopy, passage of bronchoscope & oesophagoscope seen in relation to the treatment of various types of disease. Method of local anaesthesia employed. Silent. B & W. 11 min

V 178 **1927** Technique of local anaesthesia. Shows briefly the sites of injection and quantities of anaesthetic for these techniques. 19 min

V 179 **1934** Partial gastrectomy under LA. The technique of abdominal field block and splanchnic block are shown in detail and illustrated by an operation for cancer of the stomach. Silent B&W. 28 min

Family home movies; not of much anaesthetic interest!
V 253 **1930**? Memoirs of the 30s - A. Charles King. 53 min

The reason for bringing these videos to the attention of the History of Anaesthesia Society is to suggest that they (or the original films) should be copied on to DVDs. V4, material from the Imperial War Museum 1914 to 1943 (third on the list above) was copied onto DVD for the AAGBI Seminar on Military Anaesthesia on 16th October 2007. Professional copying cost £30 + VAT for about 29 minutes. Adding up the duration of the other films comes to a total of over 6 hours which would cost at least £360 + VAT. There are a considerable number of other, more up to date, films that will be come of historical interest as the years go by.

The income of AAGBI is very large but converting videotapes to DVD has a very low priority. I know that the possibility of company sponsorship has been suggested. I'd like to suggest that HAS considers buying a video-to-DVD recorder and presenting it to AAGBI with the proviso that the oldest videos are the first to be converted. Doing this would help to preserve the material in the latest format: how much longer will video recorders be available? In addition DVDs are more portable and more manageable.

A "BLESSING TO OBSTETRICS": EVOLUTION OF PAIN RELIEF IN CHILDBIRTH

Dr Indira Kannan
Specialist Registrar, Royal Victoria Infirmary, Newcastle

Labour has been portrayed as a painful, life-threatening event since the earliest recorded history and held that status until the last century. Anaesthesia for childbirth has undergone constant changes ever since it was introduced to medical practice in 1847. The agents and methods used for analgesia are numerous. [1] This article traces the history of development of obstetric anaesthesia from the days of Simpson and Snow to the era of current practice.

General Anaesthesia

James Young Simpson, a successful obstetrician and chair of midwifery in Edinburgh, was the first to use general anaesthesia in obstetrics. On 19th January 1847 he used ether for the relief of pain of labour. On 4th November 1847 he tried chloroform on self and his friends which made them unconscious. In six days he reported to the Edinburgh Medico-Chirurgical Society the use of chloroform in thirty painless deliveries and within two weeks his success with chloroform was published in *The Lancet*.[2]

Quoting from the Bible

"In sorrow thou shalt bring forth children." -- Genesis 3:16

the clergymen discredited Simpson as an agent of evil. They argued that relief of labour pain is against God's Will.

Simpson, who was also a student of the Bible, presented God as the first anaesthetist by quoting genesis 2:21:

"And the Lord God caused a deep sleep to fall upon Adam, and he slept; and He took one of his ribs, and closed up the flesh instead thereof".

He argued *"What god himself did cannot be sinful"*. [1] He stated that labour pain was not due to any religious curse but is the result of anatomic and scientific causes.

Simpson's method

Although Simpson strongly advocated the use of anaesthesia for women in labour, he failed to address safety issues of anaesthesia. His goal was to improve patient comfort during his obstetric procedures. He anaesthetised the patients during first stage of labour and kept them unconscious until after the delivery of placenta. Simpson disregarded the adverse effects on uterine contractions or on the newborn, which led to widespread criticisms by the fellow physicians.[3] All

in all, Simpson failed to change the physician's perception about pain relief during labour. [2]

John Snow: the Queen's anaesthetist

It was John Snow (1813-1858) an excellent physician, and epidemiologist who became famous as an obstetric anaesthetist by providing pain relief to Queen Victoria for her last two deliveries. Snow had deep understanding of anaesthetic physiology and pharmacology and performed experiments to demonstrate the effects of anaesthesia on the body. Snow anaesthetised 77 obstetric patients with chloroform. He initiated anaesthetic only during second stage of labour and titrated the dose of chloroform to maintain a semiconscious state. Light anaesthetic had little effect on labour or the neonate but provided adequate analgesia and many women were able to obey commands.[3]

Queen Victoria had analgesia by open drop technique-giving analgesic doses of chloroform on a folded handkerchief, also termed as "*chloroform à la reine*". Pleased with the pain relief, in 1853 she wrote in her journal "*Dr. Snow gave that blessed chloroform and the effect was soothing, quieting, and delightful beyond measure*".[2] Snow discouraged the open drop technique and introduced inhalers to anaesthetise with varied concentrations of anaesthetic agent.

John Snow's clinical skills and meticulous approach changed the fellow physicians viewpoint about labour analgesia and made him the Queen's anaesthetist. Religious opposition also ceased with the Queen's endorsement of obstetric anaesthesia.

So it was John Snow who succeeded in lifting the taboo associated with pain control in labour leading to change in the attitude of physicians and public towards the concept of analgesia in labour. Chloroform analgesia became one of the most important possessions in medical practice throughout the world for the next three decades.[3,7]

Obstetric anaesthesia in Europe and USA

Adam Hammer was the first person in Germany to use ether for pain relief during labour on February 18th 1847. [4] Nathan Cooley Keep administered the first obstetric anaesthetic in the United States on April 7th 1847. The patient was Fanny Appleton Longfellow, wife of the famous poet and scholar Henry Wadsworth Longfellow. [5] Klikowitsh of Russia used nitrous oxide and oxygen inhalation anaesthesia for labour analgesia in 1880. He observed that three or four inhalations rendered the uterine contractions painless without clouding of consciousness. From then on it achieved widespread popularity till Eastman showed that incorrect administration could cause asphyxia neonatorum. [1]

Twilight sleep

Twilight sleep" or "Dammerschlaf" was the term used to describe a "state of clouded consciousness" induced by the use of morphine and scopolamine. In 1903, von Steinbuchel of Austria first used twilight sleep for obstetrics. The method was popularised by Carl Gauss of Freiburg through public lectures and publications. Gauss recommended only 10 mg of morphine for entire labour but gave scopolamine as necessary, depending on the patient's response to a "memory test". But the obstetricians were not convinced that twilight sleep could provide adequate analgesia and believed it could suppress uterine contraction and cause neonatal respiratory depression. Despite their scepticism, obstetricians were forced to use twilight sleep when the press discovered it and the twilight sleep for pain relief in labour became the trend. As twilight sleep failed to provide adequate pain relief, the physicians started combining twilight sleep with barbiturates. [6, 1]

Irving and his associates in 1934 published their research on popular analgesic methods prevalent during that time (Table 1). The incidence of neonatal apnoea was 35 to 67 percent in the analgesic group compared to 2 percent in the non-analgesic groups. Nembutal (pentobarbitone sodium) with scopolamine was found to be the most effective method for labour analgesia. [1]

Sodium Amytal and scopolamine
Pantopon, magnesium sulphate and rectal ether
Pernocton
Pentobarbitone and scopolamine
Sodium Amytal and rectal ether
Pentobarbitone and rectal ether
Pentobarbitone and paraldehyde
Pantopon and scopolamine

Table 1 Popular methods of analgesia for labour in 1933

Regional Anaesthesia for control of pain

In 1901 Oskar Kreis of Germany used spinal anaesthesia for labour analgesia in 6 pregnant women. All but one had nausea, vomiting and severe postpartum headache [8, 9] In 1909 Walter Stoeckel of Germany injected cocaine solutions in the epidural space, through sacral hiatus. Stoeckel described a series of 141 cases of obstetric epidural analgesia in an article entitled 'Uber Sakrale Anasthesie'. [10]
In 1928 George Pitkin was the first person to use hyperbaric spinal anaesthesia for delivery, which he called 'controllable spinal anaesthesia' in obstetrics. [1]
In 1933 regional anaesthesia in obstetrics had a major breakthrough when John G.P. Cleland described the pathway of uterine pain. He used paravertebral block and low caudal analgesia to control the pain during first and second stage of labour respectively. [11] In 1938 Graffagnino of New Orleans used epidural anaesthesia in obstetrics, through modification of the original technique of Pagés of Spain and Dogliotti of Italy. [1]

In August 1942, Edwards (obstetrician-gynaecologist) and Hingson (anaesthesiologist) used continuous (intermittent) caudal anaesthesia (CCA) for obstetric analgesia. They used a malleable needle as had Lemon and Paschal for continuous spinal anaesthesia and highlighted the principle advantages of CCA:
"The babies were just as alert and wide awake at birth as those of the mothers who had no form of sedation or anaesthesia, and the parturients remained "relaxed," "at ease," "alert," and "usually cheerful. Such criterion is essential for father's participation during parturition." [9, 12]

In 1949 Curbelo applied continuous thoracic epidural block for surgical procedures using the technique described by Tuohy for continuous spinal anaesthesia. In 1949 also, Flowers *et al* described continuous epidural block for labour, delivery, and Caesarean section inserting plastic tubing via the lumbar interspaces using a similar technique. They stated, *"The site of election (for inserting the needle) is the second lumbar interspace as this is the largest peridural space in the lumbar area"*. Despite this, it took two decades for lumbar epidural anaesthesia to replace continuous caudal anaesthesia because of lack of the availability of sterile single use plastic tubing.
The availability of sterile single use plastic tubing in containers started the era of epidural analgesia in labour. [9]

As the years passed by, epidural anaesthesia underwent major changes in three areas.
Drugs: Local anaesthetics which had negligible effect on newborn and with less motor block were preferred. Opioids were added to provide walking epidurals.

Dose: Less and less volumes and concentration of local anaesthetics were used.
Method of administration: With the invention of infusion pumps in the 1980's, it became possible to address changing patterns of pain during the course of labour; epidural blocks became more consistent and predictable. [13]

Factors that influenced the evolution of obstetric anaesthesia

Effects of anaesthesia on labour and newborn
From the beginning physicians were worried about effects of anaesthesia on uterine contraction and fetus. As early as the 1900s Oskar Kreis found that spinal anaesthesia had no effect on uterine contractions. Hence the success of regional anaesthesia in obstetrics, which had minimal influence on the mother and baby.
Safety
High incidence of nausea and vomiting, fluctuations in blood pressure, shorter duration made spinal anaesthesia unpopular. Epidural, pudendal and para-cervical blocks were the only regional techniques to survive into the second half of the twentieth century.
Improvements in pharmacology
These influenced practice. Local anaesthetics were formulated to last longer, have fewer side effects, and preferentially block sensory nerves. Small amounts of opioids were used to effectively block the first stage of labour.
Economic factors
People who could afford to have pain relief in labour were a minority. There was shortage of anaesthetists as well. To overcome this problem, midwives were trained to give anaesthesia and new equipment for self-administration of anaesthetic gases was devised. The obstetricians were able to provide pain relief to more than one patient at a time when the intravenous drugs and regional anaesthesia came into practice.

Obstetric practice
This also shaped the use of anaesthesia. When the practice changed from extensive use of forceps, dense blocks were replaced by mobile epidurals. With the rise in caesarean section rate and the appreciation of risk of general anaesthesia, epidurals were instituted early in labour.
Patient's expectation
This was the most important factor, which influenced obstetric anaesthesia. Public support for the inhalation anaesthesia and later on for heavily medicated deliveries forced the physicians to use them on labouring women in spite of their drawbacks. With the increasing public awareness of the potential effects of drugs on the newborn, women turned to the technique of natural, painless, gentle birth. The public interest in labour analgesia was renewed with the

introduction and development of epidural anaesthesia, which was relatively safe and provided effective pain relief. [13]

Summary

James young Simpson, who predicted the role of public opinion in the acceptance of obstetric anaesthesia, wrote

"Medical men may oppose for a time the super induction of anaesthesia in parturition, but they will oppose it vain; for certainly our patients themselves will force use of it upon the profession. The whole question is, even now, one merely of time"

This prophecy has come to reality in the years that followed. With the change in public attitude in favour of obstetric anaesthesia, anaesthetics were used increasingly for labour pain. The absence of pain, at least in part led to drop in maternal and infant mortality and morbidity by permitting the midwife, or obstetrician to work unhindered in difficult labours.

The Old Testament curse of womankind has been finally repudiated in the New Testament prophecy

"She shall be saved in childbearing if they continue in faith and charity and holiness with sobriety"

and it is due to the hard work and dedication from several researchers, physicians, pharmaceutical organizations, and professional societies in the last century. They have made obstetric anaesthesia safe for pregnant women seeking pain-free childbirth in this century, making their birthing experience a pleasurable memory to be cherished for a long time.

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Editorial comments

Regarding anaesthesia for women in labour, the statement "Simpson disregarded the adverse effects on uterine contractions or on the newborn" deserves a counter-balance. In an article in the *Edin Monthly J of Med Science* in March 1847 Simpson wrote: "it will be necessary to ascertain anaesthesia's precise effects, both upon the action of the uterus and on the assistant abdominal muscles, its influence, if any, upon the child; whether it has a tendency to haemorrhage or other complications."

The extent to which clergymen discredited Simpson has been much debated. See papers by Adams and Maltby in *The History of Anaesthesia Society Proceedings* 2001; **29**: 42-57.

Did John Snow become famous as an obstetric anaesthetist by chloroforming Queen Victoria for labour analgesia? As Connor and Connor (*Anaesthesia* 1996; 51: 955-7) have pointed out, it was not until 1859 that a major newspaper, when commenting on the *obituary* of John Snow, informed of the Queen's use of chloroform in 1853 and 1857.

THE EVOLUTION OF ASPIRATION PROPHYLAXIS IN OBSTETRIC ANAESTHESIA

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Aspiration of stomach contents has been a prominent cause of mortality in obstetric general anaesthesia. Various methods have been tried and tested to prevent this condition. An overview of the problem and the timeframe of the different approaches undertaken to solve this problem is presented in this paper.

The problem identified

The paper that brought to light a major cause of mortality during anaesthesia in labouring women was published in 1946 [1]. The credit goes to Curtis Lester Mendelson, an obstetrician at the New York Lying-In Hospital (Figure 1). He reviewed the records of 44016 pregnancies from 1932 to 1945 and found 66 cases of aspiration of gastric contents during general anaesthesia.

Aspiration was recorded as having definitely occurred in 45 cases. The rest of them went unrecognised. Forty patients aspirated liquid and developed an acute asthma-like attack. They were critically ill during the acute episode, but stabilised in 24–36 hours. However, none of them died. Obstructive reaction and massive collapse occurred in 5 patients who aspirated solid material. Two of them died due to complete airway obstruction by solid undigested material. All had gas, oxygen and ether as anaesthetic. Slightly more than half of the cases had operative intervention requiring longer administration and greater depth of anaesthesia than those delivered spontaneously.

Mendelson went on to write "Anyone who aspirated the slightest amount of fluid during a vomiting seizure will remember the intense irritation produced". Hence, he thought that it was pertinent to evaluate the role of hydrochloric acid. He conducted laboratory experiments in which he instilled various liquids into the lungs of anaesthetised rabbits. Hydrochloric acid or unneutralised liquid vomitus caused immediate cyanosis, laboured respiration and death within minutes to hours. Distilled water, normal saline or neutralized liquid vomitus caused a similar early reaction but full recovery ensued.

Mendelson presented his findings to the New York Obstetrical Society in December 1945. Invited speakers found it strange that there was no anaesthetist present at the meeting. They observed that labour anaesthesia service was given

step motherly treatment by anaesthetists and that the most junior anaesthetist was usually sent to the labour ward.

Mendelson published his paper in the American Journal of Obstetrics and Gynaecology 1946. His paper revealed two entirely different syndromes that followed aspiration. His animal experiments found out the role of hydrochloric acid in causing lung damage on aspiration of stomach contents. He campaigned for nothing by mouth during labour, natural childbirth and wider use of regional blocks to minimise the use and dangers of general anaesthesia.

Association of Anaesthetists Investigation

A crucial investigation was undertaken by the Association of Anaesthetists into 43 cases of regurgitation or vomiting that proved fatal during anaesthesia. It was published in Anaesthesia in 1951 by Morton and Wylie [2].
They advocated

i) Emptying of stomach with a gastric tube before induction of anaesthesia
ii) Use of the cuffed endotracheal tube
iii) Inhalational induction in supine position - safer in the hands of an inexperienced anaesthetist
iv) Intravenous induction in a reverse Trendelenburg position - this could be safely conducted by an experienced anaesthetist.

The solutions put forward

Protect the airway

Muscle relaxants started becoming popular as a part of an intravenous induction technique in the 1940s. Cuffed tracheal tube was put forward initially as a solution to protect the airway in operative obstetrics. Coleman and Day [3] in 1956 published a paper "Anaesthesia for operative obstetrics - value of cuffed endotracheal tube." Cyclopropane in nitrous oxide and oxygen was used for induction in the supine position. Suxamethonium was used to help tracheal intubation with a cuffed endotracheal tube. They emphasised the use of supine position, suction and tipping table to prevent aspiration.

Cricoid Pressure

The biggest advance came up in 1961 in the form of a simple manoeuvre, which

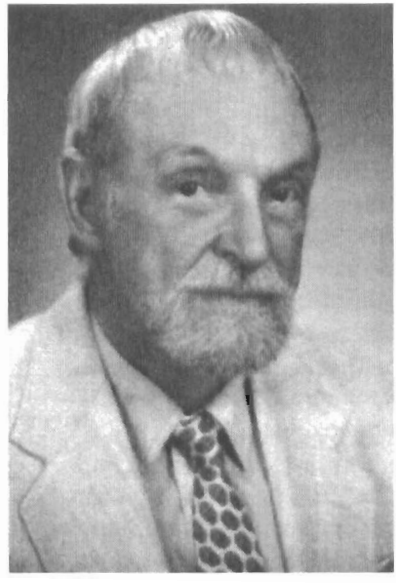

Figure 1 Curtis Lester Mendelson (Source: Dr Roger Maltby)

Figure 2 Brian Arthur Sellick (Source: AAGBI)

is still being used now. Brian Arthur Sellick was a Consultant Anaesthetist at the Middlesex Hospital in London (Figure 2). His communication to *The Lancet* in 1961 [4] advocated the use of cricoid pressure for all full stomachs. It was an excellent short communication. He began by writing, "When the contents of the stomach or oesophagus gain access to the air-passages during anaesthesia, the consequences are disastrous. In spite of modern anaesthetic techniques - or sometimes, regrettably, because of them - regurgitation is still a considerable hazard during the induction of anaesthesia, particularly for operative obstetrics and emergency general surgery."

His initial experiments in the cadaver showed that flow of water from the stomach into the pharynx could be controlled by varying the pressure on the cricoid cartilage. Sellick's seminal paper showed lateral X-rays of the neck with the oesophagus containing a latex tube full of contrast medium lying within the lumen of the pharynx and oesophagus of an anaesthetised and curarised patient. Extension of the neck and application of cricoid pressure obliterated the oesophageal lumen at the level of the body of the 5th cervical vertebra.

He went on to suggest that cricoid pressure must be exerted by an assistant. "Before induction, the cricoid is palpated and lightly held between the thumb and second finger; as anaesthesia begins, pressure is exerted on the cricoid cartilage mainly by the index finger. Even a conscious patient can tolerate moderate pressure without discomfort; but, as soon as consciousness is lost, firm pressure can be applied without obstruction of the patient's airway. Pressure is maintained until intubation and inflation of the cuff of the endotracheal tube is completed."

He was aware that this technique should not be relied on totally and that there were drawbacks in its use. He advocated the use of all possible methods to try to empty the patient's stomach using a Ryle's tube. He added that it should be removed before induction to prevent its presence from hampering the natural oesophageal sphincters. He described preoxygenation, an open vein and implied the importance of ready suction and a tipping trolley much as we would do today.

He noted that adoption of Morton and Wylie's technique has two disadvantages. Rapid induction of anaesthesia in the sitting position predisposes to cardiovascular collapse in a patient who is seriously ill. Moreover, the sitting position facilitates aspiration if active vomiting occurs.

His paper highlighted the management of 26 high-risk cases in which his

technique was used. In 23 of them, no regurgitation or vomiting took place before, during or after cricoid pressure. In the remaining 3 cases, when cricoid pressure was released after the airway had been secured, the pharynx was filled with gastric contents, thus illustrating the effectiveness of the technique for at least those 3 cases. Sellick's elegant paper changed the face of anaesthesia across the world. Since then, a lot of papers appeared regarding the appropriate and safe use of cricoid pressure.

Reduction of gastric acidity: particulate alkalis

The next big step in tackling the problem was to neutralise the acid in the stomach, so that damage could be minimised should aspiration occur. Mendelson (1946) and Dinnick (1957) had suggested the use of particulate alkalis in labouring women. Taylor and Pryse-Davies (1966) conclusively showed that antacids in labouring women increased gastric pH. They showed that magnesium trisilicate mixture (MTM) was more efficient than aluminium hydroxide. Lung lesions due to aspiration were less bad if pH more than 1.7. Since the publication of this paper, 15 ml of magnesium trisilicate mixture every 2 hours during labour with a final dose of 30 ml before anaesthesia became the standard regimen for all mothers in the U.K.

In 1974 Roberts and Shirley [5] suggested that low pH was more dangerous than volume. Preliminary work done in the rhesus monkey indicated that 0.4 ml/kg was the maximum acid aspirate that does not produce significant changes in the lung. They arbitrarily defined the patient at risk as that patient with at least 25 mls of gastric juice of pH less than 2.5 in the stomach at delivery. This was a landmark paper in the efforts to reduce the risk of aspiration in obstetrics.

Throughout the 1970s, deaths occurred among mothers despite the use of the recommended regimen of MTM. In England and Wales, 14 mothers died from this cause in 1970-72 and 13 died in 1973-75. A majority of women who died were said to have received oral antacid. In 1978 Scott pointed out that only 2 of Mendelson's original 66 patients died. He suggested that the use of muscle relaxants and IPPV forcing gastric contents deep into the lungs might account for the higher mortality.

A failure to attain safe pH was reported by White *et al* in up to 20% of patients in 1976. There was a notion that MTM neutralised the acid, but was not saving lives. The use of MTM was first challenged in 1979. Gibbs *et al* reported severe and sometimes fatal pneumonitis in dogs which aspirated a mixture of alumin-

ium and magnesium hydroxides. They demonstrated multiple granulomatous lesions in the lungs of surviving animals, each of which was centred on the particles of alkali. Similar experiments were not performed with magnesium trisilicate. However, the comparable particulate nature of alkali made the possibility of similar results quite strong.

Holdsworth *et al* in 1980 [6] performed an investigation into the readiness with which magnesium trisilicate mixture, Andursil suspension and 0·3 M aqueous sodium citrate mixed with gastric contents. Laboratory investigations demonstrated that magnesium trisilicate and Andursil did not mix completely with gastric contents. The possibility that two separate gastric sacs forming on either side of the vertebral column was demonstrated by radiological studies. A clinical investigation of sodium citrate showed good mixing with stomach contents. The paper also revealed significant improvement in the mixing of gastric juice with the antacid if the patient was turned into the right lateral position following its administration.

Empty the stomach

Dietary restriction was practised from late 1940s in an attempt to reduce the stomach contents during labour. Various attempts were made at reducing stomach volume. Howard and Sharp in 1973 [7] investigated the effect of metoclopramide on gastric emptying during labour. The gastric emptying rate of a liquid test meal was significantly increased in those women who had received the metoclopramide as compared with those who had received the placebo. They however took no notice of which patients had narcotic.

Holdsworth *et al* in 1974 [8] published a comparison between two methods of emptying the stomach before general anaesthesia in obstetric patients: aspiration by a stomach tube and apomorphine-induced vomiting. It was found that most patients preferred apomorphine to the stomach tube. During the operation, stomach contents were aspirated in both groups. The mean volumes aspirated were not significantly different. It was found that neither method guarantees an empty stomach at induction. Moreover, they found that failure to induce vomiting with apomorphine did not signify that the stomach was empty.

Delayed gastric emptying proved

It was well known that labour delayed gastric emptying and this was usually due to the administration of narcotic analgesics. This was shown conclusively by

Nimmo *et al* in 1975 [9]. They estimated the rate of gastric emptying in women during labour indirectly from the kinetics of absorption of orally administered paracetamol. Gastric emptying was normal in labouring women who had not received a narcotic analgesic. However, gastric emptying was markedly delayed in women given pethidine, diamorphine, or pentazocine. This paper conclusively demonstrated that narcotics, rather than the emotional stress of labour, cause gastric retention. They found that metoclopramide did not counteract the effect of diamorphine and pethidine on gastric emptying.
Efforts were concentrated on alkalinising stomach contents safely and reducing gastric volume rather than on emptying the stomach.

Second look at reduction of gastric acidity

Clear alkalis

Sodium citrate did not cause serious pneumonitis in experimental animals (Gibbs and Wynne 1980). Gibbs *et al* in 1982 showed a rapid increase in gastric pH with sodium citrate. A 30 ml dose of 0.3 M sodium citrate was necessary to achieve a safe pH.

H_2 blockers

Histamine H_2 receptor blocking drugs had been shown to reduce gastric secretion in non-obstetric patients. Dundee's team in 1981[10] used cimetidine intravenously in fasting patients before elective Caesarean section. In all 10 patients who received cimetidine 200 mg intravenously at 60–80 minutes before anaesthesia, the pH of gastric contents at the time of induction was above 2·5. No adverse effects of cimetidine were seen in mothers or infants.

Soon, cimetidine lost favour because of the short duration of action, altered metabolism of drugs and central nervous system side effects. Case reports of cardiac arrest with cimetidine given intravenously rendered cimetidine out of favour.

Thompson *et al* in 1984 [11] advocated the use of oral ranitidine 150mg and saline antacids for aspiration prophylaxis. In 126 patients requiring elective Caesarean section under general anaesthesia they compared the effects of ranitidine alone, ranitidine plus sodium citrate, and ranitidine plus sodium bicarbonate. In all three sub-groups gastric pH and volume were satisfactory. They also gave ranitidine 150 mg orally every 6 hours to women in labour. For 221 of these who required general anaesthesia, they compared pre-induction sodium citrate

with sodium bicarbonate. In the citrate sub-group, there was one patient with a gastric pH less than 2.5, while in the bicarbonate sub-group the lowest gastric pH was 3.8. Sodium bicarbonate was a good antacid, but generated a lot of gas. The gastric distension was an undesirable effect. This paper effectively paved the way for the routine use of ranitidine and sodium citrate as a part of obstetric anaesthetic practice.

Tordoff and Sweeney in 1990 [12] confirmed routine use of ranitidine and sodium citrate for acid aspiration prophylaxis by a survey of 288 UK obstetric anaesthesia departments.

Conclusion

The journey which started in 1946 is still going on. CEMACH reports aim to report on any new cases of acid aspiration in pregnant women every three years. The use of alkalis and H_2-receptor antagonists has not lessened the importance of dietary restriction, cricoid pressure and the use of regional analgesia. Research still continues to improve our practice.

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Editorial comment

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REACHING THE PARTS THAT OTHERS COULDN'T – EVIPAN ANAESTHESIA IN THE OUTBACK!

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Introduction

It was my good fortune to recently spend 4 months of my training programme overseas in Australia, working as a Retrieval Registrar for the Northern Territory Aerial Medical Service in Darwin. 'NTAMS' has been serving the scattered population in the vast extent of land that is the 'Top End' for more than 70 years. Founded in 1934 by the colourful 'character' Dr Clyde Fenton, its origins and subsequent development (separate still to this day from the better known Royal Flying Doctor Service) make for what I believe to be an interesting tale – one which I would like to share with you today. In addition, I will relate some of the experiences of Dr Fenton in using the short acting barbiturate 'Evipan' as an anaesthetic agent in his remote care practice.

Background

Even in the 21st century, the outback is a harsh and unforgiving place with extremes of climate and distance, further hampered by limited infrastructure. Turn back the clock 100 years and it becomes difficult to imagine the hardships faced by people living in such a remote environment. Such was the lack of access to medical assistance that death was the not infrequent outcome from an accident or illness. Even as late as the onset of World War I, there were only 2 doctors covering 300,000 km^2 of Western Australia and the 1,500,000 km^2 of the Northern Territory [1].

Enter the Reverend John Flynn, who in the early 1900's was working as a missionary in the outback. Travelling around by both camel and horseback, he witnessed at first hand the suffering of the people and became determined to place what he called a 'Mantle of Safety' over them. Having established a network of inland nursing missions during the years 1912-17, he then started to formulate a more radical idea - that of an aerial medical service - to overcome the problem of distance. This was indeed a flight of fancy as the birth of aviation had only been in 1903!

Development of The (Royal) Flying Doctor Service

Flynn promoted the idea in his own regular publication, 'The Inlander'. Responding to one such article by letter while en route to the war in Europe by boat, 23 year old ex-medical student Lieutenant Clifford Peel's suggestion that an aircraft could be used as an ambulance as well as supplying a doctor to the place of need encouraged the Rev. Flynn in his thinking, as did the Australian Government of the time. However, Flynn realised that a system of communication in the outback was equally as important as the development of transport for the success of the venture and that he could not achieve this on his own.

Following a series of radio experiments with initially the radio expert George Towns and subsequently the inventor Alfred Traeger, a manually powered wireless set capable of both receiving **and** transmitting messages was successfully developed. Combined with the accumulation of £7000 in donations (in what could be seen as a forerunner of today's charitable organisation sponsored Helicopter Emergency Medical Services in the UK !), this allowed a one year trial of a doctor led aero-medical response service with an aircraft and pilot leased from the small bush airline Queensland and Northern Territory Aerial Services Ltd (QUANTAS !). The first base was established in Cloncurry, Queensland, with the inaugural flight taking place on 17th May, 1928.

The first 11 months of operation saw 50 flights take place over a distance of some 28,980km with 225 patients treated[1]. However, the Great Depression hindered the service's development and there remained a single base until 1935. Subsequently, though, a series of bases were established across Australia with a single constitution and national ruling council. Although officially named the Australian Aerial Medical Service (AAMS), to the people it became known as 'The Flying Doctor Service'.

"One man, one job"

At the outset of World War II, however, there were still only 6 planes and 6 doctors in the service[1]. As doctors joined their patients in enlisting with the armed forces, staffing difficulties meant that during the war years Flynn had to temporarily abandon his long held rule of "one man, one job" (i.e. that a doctor could not also be the pilot) which he had rigidly stuck to in the past.

The Royal Flying Doctor Service (RFDS)

In 1942, the name 'Flying Doctor Service' was officially adopted, with the prefix 'Royal' subsequently added by royal consent in 1955. Nowadays, the organisation is known throughout the world. Funded by a combination of Government subsidy and charitable donations, it has a multi-million dollar annual budget and is well staffed with modern aircraft flying from 23 bases divided into 4 operational sections covering all the huge land mass of Australia – **except** for the northern half of the Northern Territory.

The Northern Territory (NT)

Ask anyone who lives there or who has had the privilege of visiting the Northern Territory and they will all tell you the same thing – the NT is 'different'! It is certainly different from the rest of Australia - whether that is the presence of crocodiles in the rivers **and** the sea (!), the dry and wet season tropical climate, the huge distances between communities (with frequently un-passable roads due to flooding) or the large indigenous population with numerous health inequalities. The down to earth nature of the locals and the ability to maintain their sense of humour despite the harsh environment in which they live is also fairly unique!

An unmet need

The decision of the (Royal) Flying Doctor Service to lease commercial aircraft and pilots consequently restricted their activity to Civil Aviation Authority approved aerodromes with suitable navigational equipment. Unfortunately, these just didn't exist in the 'cultural backwater' of the Northern Territory in the late 1920's. So the scattered population faced long, arduous and often futile journeys to try and reach health care. Until, that is, the heroic work of Dr Clyde Fenton.

Flying Doctor: Dr Clyde Fenton

Fenton was a young medical officer for the Northern Territory Medical Service[2] based in the small town of Katherine some 200km south of Darwin. He took it upon himself to acquire and maintain an aircraft at his own expense, setting up the Northern Territory Aerial Medical Service (NTAMS) in 1934. Facing up to the challenge of flying large distances without modern navigational aids (sometimes at night) and landing on difficult terrain like horse paddocks and claypans in a less than sturdy Gypsy Moth plane in order to meet the health

needs of the local population made Clyde Fenton somewhat of a folk hero to the Territorians.

Fenton had actually approached the Rev John Flynn for help with an aero-medical scheme back in 1928. Having already learnt to fly with the RAF in England, he unfortunately fell foul of Flynn's 'one man, one job' rule that doctors should not also be pilots for missions. Fenton's argument was that while some doctors chose to employ a chauffeur to drive to see a patient many others chose to drive themselves and that there was little difference between this and a doctor flying his own aeroplane to see a patient! Flynn's retort that Fenton was twenty years ahead of his time is reported in a rather exasperated fashion by Fenton in his book 'Flying Doctor – Clyde Fenton' (Georgian House Publishing, Melbourne) [2] as is his observation that he found all this "rather surprising" from someone who was also 'well ahead of the times in his own ideas on aerial medical work'.

Undeterred, Fenton vowed to return to the Northern Territory one day with his own aircraft - as he viewed the aeroplane as "the only answer" [2]. to surmount the problems of distance, communication and poor roads that had frequently in the past made horseback the only practicable way for patients to travel. (Even in the 1930s there was still only one train a week from Darwin to Katherine and this 200km journey took all day!)

As promised, Fenton did return – in 1934 - when he was appointed to the Medical Officer position in Katherine. The posting came with a mileage allowance (1 shilling per mile) – provided an aeroplane was used for transport! Prior to taking up this appointment, he became aware of a second hand De Havilland Gypsy Moth plane that was available for purchase locally for the sum of £500. For the second time he approached the Rev John Flynn – this time to ask for a loan – but was rejected again by Flynn as at this time (pre World War II) he was still sticking to his mantra of "one man, one job". However, with the help of a Darwin solicitor sympathetic to the scheme, Fenton was able to secure a £250 loan from a mining company with interests in the region. The other £250 was provided by Fenton's widowed mother who re-mortgaged some property on her son's behalf, despite being less than enamoured at the thought of her son flying at all! She had good reason – this was just the start of a series of adventures and misadventures for Dr Fenton.

Fenton's book is littered with stories of lucky escapes from aviation related incidents. It's not that he was a poor aviator. In fact, Fenton was an excellent pilot who managed to fly a Gypsy Moth plane from Australia to China following the death of his sister overseas. But the nature of his work meant that

he was frequently having to land on difficult terrain in less than optimal circumstances.

....we cleared the trees with little to spare...
....it was an anxious journey- the air was extremely rough; the machine tossed up and down in terrific jerks which were enough to loosen one's teeth.
...on inspecting the ground, I shuddered to see things I had missed – ditches, tree stumps.....

Consequently, during his time in the Northern Territory, Fenton managed to 'write off' 3 aircraft! Serious injury was avoided each time, though on one occasion he did require hospital admission for some facial injuries...
...drove us to hospital where the nursing staff, used to being ordered about by me, showed some animation at the prospect of a reversal of roles!

However, the main injury was to his wallet! At one stage he was still paying off two crashed aircraft from his wages and had assigned his life assurance to cover the cost of another but after a public subscription was opened in Darwin for the purchase of a new aircraft the Northern Territory Government was shamed into funding a replacement.

This new aircraft was a Fox Moth. Described by Fenton as "a bonny machine", it proved a great success. It was larger, with a cabin in the front into which a stretcher could easily be slid, and alongside which was a seat for an attendant (an accompanying nursing sister). Brakes on the wheels meant it could land in confined spaces and although it was a bit sluggish in take-off, it could go to most places. The Gypsy Moth provided back up.

When WWII broke out Fenton thought his 3000 hours of flying experience would be of value to the Air Board but was disgusted to subsequently hear that his application had been rejected on the grounds of age. But after bumping into a RAAF Group Captain at a party and 'making some rude remarks' his case was reconsidered and in 1940 Fenton found himself called up into the RAAF. So after 6 years courageously serving the people of the Northern Territory he left the region to help the greater war effort.

Despite having a great affection for the Northern Territory and its people, both indigenous and white, Fenton had no plans to return to the area after the war. He viewed that part of his life as a closed chapter. In fact he had actually stopped flying at the end of the war (though the reasons why were not elaborated on in his book). However, in 1948 he was ordered back to Darwin to work as a Quarantine Officer. Though he hadn't flown for 3 years, he didn't like the idea

of being flown around by a government pilot so hired a Tiger Moth and flew himself! Despite only being there for a brief spell, Fenton managed to have another falling out with the Civil Aviation Authority. This was something he had done regularly throughout his previous stay. On this occasion he had flown to a sick patient's aid without having his air pilot licence officially renewed-ending up in court subsequently when I think the CAA tried to make him finally pay for his many previous misdemeanours. Fenton, as usual, got the better of them and had the last laugh.

Although he appears to have made no further visits to Darwin, he (and the work that he did) were certainly not forgotten by the people, with the local primary school still being named after him to this day. On his death in 1982, the front page headline of the Katherine Advertiser read 'Good-bye Clyde Fenton'.
Although there might be no cathedral dedicated to his memory (unlike Flynn of the RFDS who has one named in his honour in Alice Springs), there is a section of the Katherine Historical museum given over to his story. Located on the site of the old Katherine aerodrome, a small hangar houses the first aircraft used by Doctor Fenton, a 1934 vintage DH60 Gypsy Moth (suitably repaired!) and numerous personal effects which give some insight into his life in the Territory. In addition, numerous pieces of medical equipment used by Fenton are on display, including such diverse items as a Franklin's Simplic Super Enema Syringe, an amputation kit and Boyle anaesthetic machine. An OXY-Viva model MA38 Beaver portable resuscitator used by the Air Medical service in Katherine in the 1960s complements the collection.

'Evipan' anaesthesia

Despite the numerous clinical cases related by Fenton in his book, there are relatively few mentions of anaesthesia. However, reasonable detail is afforded to his use of 'Evipan' in remote care practice.

In the mid-1930s, this was a newly introduced drug – also known variously as 'Hexobarbitone', 'EvipanSodium' , 'Cyclural', 'Cyclonal' and 'Evipal Soluble'.

Developed by the chemists Walther Kropp and Ludwig Taub [3] with the pharmacologist Hellmut Weese for the German chemical conglomerate I G Farbenindustrie (subsequently to become infamous for developing the gas chamber agent Zyklon B during WWII), 'Evipan' (or Sodium Methyl Cyclohexenyl Methyl Barbiturate to give it it's offical name!) was the first 'ultra short acting' barbiturate. This made it an ideal agent for procedures requiring a short GA such as dental extractions and minor surgery. To quote

Fenton "To those compelled by circumstance to work without skilled assistance, the discovery of Evipan has been a priceless boon".

In his book, he goes on to describe how the drug was administered by injection into a vein, after which the doctor was free to devote himself entirely to the job in hand. The technique of injection he described as 'simple' – with the drug being given at a steady rate, so much per quarter-minute, with the patient counting aloud. When the counting stopped – thus indicating loss of consciousness - the amount already injected was noted and from this a total dose to be given was calculated. According to Fenton, the whole process took approximately 2 minutes.

Benefits that he reported were that the patient had 'no unpleasant sensations while going under' and that vomiting, nausea and other disagreeable after-effects characteristic of ether were entirely absent.

The main drawback in Fenton's opinion was its evanescence i.e. that the period of unconsciousness rarely exceeded half an hour and thus sometimes additional doses were required.

Evipan in clinical practice

A couple of clinical scenarios related by Fenton help illustrate its use:

...The stockman was a husky fellow and managed to count to 55 before passing out. The dislocation was reduced and I was idly enjoying a cigarette while waiting for him to regain consciousness when suddenly a terrific bellow reverberated through the hut. "Fifty-six! Fifty-seven! Fifty-eight!" And on he went. There was no stopping him.

By the time he reached the century four or five of his mates had gathered at the door, attracted by the clamour. "What's up with him, Doc?" "I got him to count while he was going under. And now he's started again where he left off!"

When he got to 150 we were all convulsed with laughter – but the 200 mark was too much for one chap "Good God. Who does he think he is? Don Bradman?"....

...This case was a typical example of the after effects of the drug.....the partial recovery of consciousness bore a strong resemblance to inebriation...

Confirmation came with the case of a bushman who arrived with a fractured wrist...

... the bone was set under Evipan anaesthesia, after which he had the ward in an uproar – singing at the top of his most unmelodious voice, chattering and guffawing inanely, bandying profane backchat with his fellow patients, cheeking the Sister and offering to fight anyone within reach....

When he quietened down, I went in to inspect his arm He was most enthusiastic about his anaesthetic....
...."By jove, Doc, that stuff's marvellous. Cheapest 'drunk' I ever had in my life!"

Current day practice

Although drugs such as thiopentone and methohexitone superseded Evipan (hexobarbitone) in many parts of the world, its popularity persisted in Germany until it was finally withdrawn from clinical practice by the manufacturer Bayer in 1992. It certainly wasn't in the drug box when I was working with the Northern Territory Aerial Medical Service! We did, however, have the full range of modern intravenous anaesthetic agents available to us and the majority of drugs used in an intensive care unit e.g. inotropes. In combination with modern transport ventilators (Oxylog 3000), invasive monitoring, point of care ABG/electrolyte testing (I-Stat), satellite phone communication and a fleet of modern King-Air aircraft, the team of highly trained pilots, medical and nursing staff can now fly into the outback and offer advanced pre-hospital and critical care support and expertise to seriously ill patients in the middle of nowhere! I am sure that Dr Clyde Fenton would be a proud man to know that the aerial medical service that he set up has continued to grow and develop, offering fantastic care to the people of the Northern Territory into the 21st century.

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BOOK REVIEW

Operations Without Pain: the Practice and Science of Anaesthesia in Victorian Britain. Snow S.J. Basingstoke: Palgrave Macmillan, 2006. ISBN-13:978-1- 4039-3445-1. Hardback, pp. 271. £45.

Dr. Snow is a Research Associate at the Centre for the History of Science, Technology, and Medicine, University of Manchester, UK.
The reviewer, Dr David Zuck, was a practicing whole-time consultant anaesthetist in the NHS for some forty years, and is a Past President of the History of Anaesthesia Society.

In her introduction the author emphasizes that 'In no way is it intended to be a linear history of discoveries, techniques, or famous men.' (p.4) It is a pity, therefore, that the title is so misleading, since this book is not a history of the practice and science of anaesthesia in Victorian Britain. 'Aspect of...' or 'A Consideration of ...' would have been a fairer description. Nor, although it is one in the series Science, Technology and Medicine in Modern History, is there a great deal of science or medicine, and technology is hardly mentioned at all. So such neglected technological topics as the contribution of the commercial chemists and instrument makers, still of great relevance today, do not feature. Instead, taking Pernick's treatise on the early years of anaesthesia in the United States as an example, (1) Dr. Snow has used the history of anaesthesia 'to illuminate three areas of current historical interest: the relationship between medical practice and science, the dynamics which structured patient-doctor relations, and the specialization of medical practice.' She has, also, 'approached the first two issues from a particular historiographical vantage, using a typological model of medicine.' So essentially it is an intellectual and a social history of the introduction of general anaesthesia, and of the response of surgeons and the general public to its early problems, leading up to its secure establishment in medical practice and its gradual acceptance as a specialty, written from the viewpoint of a particular school of social history. As such it invites comparison with Pernick's approach.

Dr. Snow, in her introduction, explains that 'Most writers portray anaesthesia as a natural and inevitable phenomenon of 'modern' medicine which enjoyed an immediate and sustained take-up and developed uniformly. But this was not so; the early use was uncertain and differed between nations.' She suggests that ether being a difficult agent to use, it was only the introduction of chloroform that saved anaesthesia from remaining 'on the margins of British practice.' But chloroform was occasionally associated with sudden death, and she notes the different responses in different parts of the world, abandonment in some, acceptance in others, with the development of different methods of

administration in, for example, England and Scotland. 'To skate over such complexities is to prevent the history of anaesthesia from informing our deeper understandings of nineteenth-century medicine and society.' This accusation is hardly fair, since the response of the medical profession during the remainder of the century is a major feature of serious histories of anaesthesia. In Duncum's book, for example, the bible of the historian of anaesthesia, over one hundred pages are devoted to the first twenty five years of the use of chloroform, including some twenty to an analysis of the report of the Chloroform Committee of 1864 alone. (2) In this respect Dr. Snow's exclusion of the physiologist A.D. Waller and the second dosimetric movement that he spearheaded is a major omission.

Now we come to the crux of Dr. Snow's book. The late Richard Ellis developed the thesis, not generally accepted, that after the initial enthusiasm, a run of time-wasting failed inductions and inadequate anaesthesias put the procedure in danger of being abandoned, and that it was only kept going by the persistence of the dentist James Robinson, until John Snow produced predictable and reliable effects by establishing it on sound scientific principles. This would have put it at hazard for at most two months. But Dr. Snow, 'putting anaesthesia under a wider historical lens', has turned her gaze onto the 'complex patterns of innovation, reversals, debate, and geographical difference by which anaesthesia became established in British medicine,' and as a result feels that the doubts persisted for up to twenty years. She has identified two distinct phases, the first extending from 1846 to 1860, during which it was debated whether the risks were greater than the benefits. 'That issue is the heart of this book ...' (p.4) So although she covers the period 1790 to 1900, by which time the practice of anaesthesia had become 'embedded into social and medical culture,' the larger part of her discourse is devoted to a close examination and analysis of opinion, theory, and practice, during the years up to the mid-1860s. Her penultimate chapter takes the emerging specialty to 1900, and she concludes with an overview of national similarities and differences, and a brief look at developments into the twenty first century.

It is impossible in the space available to comment, as an anaesthetist, on all the disputatious points that Dr. Snow makes. This would require an even longer book than the original, so I will try to answer two questions and deal only with her main thesis in any detail, commenting briefly on other points. Unlike Pernick, the book begins conventionally with the pre-history of inhalational anaesthesia, with Humphry Davy's and his friends' observations on the effects of inhaling nitrous oxide, and its analgesic property. Dr. Snow comments that historians have failed to tackle the commonest of the FAQs about the history of anaesthesia: why neither Davy nor his contemporaries pursued his suggestion that nitrous oxide 'may be used with advantage during surgical operations ...' Careful reading of Davy's treatise on nitrous oxide, however, which it doesn't

get very often nowadays, shows this was a throw-away remark, and that his real interest was elsewhere. (3) But nitrous oxide *was* tried, with alarming results, at a meeting of the Askesian Society in March 1800; among those present was the influential surgeon Astley Cooper. William Allen, of Allen and Hanburys, lecturer on chemistry at Guy's Hospital, related his own sensations, and the reaction of his friends. 'The company said that my eyes were fixed, face purple, veins in the head very large, apoplectic stertor. They were all much alarmed, but I suffered no pain and in a short time came to myself.' (4) His friends thought he was having a stroke, and this was sufficiently alarming for the experiments to be terminated. Does one need more explanation of why Davy's suggestion was not taken up? Furthermore, it is tacitly understood by anaesthetists that nitrous oxide was the wrong agent. It was suitable for the uncomplicated extraction of a small number of teeth or the lancing of an abscess, but for nothing more. This was the limitation faced by Horace Wells, the real pioneer of general anaesthesia, who, sadly, Dr. Snow has airbrushed almost completely out of the picture. Wells's search for a method of pain relief in dentistry was philanthropic, motivated by his desire for improvements in denture technology, and neither his nor Morton's discoveries were, as she says, serendipitous. Wells's mind was the prepared soil into which the Colton-scattered seed fell and germinated. Morton, following Wells, was looking for a better agent deliberately, for commercial gain.

Dr. Snow continues with the influence on medical practice in the early nineteenth century of changes in the attitude to the body, from what she calls 'biographical' to 'scientific' medicine. This is the typological model to which she referred earlier. I am not clear from her description whether in their essentials these not necessarily exclusive approaches to medical practice are different from what has been described elsewhere as 'bedside' and 'scientific' or 'hospital' medicine. (5) It appears to be distinct from the change from 'Rush heroic' to the more moderate approach labeled 'environmental moral' by Pernick. At any rate, a gradual change did occur, but slowly, as can be seen from the conservative nature of some of the contributions to discussions in the Westminster Medical Society as late as the mid-1840s, in spite of the efforts of John Snow. But whatever they are called, these attitudinal changes, while she concedes that they had no influence on the actual introduction of general anaesthesia, were of great importance in preparing 'elite physicians and doctors' – a group Dr. Snow mentions several times, one wonders who these were - for its acceptance.

This leads to the second of the FAQs about anaesthesia echoed by Dr Snow - why it emerged in the 1840s rather than in an earlier period, 'though the gases used had been known for some time and inhaling vapours was an established therapeutic practice.' She comments that few historians have sought to explain this; so, the answer being crucial to the main burden of her book, let

us try. Just posing the question implies, rather ahistorically, that since we now know that general anaesthesia is 'a good thing,' therefore it was the duty of someone to have introduced it as soon as it became feasible. It also makes the enormous assumption that the procedure could, like Botticelli's Venus, have emerged from the foam fully formed, perfect, demure, and ready to go. But great innovations are made by people, and Dr. Snow, by excluding from her discourse the vagaries of 'the crooked timbers of humanity,' such as enthusiasm, inventiveness, persistence, ambition, greed, inertia, and lack of interest or of imagination, has, unlike Pernick, excluded a whole stratum of explanation. Because the truth is that, humanitarian arguments notwithstanding, before Henry Hickman no one was looking; it never appears to have entered anyone's mind that it could be done. (6) The possibility had been positively dismissed by the great French surgeon Velpeau, and the American Valentine Mott. So, conceptually speaking, *acceptance of the idea* that one might safely and reversibly deliberately produce unconsciousness, hitherto an ominous sign of life-threatening illness, was a *Kuhnian paradigm shift*. (7) Other biological examples may be mentioned. Until Pasteur's flash of inspiration no one believed that living organisms could survive without oxygen, but seeing dead bacteria round the edge of a cover slip he discovered, or constructed, anaerobes. No one believed that any living organisms could withstand prolonged boiling, or live under the enormous pressures of the depths of the Pacific Ocean, until the opposite was demonstrated. The acceptance of the controlled and reversible unconsciousness of general anaesthesia was a conceptual change of similar magnitude, and once this acceptance is recognised as a Kuhnian shift, then all is illuminated; and the twenty years of uncertainty, the acceptance by the next generation, and the normal science developed by John Snow, are to be expected; being, by definition, predicted. Although she does not give any indication that she recognizes the nature of this acceptance, Dr. Snow is moving in the right direction when she claims that the attitudinal change already mentioned prepared her 'elite physicians and doctors' for it.

There are two further considerations. In early Victorian times people were not as accustomed to the rate of change as we ourselves have become conditioned to, being able to take the most drastic changes in everyday life in our stride, and this has to be taken into account when looking back at that period; so prolonged opposition to such a dramatic and potentially dangerous procedure as general anaesthesia is not surprising. The second and clinching factor was the introduction of antiseptic, shortly followed by aseptic, procedures into surgery. If general anaesthesia had not already arrived, it would have had to be invented. Anyone who has seen a patient restless under regional or spinal anaesthesia disturbing the sterile drapes will see the force of this argument. In the words of the great physician Sir Clifford Albutt, 'When I was a boy ... the best surgeon was he who broke the three-minute record for amputation or

lithotomy. What place could there be in record-breaking operations for the fiddle-faddle of antiseptic precautions? The obvious boon of freedom from pain, precious as it was ... was the boon of time. With anaesthesia ended slapdash surgery; anaesthesia gave the necessary time for the theories of Pasteur and Lister to be adopted in practice.' Pernick makes a similar point, less eloquently. So really, by the mid-1860s there was no question of turning back.

To proceed with Dr. Snow's arguments, most of four chapters are devoted to what we may now call the phase of paradigm resistance. She makes a great point of the restraint, the self-control, that had become expected by the early Victorian period of patients undergoing surgery, sometimes described as 'bottom,' and suggests that after the first successful demonstration, 'reputable doctors' would have difficulty accommodating to ether anaesthesia because it 'placed patients beyond individual self-control.' (p.40) It seems that she is referring to the stage of excitement through which most patients passed, more marked with ether than chloroform, before full surgical anaesthesia was reached. Yet in her introduction she says, without supporting references, that 'surgeons were accustomed to terrified or restless patients, but not to the newly insensible body which still breathed and might struggle in a way that inhibited surgery.' (p. 3) The only author I am aware of who clearly expressed the reaction of the surgeon to operating on the anaesthetised patient was the great Russian, Pirogoff, whose treatise on ether is required reading for anyone setting out to write about the early days of general anaesthesia. (8) He described with great eloquence his initial reluctance to use ether, his rapid acceptance, and his equally rapid realization that it greatly extended the scope of palliative surgery; yet his work is not referenced nor included in the bibliography.

After the initial demonstrations there was a short period during which many doctors, druggists, and pharmacists, thought that anyone could administer anaesthetics, and inhalers were designed by the dozen. Few practitioners realized the physiological complexity of the process, and speedy disillusionment resulted in a spate of horror stories. John Snow, in the meantime, designed an inhaler that allowed him to control the concentration of ether inhaled, and embarked on a programme of research that was aimed principally to establish the relationship between the resulting blood content and the depth of anaesthesia. But Dr. Snow describes his approach in terms that will be foreign to most anaesthetist historians. He had placed anaesthesia 'in the elite frameworks of anatomical and physiological knowledge, and then, by the use of analytical principles, he had tailored a specific intellectual framework for the etherisation process.' (p.59) Whether the high level of intellectualization that one encounters here and throughout the book is appropriate to the subject may be debated. After all, the chap just prepared a table of concentrations at different temperatures, designed an appropriate apparatus, and experimentally determined the percentages necessary to produce the required depths of anaesthesia. Was it not

Freud himself – or maybe Jung – who is reported to have said, that whether we have snipped the end off it or not, there must be an occasion when a cigar is just a cigar?

The chapter concludes with the replacement of ether by chloroform, and an account of the first chloroform death. There is not room here to discuss this in detail, but Dr. Snow is not entirely accurate in suggesting that Fife and Glover, the expert witnesses, equated the congestion of the lungs that they found with asphyxia.

Dr. Snow continues with an account of the Snow/Simpson dispute, and John Snow's attempts to persuade the profession to establish the practice of anaesthesia on sound physiological principles. This is analysed in terms of 'the very different models of the body and its systems each drew on,' and in Simpson's case there was also the 'particular resonances of Scottish Enlightenment philosophies' with its emphasis on philanthropy. 'For Simpson and other Scottish doctors anaesthesia was a vivid articulation of the humanitarianism which lay at the heart of medical practice.' But there is nothing to suggest that John Snow was any less humane, and it is very likely that he was as well acquainted with the works of the Scottish Enlightenment philosophers as Simpson. (9) The difference can be explained more simply by reference to Celsus, who wrote, around the beginning of the first millennium, in the introduction to his *De Medicina*: '... there is a primary difference of opinion, some holding that the sole knowledge necessary is derived from experience, others propounding that practice is not efficient enough except after acquiring a reasoned knowledge of human bodies, and of nature ...' The conflict described by Celsus runs throughout this book, exemplified by the difference between John Snow and the English school of anaesthetists, and Simpson and the Scottish.

The next chapter deals with the risks of anaesthesia, and its use in midwifery. Here Dr. Snow says that by the early 1850s the patient's dread of surgery had metamorphosed into a particular fear of the anaesthetic. But it is not generally recognised that patient reluctance dates back to the very earliest days of general anaesthesia. On 28th December 1846 a patient of Robinson's refused to inhale ether vapour, having heard, 'that I sent people to sleep and then took out all of their teeth.' Here, astonishingly, is the birth of a meme, a transferable unit of cultural information, that has multiplied and spread beyond measure. Where could this fear have come from? Robinson by then had administered fewer that ten anaesthetics. The patient had no reason to fear death, because there had been none. His fear was of the loss of autonomy, of what might happen to him while unconscious; and patient reluctance continued to be a feature. Pernick makes the same point. Hooper's remarkable suggestion about the desirability of patient-controlled inhalational analgesia to overcome it was published as early as April 1847! (10)

The almost equal reluctance of doctors to administer anaesthetics, which Lister spent some twenty years trying to overcome, and which operates even to this day, and is an important factor in its availability, is barely recognised by any of the writers on this subject. Dr. Snow, by focussing, as we shall see later, on the practice of John Snow, which was by no means typical, has excluded consideration of what was happening elsewhere. Thus Lister, writing in1862 in T.A. Holmes's *A System of Surgery*, was concerned that general anaesthesia 'was scantily used in parts of the United Kingdom because of fear of fatalities.' In Scottish hospitals, where most of the anaesthetics were given by medical students 'coming fresh every three months', a simplified technique had to be developed. For the conscientious anaesthetist this concern never wholly goes away. Some years ago a very distinguished Dean of the then Faculty of Anaesthetists – now the Royal College - confided to me his initial nervousness on returning to the anaesthetic room after an absence of several weeks, a feeling well-known among the specialty, 'It was just like starting all over again.' So there is always the mundane possibility that the patient did not receive an anaesthetic because there was no one prepared or available to administer it, a situation not unknown in our hospitals today. Even John Snow records occasions when, under pressure of work, he induced anaesthesia but did not stay for the operation, relying on the speed of the surgeon to see the patient through. While Dr. Snow mentions part of Lister's article, she references not the original but only the excerpt in Duncum. If that is all she read, she missed some matters of great importance.

Pernick surveyed anaesthetic usage as recorded in three sets of mid-nineteenth century surgical records. Dr. Snow, similarly, has examined the records of a number of London teaching hospitals, and, taking John Snow as an exemplar of anaesthetists practicing during the 1850s, has analysed his work as described in his casebooks in some detail. Her interpretation of her findings requires comment. John Snow anaesthetised regularly for William Fergusson, and Dr. Snow, from examination of patients' statistics recorded at King's College Hospital, and comparison of the ratio of the total of Fergusson's hospital consultations to those operated on at various times, has identified a period during 1854 when fewer operations were performed under general anaesthesia. She attributes this to Fergusson's anxiety about an increase in the number of chloroform deaths, and a comment in the *Lancet*, cited in an earlier chapter but not here, is of relevance; but the samples are small, there are a number of inconsistencies in the tables – I am indebted to Dr. Henry Connor FRCP for his very careful examination of these - and we are not told whether they have been subjected to statistical analysis, nor what was happening both in that and in other hospitals. Only one of the deaths was at King's, (p.104) although this is missing from the list in the Appendix, and John Snow had none. It must be significant of Fergusson's attitude that during the month immediately

after John Snow's amylene death in 1857 he anaesthetised the greatest number of Fergusson's private patients in any four weeks, and also Queen Victoria. A reduction in the number of operations in 1857 similar to that in 1854 receives no comment. There are many reasons for the curtailment of operating lists, as we know only too well today, staff shortages, ward closures, and so on, and these need to be excluded. In fact during the years in question King's College Hospital, the old St. Clement Danes workhouse, was very short of beds, was being rebuilt while attempting to stay open, and was running out of money, all good reasons to explain why Fergusson's hospital lists were being curtailed while his private work was not. Also, while John Snow may rightly be regarded as an example to be followed, he was in no way an exemplar in the sense that Dr. Snow is using the word, a fair sample of the average in anaesthetic practice; he was unique, and it would be misleading to generalize from his experience.

Dr. Snow's discussion of the pros and cons of the use of inhalational analgesia to relieve the pains of labour is comprehensive, occupying ten pages, and culminating in the experiences of Queen Victoria, expressing the conventional view that after her first, in 1853, 'there had been a significant change in attitudes to childbirth anaesthesia ...' (p.122) but she does not mention the research of the Connors, which throws serious doubt on the need for, and extent of, Her Majesty's influence. (11)

It is not apparent that Dr. Snow consulted any anaesthetists, since they would surely have advised her, among other things, that ether and chloroform are not gases; that chloroform kills by inducing ventricular, not atrial fibrillation; that atropine, which causes excitation of the central nervous system, is not a narcotic, and, since it dilates the pupils, is not used to treat this condition; and that Junker's apparatus, the first plenum vaporizer, introduced in 1867, which is mentioned only in passing, was technologically a great step forward, in that it allowed anaesthesia to be maintained during operations with the mouth open. The importance of this is seen in the tribute paid by Fergusson to Thomas Smith, surgeon to Barts, who greatly increased the success rate of operations for congenital cleft palate by advocating, in 1868, the use of his gag to keep the mouth open, together with general anaesthesia. She would have been advised also not to dismiss Joseph Clover, generally recognised as John Snow's successor as the leading English anaesthetist, who for a while practiced also as a surgeon, inventing the Clover crutch, a lithotrite, and a cervical cautery, because he 'did not champion anaesthetic matters through medical networks.' (p.192) Duncum says exactly the opposite. (p.457) Clover spoke at meetings, especially of the Odontological Society, where in the late 1860s most of the action was as regards advances in anaesthetic techniques, taught medical students, invented apparatuses, published papers in journals, and the article on anaesthesia in Quain's encyclopaedia. Dr. Snow does not explain what other medical networks she has in mind.

The book concludes by considering the acceptance towards the end of the century of anaesthetics as a specialty, and without supporting references unconventionally attributes the anaesthetists' claim to this status not to their technical expertise, as one might expect, but to their ability to induce a sense of calm in the patient. I would have thought that the ability to give an effective anaesthetic smoothly and safely was the primary consideration of most surgeons. This view was expressed most strikingly at a meeting reported in the *British Journal of Dental Science* in 1868 by a dental surgeon, Mr. Mummery, who said '... that the Dentist was often placed in very painful circumstances of anxiety by the medical attendant of the patient coming and volunteering to give chloroform, when, perhaps, he knew a great deal less about it than the Dentist did.' Of three of his cases that had nearly terminated fatally, he was sorry to say that two of the gentlemen administering the chloroform were Scotch doctors. 'They had seen Dr. Simpson give chloroform, and therefore thought they knew all about it.' One doctor 'seemed to think he had a sort of heaven-born talent for administering chloroform, because he had seen Dr. Simpson exhibit it.' ... ' He had operated many times with Mr. Clover... and never had the slightest passing uneasiness, but he had been frightened out of his wits by people's own doctors.' So it seems that it is the ability to induce a sense of calm in the operator, not the patient, that is the criterion.

Dr. Snow does not give us her definition of a specialty. The one I have found most applicable is an extension of that formulated by Friedson for a profession, (12) that it should determine its own standards of training, recognise its practitioners by some form of licensure, and control and man its own examination board; and anaesthetics did not fulfil these requirements until the 1930s. (13) But even by Dr. Snow's standards, the position of the anaesthetist was by no means secure at the beginning of the twentieth century. 'Who, in the eye of the law, is qualified to administer an anaesthetic?' asked Buxton in the 1914 edition of his textbook. '... nurses, students, butlers, coachmen, dispensers, and various unqualified persons have been frequently permitted to give the anaesthetic, or, as the phrase is, "keep it going," while the surgeon, besides operating, is supposed to exercise a general supervision over the administrator's proceedings.' Six years later, Barton laconically summed up the contemporary situation. (14) ' The anaesthetist does not loom largely in the public eye. With few exceptions his very name is unknown to the public, and his services are not carefully selected by the patient ... The patient writes the cheque and promptly forgets the anaesthetist's name; he probably never considers, and certainly is not in a position to know, what he owes in safety and comfort to his skill.' Dr Snow says, confusingly, that by the 1890s 'the minutiae of anaesthetic practice was outside the experience of most doctors,' and a little later, that 'until the inauguration of the National Health Service in 1948 ... general practitioners undertook the majority of administrations ...' This

was certainly true of elective anaesthetics in large areas of the country, but emergencies were almost all anaesthetised by junior hospital doctors (15). It is doubtful whether there was one anaesthetist in specialist whole time practice between Birmingham and Bristol before the NHS. However, lumping all general practitioners together is misleading. Some of the leading anaesthetists, right until 1948, when the NHS drove a wedge between hospital and domiciliary practitioners and forced them to choose, also engaged in general practice – the great Alfred Lee, author of the *Synopsis*, in its tenth edition at the time of his death, translated into six languages and used worldwide, and John Beard, of the Royal Postgraduate Medical School and Hammersmith Hospital, a pioneer in anaesthesia for vascular and cardiac surgery - to mention two.

Dr. Snow makes wide generalizations without supporting references. Her criticisms may apply to some of the standard histories of anaesthesia, most of which were published many years ago, but she almost completely ignores the considerable volume of more recent work to be found in the thirty five volumes of the *Proceedings of the History of Anaesthesia Society*, of which she is a member, and the proceedings of the five international symposia – the sixth is under preparation – held since 1982. Similarly her journal references are strongly biased towards the *Lancet* and the *London Medical Gazette*, with the result that such important matters as the enquiry and campaign to replace chloroform by ether, led by the *British Medical Journal* during the 1870s, are not mentioned. Her bibliography, by listing the editions she presumably referred to, and not including the earliest date of publication, is disconcerting, to say the least. Dr. Duncum's book was first published in 1947, not 1994. Bichat, who died in 1801, did not first publish his *Physiological Researches* in 1987, and Davy's treatise on nitrous oxide came out in 1800, not 1972. There are also references which could not be found in the bibliography, one or two entries which are out of order, and the founder and first editor of *The Lancet* has become reconstructed into Wakely. The impression is left of not very careful attention to accuracy of detail.

The high level of intellectualization has already been mentioned. Space is spent, for example, discussing the difference between mesmerism and inhalational anaesthesia, without mentioning the down-to-earth fact that ether is a substance that can be seen, felt, smelled, and measured, while hypnotism is not. In some places the language is obscure, and shows evidence of inadequate editorial attention. 'The surgical focus was on the body' – where else? 'The design of inhalers should mesh with the clinical context.' (p. 81) Presumably this means that they should be suitable for the conditions in which they are being used. 'Prior to ether the surgeon and patient functioned as a symbiotic unit.' To discover that this means more than that if asked, the patient would move a limb or change position, it is necessary to turn to Pernick. Also there are certain expressions the nuances of which were not appreciated, that will mislead

the anaesthetist; thus neither Brodie nor Hawkins 'used' chloroform (p.100), they operated on patients anaesthetised by it. John Snow used it, and would have used it on Peel, at their request. One wonders why he was not consulted – an interesting sociological question.

I hope I have not been unfair in any of my comments. Obviously a lot of hard work has gone into writing the book, as Dr. Snow says in her acknowledgements. It contains a collection of information on the disputation phase of the paradigm shift that is not readily available elsewhere. It is well referenced, nicely produced, well bound, with good heavy covers, and although expensive, I hope it will score a bulls-eye on the target readership at which it is aimed.
Dr. Snow's response to an earlier, slightly different version of this review will be found at www.history.ac.uk/reviews/paper/zuckresp.html. It will be noted that she does not reply to major points of criticism, and being impervious to irony, misunderstands others.

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