ISSN 1360-6891

THE HISTORY OF ANAESTHESIA SOCIETY PROCEEDINGS

Volume 23

Proceedings of the meeting in Southend
26th and 27th June 1998

VOLUME 22. ERRATUM.
The acknowledgements page for the Leeds Proceedings was inadvertently omitted. Please accept the apologies of the Hon Editor and the printers.

The History of Anaesthesia Society

Winter Meeting, February 1998

Acknowledgements

The Society expresses its gratitude to Dr Tony Bennett, and to the members who helped at the meeting.
The kind assistance and co-operation of the Museum Trustees and Staff is gratefully acknowledged.

Material and financial support were provided by the McKesson Equipment Company, Anaesthetic Division of Cestradent Ltd.

Proceedings of the History of Anaesthesia Society

Editor Dr A Marshall Barr
Norscot, Rosebery Road,
Tokers Green, READING RG4 9EL
Tel/fax: 0118 9479646

Publication Coordinator Dr F E Bennetts

The contribution of **Abbott Laboratories** to the preparation and printing of these Proceedings is gratefully acknowledged.

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

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The History of Anaesthesia Society

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Acknowledgements

The Society expresses its gratitude to the local organisers Drs RS Atkinson, RC Birt, D Higgins, GB Rushman and Catherine Wisely, and to Prof JAW Wildsmith. Thanks also to Mrs Judi Sharpe, Mr Roger Kittle and to the staff of the Postgraduate Education Centre, Southend. The Meeting was generously supported by Abbott Laboratories Limited, Antigen, Astra, Glaxo Wellcome, Morten Healthcare, Sims Portex and Zeneca Pharmaceuticals.

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Editor: Dr A Marshall Barr
Norscot, Rosebery Road
Tokers Green
READING RG4 9EL
Tel/fax: 0118 9479646
Email: Marshall.Barr@btinternet.com

Publication Coordinator: Dr F E Bennetts

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HISTORY OF ANAESTHESIA SOCIETY

Southend Meeting, 26th-27th June, 1998

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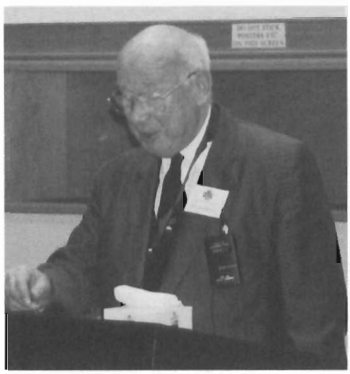

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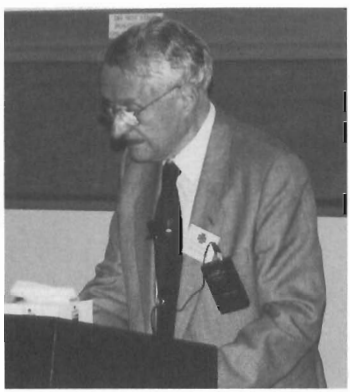

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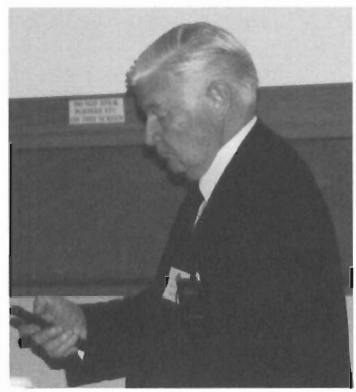

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Speakers at the Southend Meeting

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Dr G L Zeitlin

Speakers at the Southend Meeting

Dr I McLellan - President Elect

Dr Jean Horton - Presidential inauguration

PROCEEDINGS OF THE HISTORY OF ANAESTHESIA SOCIETY

Volume 23

Southend Meeting - June 1998

JOHN ALFRED LEE 1906-1989 - A PERSONAL VIEW

Dr R S Atkinson
President, History of Anaesthesia Society

The Inaugural Meeting of the History of Anaesthesia Society took place in Reading in 1986 with J Alfred Lee as its first President. This year it is ten years since this society met in Southend in February 1988 and 1998 saw the end of his presidency. Spinal anaesthesia was one of his many interests and this year marks 100 years since the first clinical use of spinal anaesthesia in Kiel, Germany. So some thoughts on J Alfred Lee are particularly appropriate for this meeting. The main facts about the life of Alfred Lee are well-known. But no anaesthetist knew him so well or worked so closely with him as I did subsequent to my arrival in the Southend Department of Anaesthesia in early 1961. This talk concerns his life as I remember him.

There were three stages when my knowledge of anaesthesia increased sharply. The first was in the early years as a junior at Bart's, the second during my year in America, but the third and most important period was after I had achieved consultant status and came under the influence of Alfred Lee. Of course, I had known about him much earlier, mainly because his book *A Synopsis of Anaesthesia* was one of the few texts readily available to those sitting examinations in the 1950s and it was because Alfred worked in Southend that I applied for a consultant post here when one became available in the early 1960s.

Alfred and Norah

One story concerns my wife-to-be. I was working for the examinations and carried my copy of the *Synopsis* everywhere, reading bits when opportunities allowed. One day it was too much for her. After a session reading the *Synopsis* on the beach at Worthing, she said to me 'When you have finally passed this examination I never want to see this book again'. Little did she know.

Alfred Lee was born in Lancashire, the son of a Congregational minister, and received his medical education in Newcastle, then part of the University of Durham, where he qualified in 1927. It was in Newcastle that he met Norah, who was to become his wife and close companion to the end of his life. In the early 1930s he moved to Southend where he became a general practitioner with sessions in anaesthesia. He took the Diploma of Anaesthetics in 1940 and following the wartime evacuation from Dunkirk became anaesthetist in the Emergency Medical Service at Runwell Hospital. With the start of the National Health Service in 1948 he became a Consultant Anaesthetist at Southend and Rochford Hospitals.

Publications

This young man, with no academic background, except for a week or so working with Robert Macintosh in Oxford, was to become one of the leading anaesthetists in this country, enjoying international recognition. How did this come about? Alfred Lee was primarily a clinician. He did little research, but he wrote books and papers and was invited to give prestigious lectures.

His first publication was in *The Lancet* in 1943 entitled: *'Serial Spinal Analgesia'*. He always used the term Spinal Analgesia rather than Spinal Anaesthesia. It is interesting that Lemmons' first paper on continuous spinal anaesthesia was only published in 1940 and that by Edwards and Hingson on continuous caudal analgesia in 1942. From the beginning, Alfred was well read, practical and industrious.

After the war was over, many doctors who had received training in anaesthesia in the Armed Forces were returning to civilian practice. There were relatively few textbooks available and Alfred saw the need for a small pocket-sized synopsis and approached publishers with this in mind. He submitted some specimen chapters to John Wright of Bristol and the result was the first edition of the *Synopsis of Anaesthesia* in 1947.

Alfred had no secretarial help, no hospital office and, of course, there were no word processors then. He later gave me the manuscript for this first edition, all in longhand! The *Synopsis* proved to be a great success and further editions followed. Alfred was to take a personal part in the publication of the first ten editions which were translated into a number of foreign languages. His name became known world wide and as the years passed he had many visitors from many countries. It was only in recent editions that equipment like word processors came to be used. In Alfred's time, before a new edition, the publishers would send the authors a mountain of huge sheets of paper, each one with a page of the previous edition pasted on so that alterations or additions could be added, usually in longhand though larger pieces of new material would sometimes be typed. The final manuscript would be taken to the publishers by car and, as I remember, only once was the manuscript returned as too untidy to be used!

Other notable books he took part in included the 8th edition of Langton Hewer's *Recent Advances in Anaesthesia and Analgesia* in 1957, for which his contribution was again delivered in longhand. There were also Sir Robert Macintosh's *Lumbar Puncture and Spinal Analgesia*, the 3rd, 4th and 5th editions, *Practical Regional Anaesthesia* with Roger Bryce-Smith in 1976 and, unusually for a clinician, collaboration with an administrator which resulted in *The Hospitals of Southend* with Malcolm Jefferies, the District Manager, in 1986.

International reputation

Alfred was a keen attender of international meetings and he attended congresses in The Hague, Toronto, Osaka (travelling on Japanese Airlines which he was amused to note carried the abbreviation JAL), India (when he is said to have avoided gastro-intestinal upsets by keeping to a diet of bananas), Auckland and Christchurch and many more. He was a leading man at the first International Symposium on the History of Anaesthesia held in Rotterdam in 1982 and was the British editor, with his Dutch colleagues, of the *Proceedings*. He was also a contributor to the second Symposium held in London.

During all these years Alfred carried a considerable clinical load. On Mondays, Tuesdays and Wednesdays his afternoon lists always carried on late into the evening. Thursdays would finish in good time and he had Friday afternoons free. This enabled him to travel to London for meetings of the Royal Society of Medicine and, perhaps, the opera. But he had a list on Saturday mornings with Miss Eileen Whapham, gynaecologist, who was a quick surgeon and who liked to work with the benefits of extradural or caudal block. Saturday morning was often particularly convenient for visitors and the list often began with one or two D&Cs so that time could be spent demonstrating blocks. He always had juniors available to help give him time for his visitors.

Alfred had no secretary, no hospital office. He would say that his brief case was his office and for any particularly private discussion he and his visitor would retire to the lavatory. When did he get time to read? Fortunately, his operating lists seldom started early as many of his surgeons came down from London, or even Luton. In the 1960s the hospital library was immediately adjacent to the theatres and he was often to be seen catching up on the journals when they were late. He would, of course, also read at home, where one of the upstairs rooms was a study, and if on a Saturday morning you could mention something he had missed in the *British Journal of Anaesthesia*, *The Lancet* or the *Times* your day was made. He was widely read and took an interest in football. Born near Liverpool he supported Everton, but as he had been educated in Newcastle he also supported Newcastle. I remember him saying that the only time he was confused about who to support was when Everton were playing Newcastle in the football league!

Alfred had many distinguished visitors and many more of the more ordinary variety. He was on friendly terms with Sir Robert Macintosh, Langton Hewer, Massey Dawkins and many others. He had friends in Germany, Belgium, North America and Australasia, too many to name. Junior anaesthetists working at Southend came from many countries, including the Indian sub-continent, the Middle East and Australasia. He taught them well and took many of the less well-off home to tea.

What did Alfred do for Southend Hospital? He led the way in the dramatic developments in anaesthesia which occurred in his lifetime. He was proud to have developed, in 1949, the first Anaesthetic Outpatient Clinic in any British hospital. In particular, all patients for inpatient dental anaesthesia were seen and assessed here. So were all major gynaecology patients; many were advised to lose weight, given a simple-to-understand diet sheet, and seen at fortnightly intervals to assess progress. Advice could be given to stop smoking, routine haemoglobin estimation occasionally unearthed problems, diabetics were sometimes discovered and more serious underlying disease occasionally found.

In 1955 he started the first postoperative ward in a general hospital in England. He insisted that it be called the Post-Operative Observation Ward and not the Recovery Room, as observation was the key to its function. It was situated close to main theatres, and independently staffed with its own sister in charge. The present unit is called the J Alfred Lee Postoperative Observation Ward in his memory. It was open 24 hours a day, seven days a week and patients could, if necessary, stay for several days. This led on much later to the development of the Intensive Therapy Unit, though Alfred did not have a direct role here. The Postoperative Ward gradually came to house a few patients needing intensive treatment and not all had had surgery. Alfred spoke up for the need for an ITU in medical committees and arranged for me to visit such units as were already established with the input of anaesthetists in Oxford, Liverpool and Manchester.

Alfred was interested in spinal techniques, though that is a subject dealt with elsewhere in these proceedings. I will just mention that he was invited to speak in London on the subject of Alfred Barker and that his name was given to the Lee extradural needle. This had centimetre markings, the first mark being 4 cm from the needle tip, since distances less than 4 cm were seldom required in extradural block. Incidentally, he always preferred the terms subdural and extradural to distinguish the two types of spinal block.

Alfred encouraged his colleagues to attend meetings, to keep abreast of developments and, though he would take no part himself, he supported the development of the then new local analgesic, bupivacaine, so that Southend was responsible for the first publication in the British literature (by one page!).

Nationally, Alfred Lee played a big part. He was a member of the Board of Faculty of Anaesthetists, and an examiner for the Final Fellowship Examination. As such, he was always polite. Only once, he told me, did a candidate complain afterwards: 'If you were going to fail me,' she said, 'why did you keep smiling?' He was asked to give the Joseph Clover Lecture in 1960 and was made Faculty Medallist in 1970. The Faculty of Anaesthetists of the Royal College of Surgeons in Ireland made him an Honorary Fellow in 1970.

The Association of Anaesthetists of Great Britain and Ireland was another body in which he played a great part. He was Assistant Editor and, later, Chairman of the Editorial Board of *Anaesthesia* (from 1970 to 1972) and served as President from 1972 to 1973. He was, of course, an Honorary Member. In the Royal Society of Medicine he served a term as President of the Section of Anaesthetics in 1959 to 1960 (and in those days Presidential Addresses were published in the *Proceedings*), having been Honorary Secretary between 1952 and 1954. In 1985 he joined the very select group (only one every three years) as Hickman Medallist.

Among the many honours and invited lectures some require special mention. 1984 was the centenary of the first use of cocaine by Köller in Vienna and Alfred was awarded the Carl Köller Gold Medal of the European Society of Regional Anaesthesia in that year. In 1985 he gave the Gaston Labat Lecture to the American Society of Regional Anesthesia and in 1986 the T H Seldon Distinguished Lecture to the International Anesthesia Research Society in Las Vegas. Nearer home, he was invited to give the Stanley Rowbotham lecture at the Royal Free Hospital.

Alfred Lee the man

Following retirement in 1971, Alfred continued to carry out locums in Southend (happy to do even SHO locums though we did not put him on the duty roster) and in London. He had always provided dental anaesthesia in dental surgeries in the town and this carried on in retirement. He continued to attend clinical meetings, particularly at the RSM and in the North East Thames Region (the last in the early part of the last month of his life). He also worked for significant periods overseas in such diverse places as the Netherlands and Baghdad and between all this he carried on writing - the *Synopsis* and other things.

Overseas travel played an important part in his life. In Europe he visited the south of France every year for many years for the sun, and Germany for the opera at Bayreuth where he met Winifred Wagner (the English-born daughter-in-law of Richard Wagner and an important personage in the opera house for many years). He kept the letter she wrote to him in 1964 as well as the note of thanks which she sent him following the death of Weiland Wagner in 1966. Of the many countries he visited, special mention should be made of Thailand where he knew anaesthetists who had worked as juniors in Southend, and which he visited again in the last year of his life.

On a personal note here was a man of no academic background, but interested in clinical work and in history. His way of life was also simple. When out for a meal he always opted for chicken and two vegetables followed by apple pie and ice cream with a cup of tea, if available, but he would never offend by not having what was provided. He drank wine only for politeness, and in the old days when in London with time before a meeting, would suggest a visit to Joe Lyons for a cup of tea. He never took a taxi without good reason. He used the train, the underground, or he walked.

What were his interests outside anaesthesia? He always enjoyed the sun. He would often be found sitting in the garden at home, and in former times at the hospital was to be seen at lunchtime eating sandwiches on the roof leaning against a chimnmey stack in the sun. And, of course, he liked the south of France.

His other abiding interest was music. His favourite composers were Richard Wagner and Richard Strauss (both common interests with myself). He did not like modern composers and said: 'With Britten I am not smitten and as for Tippett you can skip it'. But he tried. He once told me that he had had to leave the opera house at the interval of Britten's *Peter Grimes*. Covent Garden was his favourite London outing, matched by Glyndebourne and, of course, Bayreuth. On his last trip to Bayreuth my wife and I took him and Norah all the way by car. But we only had two tickets for each opera and there were four persons. What happened? Not alternate operas, but alternate acts!

In summary, though his father was a clergyman, Alfred was an atheist and a believer in euthanasia. He had inherited the protestant work ethic, never wasting time, and was known for his humility and anxiety to help. He never appeared to lose his temper though sometimes you could see he was upset by noting his clenched jaw and the look in his eyes. If you had done something wrong, he corrected you in such a polite manner that it was only some time afterwards that you realised that you had been reprimanded.

On his retirement he had asked not to have a dinner as was the usual custom and said he would refuse any gifts. However, the department, finding a time when he was out of the house, arranged for a complete recording of Wagner's Ring Cycle to be left there, and he did keep it! When he died he had, at his request, no memorial service, though we were later to hold a memorial meeting in this very lecture theatre. His death was marked by obituary notices not only in this country but also in the *Indian Journal of Anaesthesia* and in the *Anesthesia History Association Newsletter* in the United States. His presence was missed by many people, but most by Norah, who survived him by a few years.

His own attitude to illness is worth noting. He did not want to be admitted to hospital and died in his own home attended by his own GP. He often said surgical operations had to be earned, by which he meant that pain and discomfort had to be severe enough to make you want surgery to get relief. In later life he often accepted car rides to attend anaesthesia meetings. It was my pleasure to take him to many of these in London and elsewhere, and one would often find money left on the dashboard to pay for petrol. One of my fondest memories is that, knowing I shared with him a liking for Richard Strauss, he gave me a book on the life of Strauss with his thanks inside. This thoughtful touch seems a fitting way to end a personal contribution to his memory.

ALEXIS MONTIGNY
The first death under anaesthesia

Dr C N Adams & Dr M Palmer
Dept of Anaesthesia, West Suffolk Hospital, Bury St Edmunds

The First Deaths

The unfortunate Hannah Greener is usually quoted as the first person to die during an anaesthetic, on 28 January 1848, but three earlier deaths in association with anaesthesia were recorded in the British medical press. Thomas Herbert died on 14 February 1847 in Colchester, Essex,[1] Albinus Burfitt died on 23 February 1847 in Mere in Somerset[2] and Ann Parkinson on 11 March 1847 in Grantham, Lincolnshire[3]. However each of these deaths actually occurred after surgery was complete, and the patients had recovered from anaesthesia. Ann Parkinson died two days after her operation for the removal of an osteosarcomatous tumour of the thigh. A Coroner's inquest held at the Brewer's Arms in Spittlegate found that she 'died from the effect of ether administered for the purpose of alleviating the pain during a surgical operation to remove an Osteo Sarcomatous tumour from the left thigh', and thus her death certificate[4] is the first to give anaesthesia as the cause. A modern interpretation of the inquest would probably give hypovolaemia from blood loss as a more likely cause of death.

Hannah Greener died when she received chloroform anaesthesia for the removal of her right great toenail. She died under the anaesthetic despite resuscitation attempts with brandy and by bleeding the arm and jugular vein. According to her death certificate[5] she died of 'Congestion of the lungs by inhaling the vapour of Chloroform when under a surgical operation', clearly implicating the anaesthetic. This case is presently accepted as the first death under anaesthesia, almost certainly due to cardiac dysrhythmia from the use of chloroform.

Alexis Montigny

Several months after the death of Hannah Greener, there was a short case report in the *London Medical Gazette*[6] quoting the *Gazette Médicale*[7] of 4 March 1848. Both reports refer to an event at the Hôtel Dieu in Auxerre and clearly describe a 55 year old man dying under anaesthesia whilst surgery was in progress to remove a cancerous tumour of the left breast.

The London article suggests August 1847 as the date of the fatality, but the original report pin-points the date as 10 July 1847, six months before the death of Hannah Greener.

The British article leaves the reader in no doubt that poisoning from ether was the cause of death, and disputes the opinion of the 'five intelligent physicians' present at the case who concluded that no one was to blame. It points out that the pulse was not felt until the patient was almost dead and gives asphyxia as a more probable cause of death, noting that 'ether does not possess the property of oxygenating the blood'. However, neither article was published contemporaneously and, importantly, they appeared after the four British cases had been described in both the medical and lay press. Investigation in the archives of the Library in Auxerre has revealed a report of the case in *L'Union, Journal de l'Yonne*, Friday, 15 July

1847. A transcript of this article is included as an appendix. Much of the French wording is identical with the report in the *Gazette Médicale.*

On 10 July 1847, at 3.40pm, Alexis Montigny, an iron-smith of Bavarian origin aged 55 who suffered from a cancerous tumour on his left breast dating back seven months, was etherised with the help of a Charrière device which had already worked successfully in other cases. The patient was noted to be quite strongly built and had not seen his health deteriorating[8]. Two or three minutes into the inhaling process his chest and limbs started shaking violently, and several people were required to hold him down. His respiratory rate quickened and his face blushed. When the device was removed from his face, he was noted to be babbling indefinable words as if in an alcoholic stupor. After five minutes, the patient's sensitivity was checked by pricking him with a needle and it was noted not to have been lost. The appliance was maintained on his face with its opening widened as much as possible. The tap controlling the flow had only reached half its full rotation. After a further five minutes the immobility of the patient's limbs was total, his breathing high and slow, and his face muscles had stopped twitching. His facial complexion had become purple red as had the upper part of his chest. His pupils were dilated and still, his eyes turned right up under his eyelids.

At this point, the etherisation device was removed, and the surgeon decided to commence the operation. The incision only produced a small quantity of black blood. Now it was noticed that the complexion of the patient's face had deteriorated, and the skin was totally purple. The breathing was slow and the pulse, checked for the first time, was 'floppy' and very slow. Suddenly it ceased to beat; it was all over.

The 'dextrous and honourable' operator remained full of dismay at the outcome. The 'impartial' witnesses were adamant that no one failed in their duty during the unfortunate incident. The post mortem, carried out 22 hours after death noted a strong odour of ether in all the organs, deep black viscous blood in all the veins, the anterior part of the lungs filled with frothy mucous and the membrane of the bronchial tubes, trachea and larynx were deeply injected. Cause of death was by asphyxia and poisoning with ether fumes carried into the blood stream.

A week later, in *L'Union*[9] Dr M Cœurderoy wrote to question the cause of death, suggesting that air embolism may have been a cause. He described a similar case he had seen with Dupuytren when a woman with a scirrhous tumour had died almost instantaneously from air embolism. Cœurderoy also wondered about the purity of the ether.

Alexis Montigny's surgeon replied in *L'Union* three days later[10]. He confirmed the purity of the ether and refuted air embolism as a cause. He referred to the fact that everybody was aware of similar accidents that had happened in England, causing great commotions among our neighbours over the channel. This implies knowledge of the cases of Thomas Herbert, Albinus Burfitt and Ann Parkinson.

None of the newspaper articles in Auxerre include the name of the patient, but investigation in the archives of the Hôtel de Ville d'Auxerre has uncovered a death certificate[11] which matches the name and details of Alexis Montigny with the age, profession, origin and date of death of the patient described in the newspaper articles.

Snow's report

In 1858 in his book *On Chloroform and Other Anaesthetics: their Action and Administration*, John Snow[12] does pick up on this case. Uncommonly for the period, he actually cites the *Gazette Médicale* of 1848 as his source, and the content of the item is essentially a translation from the French of that article. The chapter is headed: 'Alleged deaths from ether' and his discussion in support of the safety of ether doubts that this agent was in fact the cause of the patient's demise. Snow's opinion is that death resulted from the want of sufficient air to the lungs. Because Snow's report also comes from the *Gazette Médicale*, which was published after the English deaths, he does not provide contemporaneous proof of the occurrence of this anaesthetic death. It is uncertain why more modern authors such as Duncum[13] have not discussed the 'Man from Auxerre', but Snow's scepticism, combined with the lack of a contemporary record may offer some explanation.

Discussion

The newspaper report in the *L'Union, Journal de l'Yonne* of 15 July 1847 provides firm evidence of an anaesthetic death which occurred six months before that of Hannah Greener. Alexis Montigny died under ether anaesthesia whilst surgery was being performed to remove a tumour from his breast. The post mortem examination gives both ether and asphyxia as causes of death. The description of injected membranes of the upper airway suggests this case should be considered a true anaesthetic death due to obstruction. The presence of frothy mucous in the lungs may indicate an associated aspiration or acute pulmonary oedema. Alexis Montigny should supersede poor Hannah as the first patient known to have died under anaesthesia. Since the inhalation of ether as an anaesthetic commenced as early as 1842 with Crawford Long and W E Clarke in America, and since it was used for recreational purposes long before then, scrutiny of local records and newspapers may yet reveal earlier deaths under ether.

The death of Alexis Montigny seems to have been forgotten for 150 years despite the fact that details of his case were covered in the medical press of both England and France in 1848, and by Snow in 1858. However, it was also in 1858 that Glover, in a series of articles in the *Lancet*[14,15] attempted to identify the first 21 deaths. He cited Hannah Greener as the first on 28 January 1848, a boy in Aberdeen as the second on 8 February 1848 and a thirty-six year old woman in America on 23 February 1848 as the third. Though the case of the man from Auxerre, now identified as Alexis Montigny, was published, Hannah Greener has been handed down from author to author over the years as the first death. It is another example for historical researchers on the importance of examining the primary sources.

Conclusion

Alexis Montigny is now the first known death under anaesthesia, on 10 July 1847 at the Hôtel Dieu in Auxerre, France. Hannah Greener's death at Gateshead on 28 January 1848 remains the first under chloroform anaesthesia and the first in the United Kingdom. The first death certificate to mention anaesthesia as a cause names Ann Parkinson on 11 March 1847.

Acknowledgements

Hervé Sanchez of South Lee School, Bury St.Edmunds for the translation of the French papers, and Corinne Knockaert of the Library in Auxerre for locating the relevant archives in France.

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9. Cœurderoy M. Inhalation d'Ether. *L'Union, Journal de l'Yonne*, jeudi 22 juillet 1847 p2, Cols 2 & 3
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Appendix: Transcript of the French report, including misprints and other imperfections of language.

'*L'Union, Journal de l'Yonne*, Jeudi, 15 Juillet 1847 Inhalations d'Ether. Nous nous sommes fait un devoir de publier, jusqu'ici, les diverses expériences relatives à l'inhalation de l'éther, dont nous avons été témoin. Nous pensons, en effet, que lorsqu'il s'agit d'un agent médical nouveau, entouré d'un cortége de phénomènes étranges, qui excitent à juste titre la curiosité générale, les organes de la publicité ne sauraient rester muets et indifférents. Ajoutons même que la discrétion, en pareille circonstance, deviendrait presque un crime si la découverte merveilleuse recélait dans son sein un poison terrible capable de tuer, en quelques minutes, les victimes de son choix.Le récit qui va suivre prouvera à nos lecteurs que ce préambule sinistre n'a rien d'exagéré. La vérité pure et simple, d'ailleurs, est ici tellement triste que nous serions heureux de trouver le secret de la déguiser ou de l'atténuer, sans manquer le but humanitaire que nous nous proposons d'atteindre.Le 10 juillet 1847, à quatre heures moins vingt minutes, le nommé ***, ouvrier serrurier, Bavarrois d'origine, âgé de 55 ans et porteur

d'une tumeur cancéreuse au sein gauche, datant de sept mois environ, fut soumis à l'éthérisation au moyen de l'appareil de Charrière, le même dont l'emploi avait déjà été couronné de succès dans plusieurs opérations précédentes.Le malade, homme d'une constitution assez robuste, que l'affection cancéreuse - n'avait pas encore détériorée, était à peine soumis, depuis deux à trois minutes, à l'action de la vapeur d'éther que déjà une vive excitation se manifestait. Le tronc et les membres étaient agités de soubressauts et de secousses violentes que comprimaient difficilement plusieurs aides. En même temps, la respiration devenait précipitée et la face s'injectait. Tout en faisant de violents efforts pour débarrasser sa bouche de l'instrument, *** se livrait à un parlage continuel non distinct et ressemblant au délire de l'ivresse.Ces phénomènes avaient duré cinq minutes, quand, en piquant la peau avec une épingle, on s'assura que la sensibilité n'était pas encore anéantie. On continua à faire fonctionner l'appareil, mais en ouvrant aux vapeurs éthérées une issue aussi large que le permettait l'instrument, car le robinet qui leur livre passage n'avait parcouru jusque-là que la moitié de sa rotation et progressivement.Au bout de cinq minutes, à partir de cet instant, et de dix minutes, à partir du début de l'expérience, la résolution, l'immobilité des membres était complète, l'insensibilité non douteuse, la respiration s'accomplissait haute, lente, mais exempte de râle. La face, dont les muscles avaient cessé de s'agiter, était, d'un rouge violacé; la peau antérieure de la poitrine offrait la même teinte; les pupilles dilatées et immobiles remontaient en haut sous les paupières supérieures.L'appareil à éthérisation ayant été enlevé, le chirurgien jugea qu'il était temps de pratiquer l'ablation de la tumeur. L'incision, à peine commencée, n'avait encore donné issue qu'à une petite quantité de sang noir, lorsqu'on s'aperçut de la décomposition des traits devenus entièrement violacés et de la lenteur de la respiration. Le pouls touché en ce moment, pour la première fois, était mou, plein et très-lent; tout à coup il cessa de battre. Tout était fini.Douze minutes plus tôt, le malheureux comptait sur l'éther pour éviter les angoisses de la souffrance! a-t-il eu un mécompte, lui? nous ne le croyons pas, car son mal, ainsi qu'on l'a reconnu plus tard, était de ceux qui récidivent toujours, de ceux qui, quoiqu'on fasse, déterminent d'atroces douleurs et une sorte de désorganisation lente. Mais, pour la science, quelle déception! L'habile et honorable opérateur demeura consterné en face d'un résultat aussi inattendu qui, par un singulier hasard, n'était un bonheur que pour la victime. Pour nous qui écrivons ces lignes et qui avons été témoin impartial des moindres circonstances, nous pouvons affirmer que nul n'a failli à son devoir dans cette malheureuse affaire. En lieu et place de l'opérateur, nous eussions agi de même, et si une responsabilité quelconque devait peser sur lui, nous tiendrons à honneur de la partager.L'autopsie du sujet fut pratiquée vingt-deux heures après la mort. Le cerveau, les poumons, le cœur, le foie, les reins, la rate, exhalaient, à chaque incision de leur tissu une trés-forte odeur d'éther. Le sang des vaisseaux était fluide, d'un noir foncé, comme visqueux. Le sang, qui engorgeait toute la face postérieure des poumons, présentait une consistance et une coloration un peu analogue a celle de la mélasse. La face antérieure des poumous était seulement remplie de mucosités écumeuses. La muqueuse des bronches, de la trachée et du larynx était fortement injectée; la rate ressemblait presque à de la lie de vin tant elle était ramollie à l'intérieur.Ces diverses circonstances de l'autopsie nous portent à croire que la mort a eu lieu tout à la fois par asphyxie et par un empoisonnement dû à la saturation excessive des organes par les vapeurs éthérées, entrainées par la circulation du sang.Trois cas d'inhalation d'éther ont déjà été rapportés dans ce journal. Deux opérés sur trois ont succombé; celui de Vincelles au bout de trés-peu de jours, le nommé Duhatois, après quelques semaines, à l'hôtel-dieu d'Auxerre. Il serait difficile d'affirmer si l'éther est pour quelque chose dans ces malheureux résultats.'

'THE MOST VIRTUOUS MAN I HAVE KNOWN' DOMINIQUE JEAN-LARREY 1776-1842

Dr D D C Howat
Honorary Consulting Anaesthetist
St George's Hospital and Royal Masonic Hospital, London

This is what Napoleon on St Helena wrote in his will about Baron Larrey: 'C'est l'homme le plus vertueux que j'aie connu'.[1] The word 'vertueux' means rather more than the English in its modern sense; it implies courage, honour, uprightness and honesty, as well as moral good. What is his relevance to the history of anaesthesia? There is not space to recount much about this remarkable man, but this paper concentrates on those facts which are of importance to anaesthetists.

Figure 1. Baron Dominique Larry

Dominique Jean Larrey (Figure 1) was born on 8 July 1766 in Baudéan in the Hautes-Pyrénées region of France, a small village about 15 miles south of Tarbes and east of Lourdes. At the age of 13, he walked the 70 miles to Toulouse to study surgery under his uncle, Alexis Larrey, the chief surgeon at the hospital there. A year later, he walked to Paris to study under Desault, a fine teacher of surgery, at the Hôtel Dieu. Always short of money, he obtained a post as a naval surgeon and walked to Brest, visiting the house of his idol, Ambroise Paré, on the way. Kept waiting at Brest for some months, he organised a series of lectures for the students and surgeons there, before setting off for Newfoundland, where the French still had fishing rights in the region of Belle Isle. Seven months later, he was back in

Brest, his ship was decommissioned and he made for Paris. In the following year, 1789, he was leading the revolt of medical students against the Bastille.

Military surgeon

Soon after this, France was at war and Larrey began his career in the Army of the Rhine. He distinguished himself by treating every wounded soldier according to need, regardless of rank, whether friend or enemy, a policy which made him an object of suspicion to the Committee of Safety at the height of the Terror. It was hardly surprising that Larrey felt safer with the army than in Paris.

He was distressed that the wounded were left on the field of battle until it was over, when they were picked up and taken to the hospitals situated some miles behind the lines. He therefore devised his 'ambulances volantes' or flying ambulances (Figure 2), which could move up to the front and reclaim the wounded while the battle was raging, and the seriously wounded could be operated upon before withdrawing them to the rear.[3] The ambulances were sprung, with mattresses. The two-wheeled ambulances could carry two patients in flat country, while the four-wheeled ones could take four and were suitable for mountainous regions. During the Egyptian campaign of 1798-1801 he even devised a camel ambulance, using the animal's back. During the Italian campaign of 1797, Larrey described the organisation of the personnel and equipment of each ambulance in detail: there were three divisions, each containing twelve ambulances, with a staff of 113 attached to each division.[4] Thanks to the bravery of the surgeons and staff involved, many wounded were saved. Because of his policy of triage, many of the enemy who had been treated by him, Russian, Prussian and English, came to thank him personally during and after the various campaigns.

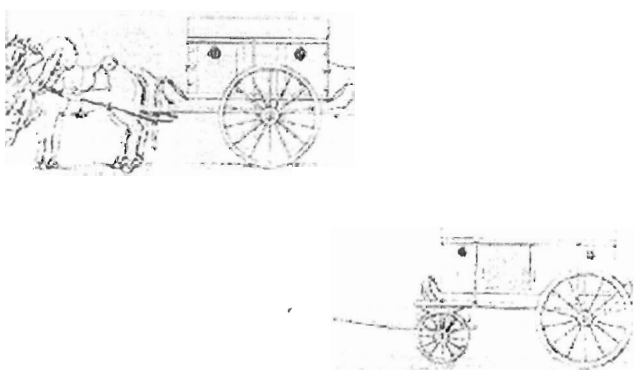

Figure 2. Larrey's ambulances volantes
From Richardson RA. Larrey: Surgeon to Napoleon's Imperial Guard London: John Murray, 1974. With permission

I now come to something which has often been recounted - that Larrey was the first to make use of refrigeration anaesthesia in the icy conditions of the retreat from Moscow. The truth is that he reported in his memoirs that at the battle of Eylau in the Polish campaign in February 1807, when the ambient temperature was -15° Réaumur (below -18° Celsius), he noticed that the complaints of pain suffered by the soldiers who had undergone amputations were succeeded by a surprising calm, in which they no longer complained of their own ills, but expressed concern for the safety of the Emperor and the success of the army. Thus they encouraged each other to bear the necessary operations.[5] Larrey does not appear to have made any reference to the deliberate use of refrigeration either here or in his account of the retreat from Moscow, when the temperature fell to -26° Réamur (-35° Celsius).

Two other episodes of interest are recounted in his memoirs. At the time of the battle of Eylau a colonel who had received a bullet in his foot was shaking so much that Larrey could not operate on him. Larrey slapped his face and the officer was so enraged that he said: 'You have taken a cowardly advantage of my condition; I demand satisfaction'. Larrey said: 'Forgive me, but I know you and realised that you would think of your honour and forget your wound. The operation is done, here is the bullet; give me your hand'. An example of distraction anaesthesia.[6]

In December 1806, when the troops were in Berlin and the weather had already turned very cold, some of the soldiers shut themselves into rooms which were heated by iron stoves, and several of them were asphyxiated. In one room, some of those sleeping furthest from the stove were awakened by drums sounding the reveille. They were lethargic and suffering from violent headaches. One rushed to open a window and called for help. A few recovered after some days, others after some weeks; several died. Larrey performed post-mortems on the dead and describes findings suggesting anoxia and carbon dioxide poisoning.[7] One wonders if Larrey recalled the incident when he later heard of Henry Hill Hickman.

A distinguished patient

Napoleon fully appreciated the worth of his chief surgeon, awarding him several decorations and finally making him a Baron during the Austrian campaign in 1809. In 1811, not long before setting off on the disastrous Russian expedition, Larrey was called upon to operate on a distinguished civilian, none other than Fanny Burney, the famous diarist and novelist and friend of Dr Samuel Johnson. She had married the Comte d'Arblay while he was an emigré from France during the revolution and now lived in Paris. For some months she had noticed a steadily growing painful lump in her breast and was advised to have the breast removed. Since this was long before anaesthesia was available, the suggestion naturally filled her with horror. A well-known surgeon, Antoine Dubois, had given her a prescription but was too busy to see her again. Her husband had an introduction to Larrey, who was highly recommended as having treated a Polish lady with a similar condition. Larrey eventually agreed to treat her but only if Dubois agreed to his taking over the case. In a letter to her sister, Fanny makes a very shrewd assessment of his character:

> 'M Larrey has proved one of the worthiest, most disinterested, & singularly excellent of men, endowed with real Genius in his profession, though with an ignorance of the World & its usages that induces a *naiveté* that leads those that do not see him thoroughly to think

of him not alone simple, but weak. They are mistaken; but his attention & thoughts have exclusively turned one way, he is hardly awake any other.'[8]

Indeed, Larrey was interested only in his profession. In many of the cities that were taken during Napoleon's campaigns, Larrey used to lecture and teach the local surgeons; this was greatly appreciated and once saved his life, as I shall explain later.

To return to Fanny Burney d'Arbley: Larrey asked an anatomist and a physician to see if an operation could be avoided and even proposed calling in Dubois again, anxious that Fanny should have the best advice possible: 'You are so highly thought of here', he said, 'that the public itself will be unhappy if you have not all the help which we can offer you'. He arranged for Dubois to see her again, but it was generally agreed that surgery offered the only hope. Larrey was clearly very unhappy at having to inflict such pain on one who had become a friend. The description of Fanny's suffering during the operation can only be appreciated by reading her account of it - but that is another story. As she did not die until 1840, it seems unlikely that the painful lump in her breast was malignant.

Tales of tribute

I have not the time to talk of Larrey's great skill as a surgeon; he preserved when he could, but, in those days, amputation was the only solution in many injuries of the limbs. Slightly under average height, he was stockily built and very strong. He was less affected by cold and hunger than most and operated when his subordinates could not even hold their instruments in the icy conditions of the Prussian campaign. He often went for long periods without sleep in order to make frequent visits to see his patients in the hospitals, even under the terrible conditions of the retreat from Moscow. Larrey's factual account of the retreat paints a harrowing picture of the conditions, not only for the soldiers, but also for the accompanying French women and children who had been resident in Moscow.

Larrey received a moving tribute during that retreat, when the remains of Napoleon's Grande Armée attempted to cross the River Beresina; the bridge was about to collapse when Larrey had returned to the other bank to rescue some much needed equipment. The soldiers of the Imperial Guard, seeing his dilemma, passed him from hand to hand and even over their heads until he reached the safety of the other side, ignoring the pleas of many senior officers.[9]

There are many more stories told about this remarkable man, who went up to the front line to operate on or to rescue his patients. It is reported that, at the battle of Waterloo, Wellington saw Larrey tending a wounded soldier and asked who he was. On being told (for Larrey's fame had spread), he said: 'He is a brave man; tell them not to fire in that direction' and saluted as he passed.[10] Shortly afterwards, Larrey was captured by the Prussians. Although wounded, he managed to escape, but was caught again. At first, his captors thought he was Napoleon, because he was wearing a similar grey overcoat and his sword had Napoleon's name on it, for he had given it to Larrey after the battle of Eylau when he had lost his own during a foray by the Prussians. When they discovered their mistake, the officer in charge ordered him to be shot. The surgeon detailed to bind his eyes before the execution recognised him from the time when he had given lectures in Berlin and demanded a stay of execution. Larrey was taken before General Von Bülow, who knew him personally and sent him to Marshal Blücher. Larrey had saved Blücher's son's life when he was gravely wounded at the

battle of Wagram in the Austrian campaign. Blücher apologised to Larrey, saw him safely on his way, and sent a message to his wife that he was alive.[11] These episodes typify the esteem in which Larrey was held by all with whom he had contact.

Larrey had always greatly admired Napoleon and wanted to follow him into exile to Elba, but Napoleon told him to remain and look after the soldiers. After 1815, because of this admiration, Larrey fell into disfavour and lost nearly all his appointments as well as his honours, but by 1818, because of the esteem in which the soldiers held him, he was rehabilitated. Later in his life he visited England, Scotland and Ireland and met many distinguished surgeons, including Astley Cooper, Everard Home and George James Guthrie, and was thanked by many whose wounds he had tended during the war.[12]

Support for Hickman

Now I come to an episode of interest in the history of anaesthesia. In 1828, Henry Hill Hickman, who had encountered nothing but derision and scepticism when he tried to interest his medical colleagues in his experiments in carbon dioxide narcosis, appealed to Charles X of France to be allowed to demonstrate his results to the medical faculty in Paris. The King referred the matter to the Royal Academy of Medicine, which appointed a representative to report on it. The following is a translation of that report:

> '**Painless operations.** M Géradin reported on a letter written to His Majesty Charles X by Mr Hickman, a London surgeon, in which that gentleman asserted he had discovered a means of performing the most troublesome and dangerous operations without pain. The method consisted in producing temporary insensibility by the methodical introduction of certain vapours into the lungs. Mr Hickman had made numerous experiments on animals, and was desirous of obtaining the co-operation of the leading physicians and surgeons of Paris, in order to make the same experiments on the human subject.'

When the letter was read it caused a sensation, but was received with contempt by all except one member, Baron Larrey, then aged 62, who offered to allow himself to be experimented upon. Although a committee was formed to go into the matter further it was unfortunately allowed to drop. Poor Hickman, bitterly disappointed, returned to England and died in the following year.[13]

Larrey died on 25 May 1842, four and a half years before the discovery of ether anaesthesia, at the time Crawford Long was beginning to use it in Jefferson, Georgia. It is easy to imagine that this remarkable man would have welcomed the discovery, had he survived, for he lived only for his love, surgery, and was treasured by all the soldiers in his care for his humanity and concern for their welfare. On St Helena, a year after his defeat at Waterloo, Napoleon said: 'If the army wants to erect a monument, it should be dedicated to Larrey'.[14]

I believe that this brave, honest, upright and humane surgeon deserves more than just a mention in any history of anaesthesia.

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EARLY PROVINCIAL USE OF NITROUS OXIDE

Dr P Drury
Retired Consultant Anaesthetist, Liverpool

The following is an extract from some 19th century diaries, dated 14 July 1871:

> 'I went to see the dentist McAdam in Hereford. He took out a temporary tooth stopping and put another temporary stopping in, and I have to go and see him in a fortnight. He showed me the apparatus for giving people the new anaesthetic laughing gas, which he thinks is much safer than chloroform, indeed quite safe.'

The identity of the diarist is revealed in my postscript.

Apparatus?

Several questions arise from this brief extract. Firstly, what was the apparatus likely to be? You will recall that Thomas Wiltberger Evans, an American dentist based in Paris who numbered Emperor Napoleon III among his patients, came to London in 1868 and gave demonstrations of nitrous oxide anaesthesia for dental operations in the Dental Hospital of London and elsewhere over a period of a week. He brought with him the apparatus that Colton had shown him at the Universal Exhibition in Paris in the previous year. This was the Sprague apparatus. You had to make your own nitrous oxide by heating ammonium nitrate; the gases were passed through wash-bottles and into a tank. Large bags (Colton's were of 30 litre capacity) were filled with the gas and used four times.

This was not convenient for everyday use; as Boyle pointed out in his 1934 paper on the history and development of nitrous oxide, it was impracticable for anaesthetists to go running round like toy balloon sellers. But by the end of 1868 the firms of Coxeter and Barth produced iron cylinders of 100 gallon capacity and weighing 9lb. Coxeter also provided gasometers, usually surmounted, as Duncum describes: 'by a statuette - a baroque angel sounding a trumpet, Mercury, a nymph, or a stag couchant' and possibly other individual choices. One enterprising man in Berwick-on-Tweed built his own 150 gallon tank and pleaded with others to do so, as he did not wish to be peculiar or different. Coxeter also produced apparatus using Clover's mask. Clover had been present at Evans' demonstration. Another piece of equipment, designed by Alfred Coleman, is a less likely candidate because it did not seem to gain wide acceptance. It was probably the first apparatus to use an absorber clinically, in this case quicklime.

Laughing gas - new ?

Secondly, it is a little surprising to read of 'laughing gas' as 'new' in 1871, since it had in theory been available for three years. The evidence is that after Evans' demonstration its spread was rapid, over 2,000 cases being reported from the provinces before the end of 1868. Both McAdam and his father, with whom he was in practice, were members of the Odontological Society of Great Britain, considered in a *Lancet* editorial of 1868 to represent the dental profession in terms of its leading members (and which was the forerunner of the Section of Odontology of the Royal Society of Medicine), so they were surely not unaware of

its existence. The diarist could, of course, have meant new in the sense of the last couple of years, rather than the last couple of weeks. However, the availability was not uniform. As late as 1895 Buxton could write:

> 'Even in Great Britain the employment of nitrous oxide is not very common, except in the large towns of England. In the country districts and in Scotland chloroform still reigns supreme, and not a few medical men are almost ignorant of the practical points involved in the administration of laughing gas.'

In April 1871, someone signing himself as RSPT, from Puddletown (near Dorchester and a similar sort of distance from London as Hereford) wrote anxiously to the *Lancet* as follows:

> 'Where can I get the apparatus for giving nitrous oxide gas? I am continually questioned - why don't you use the gas and give us no pain? Does it require instruction to administer gas and how can it be obtained?'

He was referred to Coxeter, Grafton St, London.

If there was a delay in news reaching Hereford it might have been a communications problem. Although a historic city with a famous cathedral, Hereford was slightly off the beaten track. Its road and rail routes ran on a roughly north-south axis, linking south Wales with the north west. You could get a train to London but the route was a bit circuitous (and still is!), going up to Worcester and then down to Oxford, and the distance is 144 miles, rather more than the crow flies.

Although there was no textbook or even handbook at this time there was plenty of information in the general medical journals and the *British Journal of Dental Science*. The Odontological Society of Great Britain had set up a committee which reported in 1868 and 1872. There was an early awareness of matters which still concern us; the dangers of the operator/anaesthetist, the advisability of the presence of a third person - as one writer elegantly put it: 'as a guard on the purity of our women and the prevention of accusations by designing persons' and the risk of syncope in the upright position. The *Lancet* of 18 July 1868 carried a leading article on protoxide of nitrogen and described an administration as follows:

> 'An elderly man, whose appearance to bystanders during part of this time was to all intents that of a person in an epileptic fit, presenting as he did dense lividity of features, frothiness about the teeth, fixed and staring eyes with dilated pupils and rigid convulsions of the muscles of his arms. Notwithstanding this aspect, Dr John Murray, who is well qualified from experience to pronounce an opinion, told us that he should have been quite content to prolong the inhalation. It is impossible to imagine a condition of safety more strongly resembling that of imminent danger to life, and the secret of this physiological condition which obtains has yet to be discovered.'

Those of us of a certain age might recognise this description. The report of the 1868 committee said that to those who are accustomed to administer this gas, these symptoms give no alarm. Again in a *Lancet* annotation in 1873 the writer was horrified to note that a leading dentist never operated until breathing had temporarily ceased. Since usually pure nitrous oxide was breathed and the operation took place during the recovery period, the timing of the

removal of the mask was fairly crucial. Techniques for nasal administration, though attempted, had not yet been established.

The speed of recovery, although a disadvantage to the operator, was one of the features that ensured its popularity. It was illustrated by Charles James Fox, a London dentist and colleague of Clover's, as follows:

> 'M Charles Blondin on two occasions performed all his most difficult feats on the high rope, 400ft long, within 3 hours after I had given him the gas for some extremely severe dental operations.'

Who was the anaesthetist?

It is not clear from the extract quoted whether McAdam, or his father, or perhaps a local GP gave the anaesthetic. There was some discussion in the journals about who should administer gas, and there were those who considered that LDS was not sufficient qualification to do so. In fact, it was given by all and sundry which, despite protests, was not illegal. Dentistry, including painless dentistry was practised along with the work of blacksmiths, farmers, shoemakers and tailors, and in peripatetic stalls in the open markets in country towns. There is on record an illiterate sexton with a prosperous dental practice. One man advertised in the *Hereford Times*, right under McAdam's nose: extractions one shilling, painless extractions 2/6d, and he offered to pay the train fare within a radius of 40 miles.

Chloroform

The reference to chloroform suggests that McAdam and possibly the general public were aware of its dangers. The 1864 committee of the Medical & Chirurgical Society had quoted a mortality of 1:2,500 administrations. Although quick to see the possibilities of nitrous oxide, Clover remained an enthusiast and had, in fact, lectured to the Odontological Society on chloroform in dentistry one month before Evans' demonstration. The diarist says: 'indeed quite safe'; the *Oxford Dictionary* states that 'quite' could mean anything from 'completely' to 'to some extent'. I suggest the former applies since at this stage death associated with nitrous oxide had not been reported in this country.

McAdam

Who was the dentist McAdam? There is evidence that he was a bit more than a run-of-the-mill practitioner. He qualified LDS in 1866, which at the time was a brave thing to do, since there were then only 280 on the Register, as opposed to thousands of unqualified persons who had lucrative private practices and were unwilling to forego advertising. He was a member of the Council of the Odontological Society from 1883 and a Vice President from 1886 to 1889. As President of the Western Branch of the British Dental Association he organised a national meeting in Hereford. In his Presidential Address he quoted Jenner on the professional benefits of the social side of these meetings, and took the delegates for a boat trip on the River Wye. At the inaugural meeting of the Central Counties branch of the British Dental Association it was resolved to invite him on to the Council, though this was outside his area. A letter of condolence on his death and reply from his wife were included in the minute book for this branch: this seems to be unusual if not unique. He was appointed

Honorary Dental Surgeon to Hereford General Hospital from 1882 until his death in November 1898. He practised in a pleasant Georgian house, 21 King Street, and for the last three years of his life lived at Plas Gwyn, which I believe translates as 'White House', a substantial three-storeyed Victorian house overlooking the River Wye. To buy or rent this suggests a successful man, and I believe that the house contained that relatively new-fangled device, the telephone. It is of interest that a later occupant of the house, from 1904 to 1911, was the composer Edward Elgar. This coincided with a successful period of his life in which some of his major works were composed. Indeed, it was from this house in 1904 that he departed to receive his knighthood.

McAdam died in November 1898 at the relatively young age of 59. The diagnosis was heart failure associated with an aortic aneurysm. He had consulted Sir Lauder Brunton, known to medical historians as a member of the Hyderabad Commission.

Postscript: The diarist was Francis Kilvert, curate at Clyro, near Hay-on-Wye, and later vicar of Bredwardine, an attractive village a little further down the Wye towards Hereford. He died in 1879, aged 38, of peritonitis, having been married for just five weeks. There are one or two other references to pain relief in the diaries. We were reminded by Dr Riding in Llangollen that just because anaesthesia was available it did not mean that everybody got it. There is an entry for May 1875, during a visit to the Bath area, when he spoke to a farm worker who had been to Chippenham, where he had been 'put through summat' by a local doctor pulling out a good many of his teeth. An entry for 1 March 1871 states:

> 'After dinner last night Mr V (his boss) kindly anxious to cure my face-ache made me drink four large glasses of port. The consequence was that all night and all today I have been groaning with a bursting splitting sick headache.'

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J LEONARD CORNING BEFORE AND AFTER HIS 1885 ARTICLE *'SPINAL ANESTHESIA AND LOCAL MEDICATION OF THE CORD'*

Dr R Patterson
Professor Emeritus, University of California, Los Angeles

Dr Corning's 1885 paper entitled *'Spinal anesthesia and local medication of the cord'*[1] elicited no response or interest in the United States. Fourteen years later, when introduced with a European imprimatur, American surgeons enthusiastically adopted this procedure that they could have pioneered had they followed Corning's suggestion.

Neither a surgeon nor an anaesthetist, Corning specialised in neurology with emphasis on pain management at a time when all three categories, specialism, neurology and pain, were subjects of great controversy. As discussed in abstract form at the 1991 Rotterdam meeting of the HAS, Corning was committed to treating pain by direct medication of the CNS at a time when such action was publicly labelled medical malpractice, and as late as 1896 lumbar puncture attracted the fury of anti-vivisectionists. Though these issues were sufficient to dampen interest in further exploration and development of his seminal suggestion, some commentators have blamed the apathetic disinterest of the medical profession on the scientific naiveté of the author; he alone being responsible for the neglect of his idea, having merely stumbled on to a discovery he did not understand and was ill equipped to pursue.

To the contrary, a summary of his activities before and after the 1885 paper shows that he was extremely well educated, an astute clinician, an inquisitive, resourceful, imaginative investigator, and that many of his innovations would take several decades before coming into general awareness and use.

Corning was educated in Germany from the age of 14. In Stuttgart he studied chemistry under von Fehling; then, at Heidelberg, physiology with Professor Kuhne. At Wurzburg he became well versed in experimental laboratory technique and discipline, in the necessity of notebooks and meticulous documentation and in deduction based on authoritative premises. Writing his thesis under the direction of the professors of anatomy and pathology, he obtained his MD from Wurzburg in 1878.

He arrived back in New York City to intense medical competition, and as an outsider to the ruling medical cliques. The code of ethics for all respectable physicians proscribed advertising one's specialty on calling cards, letterheads or in the newspapers. A two year apprenticeship was required for being considered for a teaching position or appointment as attending physician to special hospital services or clinics which did entitle the physician to make his affiliations known.

In 1882, accredited as a Consultant in Nervous and Mental Diseases to various hospitals, he began private practice in a fashionable New York City neighbourhood. Adjoining the consultation rooms in his home were facilities for various therapies and a laboratory for experimental investigations. He believed that diseases of the brain had a physical basis; that physical modalities could aid in the diagnosis; that therapy should be based on physical means, not metaphysical. He installed electrodiagnostic and electrotherapy equipment. He had a 3-ton hyperbaric chamber adjoining his consultation room and in 1882 and 1883

published the results of his investigations showing that hyperbaria enhanced the effect of sedatives.

American neurologists had defined their field of expertise to include some unique entities, such as sleeplessness, spinal irritation and cerebral hyperaemia. They also defined an entire class of people with such unique problems:

> 'The state of excitement in which people of the present live, the demands of business, the struggle for wealth & position, all of which were never so great as in our time, produce just that state of the brain which, if continued not only through the day but far into the night, makes sound and healthy sleep an impossibility.'[2]

Sleeplessness in such an exclusive wealthy group was no simple ailment to be entrusted to the family physician, but instead was a case for the neurologist:

> 'Proper medical attention could arrest the disease and was omitted only at the patient's peril. For should disease progress to the 2nd state, it could take on an apoplectic, an epileptic, or even a maniacal form. In the 3rd state occur a variety of secondary lesions including tumours or softenings of the brain, ultimately resulting in death.'[2]

Corning's first paper, in 1882, addressed the subject of sleeplessness. Originally, normal sleep was considered to be associated with a state of increased blood in the vessels of the brain. But observations of sleeping infants, of traumatic cranial fissures and of experimentally trephined dogs ands rabbits - awake, asleep, and under the influence of chloroform and ether - agreed with a theory that the 'proximate cause of sleep consists in a diminished flow of oxygenated blood to the brain'. Alexander Fleming had already shown, in 1855, that compression of the carotid arteries resulted in deep sleep. Pursuing this lead, Corning, in 1882 and 1884, described several instruments he had devised to study this subject. At the 1991 Rotterdam meeting of this Society, Drs Bohrer and Bach presented a paper detailing Dr C Ritter's 1923 device to bilaterally occlude the carotids for routine enhancement of anaesthesia induction. The instrument is similar to that illustrated by Corning forty years earlier. In 1883 he summarised his therapy of sleeplessness or cerebral exhaustion, in a book entitled *Brain Rest*. A second edition was published in 1885.[3]

Publications pertinent to anaesthesia

In 1885, Corning published a paper on the prolongation of the anaesthetic effects of cocaine when subcutaneously injected. The method consisted of using tourniquets to block the inflow and egress of blood to the anaesthetised area of the operative site. In addition to prolonging the duration of anaesthesia, the procedure permitted the use of very dilute solutions of cocaine - 0.5%, 0.25% and even 0.2% - in a larger volume to anaesthetise a wider area. A decade later, Carl Ludwig Schleich was ridiculed at a meeting of German surgeons for proposing a similar use of low concentrations. This 'prolongation' article, in contrast to *Spinal Anesthesia* published in the same year, attracted great attention, was widely adopted and quoted.

As a consequence of the popularity of his 'prolongation' technique, and a subsequent article involving a double syringe method of 'jelling' cocaine locally in the tissues, he was

repeatedly called in consultation by surgeons who had patients unsuitable for general anaesthesia. Patients who would not lose consciousness (a problem described by Dr Marguerite Zimmer at the 1997 HAS meeting but not restricted to the early days of anaesthesia) as well as instances of prolonged slow induction of general anaesthesia prompted Corning to consider the role of the circulation and blood volume on the uptake and distribution of the inhaled vapour. By applying tourniquets to the extremities he could reduce the circulating blood volume, speeding up induction, and when the tourniquets were released awakening was rapid. For a most remarkable demonstration he constructed a large suction device that enclosed the lower half of the body to trap blood in the pelvis and lower extremities. Letters to journal editors by surgeons and observers attested to the alarming rapidity and the astounding efficacy of his methods.

Corning was constantly striving for quantitative standards. One of his studies involved a chair revolving 30 times a minute to produce the constitutional upsets of vertigo - against which various drugs and their dosage could be tested. Besides providing a valuable basic insight into patient variation in response to dosage to various drugs for the same stimulus, there was an immediate pay-off in his practice. He recommended that the wealthy contemplating a transatlantic voyage consult him and the efficacy of their sea-sickness remedy be tested in advance of the voyage.

From 1895 on he continued his interest in spinal cord and central nervous system physiology. Much of this work was integrated into his book *Pain* published in 1894;[4] a treatise, much before its time, on pain management. One of the many items illustrated was an introducer for a spinal needle, an item that would be later introduced by Sise in 1928. He took pains to avoid penetrating the cord itself: by depth measurements, by the use of extremely small expensive needles, short bevels and of bulbous needle ends which he did not want to even penetrate the meninges.

In addition to over a dozen articles pertinent to anaesthesia, a field he was not intimately concerned with, he published some thirty papers on the fields of his practice of neurology and psychiatry - on headache, epilepsy and caisson disease among other topics. Also, recovered archival material contains besides personal photos and mementoes a miscellany of unpublished material - experiments, seven chapters on the anatomy of the spinal cord, interviews in the *New York Times* regarding the use of Stovaine to which he was opposed, and insanity defences, including letters from losing prosecuting attorneys thanking him for the lucidity with which he stated the cases.

Dr J Alfred Lee, in his Gaston Labat lecture, described Walter Essex Wynter in terms that could equally apply to Corning: 'A happy and charming gentleman who ambled through life, unhurried, unconcerned and unperturbed'.[5] What did Corning think about his seminal suggestion being ignored by surgeons?

> '... nor ought we to judge them harshly for this, for at that time penetration of the meninges of the cord seemed as venturesome an undertaking as did mutilation of the peritoneum at a more remote epoch.'[4]

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SPINAL ANAESTHESIA - THE FIRST 50 YEARS

Dr B Fischer
Consultant Anaesthetist, Alexandra Hospital, Redditch

The history of spinal anaesthesia over the last 100 years has been well documented since the early experimental and clinical use of the technique both in Europe and the United States. This presentation is not a definitive history, but as we celebrate the centenary of this landmark development in anaesthesia, I thought it appropriate to look at the roller coaster ride from early euphoria through cautious concern to almost complete rejection of the technique which occurred in the first 50 years.

Discovery and development

As with most things in medicine, the first clinical spinal anaesthetic was part of a continuum of discovery rather than a bolt out of the blue. Corning, a New York neurologist, is sometimes credited with the first spinal in 1885 when he described spinal anaesthesia first in the dog and then in a man suffering from 'spinal weakness and seminal incontinence.[1] Corning clearly had a strong moral opinion about such men as he plotted the onset of the block by the vigorous application of a wire brush and electric current to the genitalia. In reality, his technique was not reproducible and was probably a fortuitous epidural as it preceded the first accurate descriptions of lumbar puncture by both Wynter[2] and Quincke[3] in 1891.

Corning theorised that if he could inject drugs directly into the epidural plexus of veins then they would be absorbed into the spinal cord for the more effective treatment of cerebral hyperaemia, spinal irritation and other neurological diseases. His knowledge of the anatomy of the spinal cord and meninges appears to be deficient even by the standards of the day; no attempt to identify CSF was made and the effects of the injections were fortuitous since, in the man, he injected up to four times the potentially lethal dose over about eight minutes. Corning showed no further interest in the development of spinal injections for surgical or other uses and perhaps he should be best remembered for his prophetic quote about his accidental spinal:

> 'Whether the method will ever find an application as a substitute for etherisation in genito-urinary or other branches of surgery, further experience alone can show. Be the destiny of the observation what it may, it has seemed to me, on the whole, worth recording.'

It was to be another 14 years before Bier published the first paper on spinal anaesthesia.[4] He described a series of six patients operated on under spinal anaesthesia and in the same year, 1899, Tuffier - a French surgeon working in Paris - wrote a paper describing its use for the relief of intractable pain and for surgery.[5]

They both acknowledged the rôle of Quincke who first described the technique of lumbar puncture that formed the basis of the method still practised today. He worked in the same

hospital as Bier in Kiel and, having read of Essex Wynter's use of Southey's drainage tubes (intended for draining oedema and ascites) to treat tuberculous meningitis by CSF drainage at the Middlesex Hospital, he refined the technique. Wynter's attempts to treat his four patients were not very successful and his insertion methods crude, but Quincke acknowledged his contribution to the development of a technique that has remained basically the same ever since. He used small needles of varying gauge (0.5 - 1.2 mm) in a paramedian approach at L3/4 to avoid damage to the spinal cord.

Augustus Bier was born in 1851 and was a surgeon at Kiel University where he combined the new developments in cocaine local anaesthesia with lumbar puncture to perform surgery under spinal anaesthesia. So, on 16 August 1898, the first spinal was performed on one of the six patients that Bier described as receiving between 10 and 20 mg of spinal cocaine in his paper of 1899. Apart from the undoubted surgical successes, Bier was concerned by the sometimes severe and prolonged vomiting and headaches that occurred after the technique. Bier submitted himself and his assistant, Hildebrandt, to the rigours of a spinal anaesthetic. Hildebrandt had difficulties with performing a spinal injection on his boss, with a major loss of CSF and a leakage of the cocaine injection due to an ill-fitting syringe and needle. Bier exacted his revenge by performing a perfect spinal on his assistant with 5 mg of cocaine and then testing its analgesic potency with a combination of pubic hair traction, compression of and traction on the testicles and a sharp blow to the shin with an iron hammer. These experiments commenced at 7.30 in the evening and they then celebrated their successes with dinner, wine and cigars. It was thus difficult for them to establish the precise cause of their hangovers the next day, although as Bier's headache lasted nine days and was markedly postural in nature he began to suspect that CSF loss may have had something to do with it! Perhaps coloured by his own experiences, Bier lost his enthusiasm for spinals and despite improvements in technique, he remained cautious about them.

By contrast, Tuffier rapidly became an enthusiast for spinal anaesthesia and by 1908 had written 20 publications on the subject, totalling 125 patients. He had recognised the importance of asepsis, the rôle of posture in block height and had carried out the first audit of 60 spinal anaesthetics noting no serious complications apart from an incidence of spinal headache of 40%! He also recognised the importance of clearly identifying CSF prior to the injection of cocaine.

The first spinal anaesthetic in the United States was performed on 26 October 1899 by Tait and Caglieri who carried out extensive animal (including horses) and cadaver experiments prior to using it on a series of 11 patients who were given between 5 and 15 mg of cocaine. They published an account of their studies in 1900[6] and their work in spinal anaesthesia is well described in a paper in *Anesthesiology*.[7] The credit for the first written report of spinal anaesthesia in America is usually given to Rudolph Matas, who attended a medical congress in Paris in 1899 and witnessed Tuffier administering a spinal anaesthetic.[8] He gave 50 spinals in the United States on his return but the first was after Tait and Caglieri had performed their work. Of interest to us now is the fact that Matas was certainly the first person to describe the use of intrathecal opioids when he added morphine to his spinal solution.[9]

It is perhaps difficult for us now to appreciate the enormous impact that spinal anaesthesia had on anaesthetic practice within a few years of its introduction. There was huge interest in

this new technique which offered better operating conditions and was apparently much safer than the only alternative - ether and chloroform general anaesthetics. Within two years of the first publication of spinal anaesthesia, 1,000 published accounts of the technique were in print.[10] The speed of development was extraordinary:

- Caesarian section under spinal, Kreis 1900
- Spinal analgesia in labour, Marx 1900
- Forty paediatric spinals, Bainbridge 1901
- Differential nerve block, Dixon 1905
- Continuous spinal, Dean 1906
- Total spinal anaesthesia, Chaput, 1907

British enthusiasm for spinal anaesthesia was, as usual when it comes to regional techniques, less than lavish. A leading article in *The Lancet* of 4 December 1909[11] said:

> 'Spinal anaesthesia does not appear to be welcomed so warmly in Great Britain as in some continental countries .... there is less cause to be dissatisfied with the use of general anaesthetics here than abroad.'

In fact, in 1907, Professor Arthur Barker of University College Hospital, made Britain's first significant contribution to the current knowledge of spinals when he published a series of three papers with a total of 300 patients, in which he studied the principles of hyperbaric solutions of stovaine, complete with a glass spine to demonstrate the effects of posture and gravity on block height.[12] He also encouraged scrupulous attention to detail both with technique and asepsis. Parsons and Gray working in Birmingham also made important contributions in the field of spinal anaesthesia and its effect on cardiovascular physiology.[13] They studied the variation of blood pressure with the onset of spinal blockade concluding that arterial pressure fell as abdominal and lower thoracic muscles became paralysed, causing a diminished negative intrathoracic pressure, publishing their results in 1912.

The researches of British clinicians formed the scientific basis on which many of the other developments in spinal anaesthesia were based. With continuing improvements in needle design, new drugs and a better understanding of the physiology of the accompanying hypotension, appropriate use of fluid replacement and vasopressors, spinal anaesthesia became a popular and safe technique world-wide until the end of the 1940s, almost exactly 50 years after its discovery.

The downfall

Two unrelated but important events, one in the United States and one in England, led to a rapid and prolonged decline in the use of spinal anaesthesia. In 1950, Foster Kennedy, a British neurologist working in New York published. 'The grave spinal cord paralyses caused by spinal anesthesia'. His conclusions were that:

> '.... spinal anesthesia is accompanied by so many definite and terrible dangers .... spinal anesthesia should be rigidly reserved for those patients unable to accept local or general

anesthetic .... Paralysis below the waist is too large a price for a patient to pay in order that the surgeon should have a fine relaxed field of operation.'[14]

His work had an immediate impact. Then, as if to ram home the message, the now infamous Woolley and Roe case hit the headlines in 1954 when, having been rendered painfully paraplegic following routine spinal anaesthesia, these two unfortunate men sued the anaesthetist for negligence. Despite a well publicised trial, a subsequent publication by Cope in *Anaesthesia* in 1954[15] and a review of the case by Hutter in 1990,[16] the cause of the paralysis has never been conclusively demonstrated. Conjecture and mystery still surround the events. Nevertheless, this case had the effect of inhibiting the use of spinal anaesthesia for the next twenty five years.

A personal account

Mr Swallow, at the age of 91, presented last January for a right hemicolectomy. A very sprightly man for his age, his only previous operation had been an internal fixation of an ankle fracture under spinal anaesthetic at our hospital a few years earlier. My colleague discussed the benefits of a combined GA and epidural and he was very keen on the idea. It was only in the anaesthetic room as he was drifting off to sleep that he said: 'Did I tell you I was the hospital pharmacist involved in the Woolley and Roe case ....?'

Some months later, having made a full recovery, he invited me to his house and we had a fascinating afternoon discussing the case. He could shed no more light than the published documents but he brought the characters to life: Dr Graham, the GP anaesthetist who died only 15 months ago, the theatre sister and her deputy who are both still alive, despite the latter going off sick the day after the fateful list in 1947 and having a brain tumour diagnosed (fortunately benign). Woolley and Roe were cared for in chronic care wards at Lodgemoor (?Whamefield) Hospital, Sheffield, and died within five years of the initial events. Despite suing the anaesthetist and losing, and despite their dreadful circumstances, they asked Dr Graham to visit them later and apologised for all the trouble they had caused him!

Mr Swallow found the court proceedings quite harrowing - even 45 years later. He felt that he was being made a scapegoat because of the inadequate coloration of the phenol, despite the fact that it was only ever requested for identification of the solution in theatre, not to signify any penetration of ampoules. He was reassured by the strong support he received from Professor Macintosh and felt that his procedures were vindicated when there was no change to hospital practice after the case. He did make the comment that many of the so-called experts invited to give opinion on the cause of the paralysis actually knew very little about the practice of spinal anaesthesia and that many of the theories bore little relevance to the facts. This feeling was echoed by the editor of *Anaesthesia* in his foreword to the reprinting in 1995 of the original Woolley and Roe paper: 'theories put forward may seem far fetched by today's standards'.[17]

Meeting Mr Swallow made me realise just how short a time our specialty has been in existence - he was born only 8 years after Bier had performed his first spinal; almost exactly 50 years later he was involved in the event which marked the lowest point of spinal anaesthesia; he lived on to see its centenary and to benefit from the resurgence of interest in spinal and epidural anaesthesia.

The next 50 years

If that was the nadir of spinal anaesthesia, what has happened to improve its popularity? The watershed was probably 1949/50. According to J Alfred Lee the single greatest advance in regional anaesthesia since the description of the techniques of central neural blockade was the introduction of lignocaine into clinical practice in 1947, and it possibly rescued spinal anaesthesia from a complete demise. With its clinical effectiveness and reasonable duration of action came chemical stability enabling it to be sterilised safely, and it was non-toxic compared to its predecessors. The second 50 years would see many advances.

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SPINAL ANAESTHESIA - THE SECOND FIFTY YEARS

Professor J A W Wildsmith
University of Dundee

Fifty years of history is not easily encompassed in a short paper and the challenge is made all the more difficult by the need to cover recent history. The author risks being undermined by the ultimate personal communication: 'I know, because I was there'! Thus this short review presents a personal, idiosyncratic even, look at the last fifty years of the history of spinal anaesthesia. However, no time period exists in isolation and this assessment has to be viewed in the context, not only of the hundred years of the clinical use of spinal anaesthesia, but in the full 150 years of the history of anaesthesia.

Those 150 years may be split into three approximately equal periods of about half a century. During the first, virtually all the basic discoveries of anaesthesia, including spinal anaesthesia, were made. The second half century was mostly about refinement and, in the current context, it is interesting to note that it began and ended with the introduction of a new local anaesthetic (procaine in 1904 and lignocaine in 1943). The last fifty years have, more than anything, been about the development of the systems of our specialty: learning to use and apply the methods effectively and safely.

The operating list of Monday, 13 October 1947, at the Chesterfield Royal Hospital, together with the publication of the Foster Kennedy review of spinal paralysis in 1950, clearly show that we had not learned to use spinal anaesthesia effectively and safely at the beginning of the last half century. Aspects of the Woolley and Roe case have been reviewed in the previous paper and are still much discussed in the UK. However, any user of spinal anaesthesia should also look at the Kennedy review. What lies therein is an anecdotal review of disaster with much neurological detail, but no anaesthetic information or consideration of the aetiology of the individual disasters. It is the classic example of condemnation by association.

The UK reaction was to (almost) abandon regional methods, but our American colleagues were more logical. In particular, Dripps and Vandam followed up over 10,000 patients to demonstrate that properly conducted spinal anaesthesia can be safe. However, we should never forget that the patients described by Kennedy existed and that the technique does carry the potential for personal disaster if it is not used properly. Of course, regional methods have potential advantages also and these could be debated at length, but 'first do no harm' is a paramount requirement and we must recognise that the problems of spinal anaesthesia must be eliminated before its benefits can be obtained. As well as neurological sequelae, it can cause headache and severe hypotension, and also results in very variable effects. These complications all received much attention during the last fifty years, the last (variability in effect) being a personal interest. This is not the place to review these aspects, but it is intriguing to note that each time a new drug has been introduced and applied to spinal anaesthesia, the same lessons about controlling its spread through the cerebral spinal fluid have been learned over again, the most recent example being bupivacaine.

To return to the main theme, spinal anaesthesia was used hardly at all in most UK centres during the first 25 years of the most recent half century. However, a few determined practitioners kept the method alive. My peer group training in Edinburgh was fortunate to be

influenced by several of them so that when we became consultants we were able to meet the challenges of surgical advance (in obstetrics, orthopaedics, urology and vascular surgery) by using spinal and other methods of regional anaesthesia. As a result, the use of these methods increased dramatically during the late 1970s and early 1980s (Figure 1).

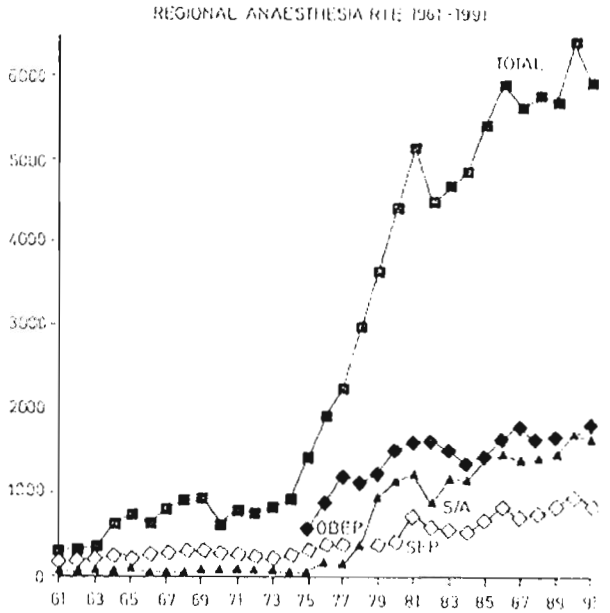

Figure 1.
Total numbers of regional anaesthetics given in the Department of Anaesthetics, Royal Infirmary, Edinburgh, between 1961 and 1991. Figures are also given for obstetric epidural (OBEP), surgical epidural (SEP) and spinal anaesthetics (S/A)

Perhaps the first individual to mention in this context is John Gillies, Head of the Edinburgh Department after the war, who actively supported those of his colleagues with these interests. He collaborated on the use of high spinal anaesthesia for induced hypotension with H W C Griffiths, and encouraged D B Scott with his work on epidurals. Of course, Edinburgh was not the only such centre and Scott was much influenced by J Alfred Lee from Southend.

So spinal anaesthesia recovered under their influence, but history does have a habit of repeating itself and it is my current concern that familiarity is breeding a little contempt. For example, continuous spinal anaesthesia has been the cause of cauda equina syndromes recently. Awareness of past experience might have avoided this. In the last decade or so there have been significant discoveries indicating that a wide range of neuro-transmitter substances are involved in the modulation of pain impulses in the spinal cord. Many of these

transmitter systems are influenced by drugs that are widely used systemically. Because they are available in injectable form, they have been used intrathecally without any prior safety testing.

In the Woolley and Roe case, the judge (Lord Justice Denning) eventually absolved the anaesthetist of responsibility, but we would do well to remember one of his statements: 'We must insist on due care for the patient at every point'.

Every time the vertebral canal is entered we should remember how narrow it is (approximately 1cm in diameter), and ask how much metal and plastic can be safely inserted therein? We should remember how delicate, and irreplaceable, is the nervous system and only expose it to substances that have been actively shown to be safe. Enthusiast though he was for spinal anaesthesia, J Alfred Lee was acutely concerned about its safety. Indeed, his last contribution to the literature was on that very subject. Some might consider his position to be harsh, but it bears consideration:

> 'Some individuals may not be able to attain such high standards and should be encouraged to confine themselves to less demanding methods.'

We would all do well to give this statement careful thought.

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NEURAL BLOCKADE - EVOLUTION TO VETERINARY PRACTICE

Dr Barbara Weaver
Honorary Senior Research Fellow in Veterinary Anaesthesia,
University of Bristol

Historical Background

Historical records clearly show that attempts to relieve or numb pain were being made centuries before the discovery of anaesthesia. Early in the 17th century, an Italian named Valverdi produced a sort of regional analgesia by compressing nerves and blood vessels near the region of the body to be operated on. More success, however, was found with the application of carbon dioxide (Professor James Simpson, 1857) and then, in 1866, the ether spray (Benjamin Ward Richardson) to freeze the skin. This was replaced by the end of the 19th century with ethyl chloride which vaporised very rapidly and was supplied in glass vials with a spray nozzle making it easy to use. This was a method still in use in the early 1950s for very minor procedures such as cutting an injured claw or lancing an abscess in small animal practice; the noise of the spray, however, was often more upsetting to the patient than a quick snip or lance.

The first use of a chemical substance to block sensory nerves other than by freezing came with the introduction of cocaine, an alkaloid first isolated from the plant erythoxylon coca by Friedrich Gaedicke of Germany in 1855 and then purified by Albert Nieman in 1860. Nieman named the product cocaine (benzoyl methylecgonine hydrochloride). Surprisingly, more than twenty years were to pass before cocaine came to be used as a local anaesthetic even though it was known to cause numbing of the tongue when taken by mouth. It was recommended in America to break a morphine-taking habit. Carl Köller, an ophthalmologist, was seeking a local anaesthetic for use on the eye and he described the use of cocaine in this way after studying the agent with the psychologist, Sigmund Freud.

Neural blockade is introduced with help from the animals

As with so many advances in medical and veterinary practice, much is owed to members of the animal kingdom that are lower in its taxonomy than human beings. Köller[1] carried out experiments with cocaine on the eye of a frog and a guinea pig and then tried it on himself. For efficiency as a surface anaesthetic, cocaine has never been surpassed but when administered by injection it was soon found that it could easily be toxic leading to convulsions and respiratory arrest. A study was carried out by Tatum et al (1926)[2] to determine the minimal dose that would be fatal for the rabbit and the dog. These workers found that when cocaine was injected subcutaneously 100 mg/kg was fatal to the rabbit and 26.7 mg/kg was fatal for the dog. Cocaine was also found to be addictive and this, together with the potential it has to cause poisoning, led to all preparations of it being controlled under the former Dangerous Drugs Act.

The temporary blocking of sensory nerves by injection was an accepted clinical procedure in both medical and veterinary practice from the beginning of the 20th century, but the physiology as to how a stimulus was propagated along a nerve was not known until the 1930s

when a study was carried out on the giant axons of the squid. This creature has axons measuring up to 1 mm in diameter to enable it to rapidly dart forward or backward.

Early clinical use of neural blockade in veterinary practice

Contributions to the introduction of neural blockade in veterinary clinical practice arose from studies in many countries including Germany, France and America, but in the United Kingdom its early use can be attributed to Sir Frederick Hobday (1870-1939) who devoted his life to the advancement of veterinary surgery and whose work covered all aspects of the profession. One topic of concern to him was the making of anaesthetics safe for animals. In 1915 he published what may well be the first veterinary anaesthetic textbook entitled *Anaesthesia & Narcosis of Animals and Birds*.[3] The considerations he describes for the safety of the patient would not be so different from those of today's anaesthetist. For example, in selecting an anaesthetic he states that the surgeon must always take into consideration the age and condition of his patient, the severity of the operation, the chance which the animal has had of being properly prepared, and other circumstances which may occur at the time or may have occurred previously. He goes on to state that: 'in cases of accident or other cause of urgency, the stomach may be full, or the patient may be weak from loss of blood ...'.

For local anaesthesia, Sir Frederick considered the use of cocaine, eucaine, novocaine, stovain, holocain, urea and quinine, eudrenin, codrenin, ether spray, ethyl chloride and orthoform and, in addition, the use of styptics such as adrenalin, renastyptin and suprarenin as adjuncts. He describes as indisputable the therapeutic value of cocaine as a local anaesthetic but at the same time he was aware of its toxicity. Sir Frederick described 'intraspinal anaesthesia' as being 'somewhat difficult of application' in animals. He considers only sub-arachnoid injections with no mention of epidurals and he refers to the work of French veterinarians, in particular that of Mennerat in 1914. Injections were made at the sixth lumbar or lumbo-sacral space, i.e. posterior to the termination of the spinal cord.

From the 1920s up to 1940, many techniques of perineural injection for clinical use in veterinary practice were reported and these were reviewed and described in Professor J G Wright's *Veterinary Anaesthesia* which became the standard textbook on the subject for many years. The book was first published in 1941[4] and subsequent editions appeared in 1947, 1948 and 1957.

The agents used for perineural injection

The toxicity of cocaine meant that it was replaced by the less toxic agent procaine, synthesised by Einhorn in 1904 which, like cocaine, was an ester of a lipid soluble alkaloid. It was the first of the agents and preparations having the para amino benzoic acid grouping hydrolysed in the body by plasma pseudocholinesterase. Cocaine remained in use, however, for many years as the best available surface anaesthetic. Many new agents were introduced but the most significant was lignocaine, a water soluble amide (the hydrochloride of 2-diethyl-aminoacetamide-m-xylene) synthesised by Swedish workers Lofgren and Lundquist in 1943, and first used clinically by Gordh in 1949. Its use clinically in veterinary practice was first reported in this country by Anderson, Tucket and Kenworthy in 1952, maybe after satisfactory trials in humans! Rapid action, ability to diffuse well in tissues and fairly good

surface action were features that popularised its use. Other amides came along but its main rival, prilocaine (Citanest) was not used very much in veterinary practice.

Administration of local and regional analgesia in animals

Local and regional techniques most commonly employed for animals are surface application, local infiltration, perineural injection and epidural analgesia. In larger animals such as horses and cattle and also in sheep and pigs, a local or regional technique is often used to avoid giving a general anaesthetic. Also, the veterinary surgeon often has to work at the farm or stable where the animal is kept rather than at a fully equipped hospital. A particular reason for the reluctance to administer a general anaesthetic in ruminant creatures is the risk of inhalation pneumonia from regurgitated and inhaled ruminal content.

There is a legal requirement for operations on animals to be performed under anaesthesia. The first Animals (Anaesthetics) Act became law in 1919. This Act referred to horses, dogs, cats and bovine individuals and divided operations into six Schedules, for the first three of which a general anaesthetic had to be given. It was replaced in 1954 by the Protection of Animals (Anaesthetics) Act, amended in 1964. Essentially, with just a few exceptions, any operation performed on any animal (vertebrate) must be done in such a way that the animal does not feel pain for the duration of the procedure.

Surface application is used particularly to the eye and also on to joint surfaces. Local infiltration is useful for minor skin surgery. It has also been used for many years for laparotomies, eg rumenotomy, caesarean section - through the flank in cattle and sheep. This is known as a field block whereby three layers of local anaesthetic are administered forming an inverted L shape along the ventral aspect of the lumbar vertebrae and posterior to the line of the last rib. Many veterinary surgeons have found this technique preferable to that of paravertebral nerve blocking, to be described shortly.

Regional analgesia by perineural blockade in domestic animals has been described recently by McGregor and Jones (1998).[5] Many nerve blocking techniques have been in use for most of this century but with improved techniques for general anaesthesia introduced in the 1950s they remained in use mainly for the large animals until recent times.

Limb blocks

The nerve supply to the lower forelimb of the horse is fairly straightforward and most commonly the subcarpal, high or low plantar nerves are blocked. This may be done to treat minor injuries in the de-sensitised areas but it is also done sequentially, working up the limb in order to detect the site of lameness. For example, a low plantar block of the terminal posterior branch of the nerve could be indicative of navicular disease. Such nerve blocking can also serve to give the animal some relief from pain and allow rest **but** care must be taken to see that incoordinate limb movement does not lead to further damage. Plantar nerve blocks can be carried out on the hind limb of the horse as can blocks of the tibial and peroneal nerves higher up the limb but they have not proved as useful or as effective, and are not so easy to carry out.

Nerve blocks to the lower limbs of cattle can be carried out although the nerve supply is more complicated than in the horse. For the forelimb, to desensitise the medial digit, three blocks are necessary, the medial and anterior branches of the radial nerve and the mixed volar nerves posteriorly at about the level of the fetlock joint. For the lateral digit, the mixed ulnar and median nerve must be blocked on the lateral aspect and the anterior branch of the ulnar nerve in front of the suspensory ligament. Pinceman, in 1933, recommended six injections below the fetlock. Not surprisingly, perhaps, many practitioners settle for a 'ring block' around the limb! The hind limb is just a little more straightforward but does involve the superficial and deep peroneal nerves anteriorly and the lateral and/or the medial volar plantar nerves posteriorly. As an alternative, the peroneal nerve laterally or the tibial nerve medially can be blocked in a comparable manner to the horse.

Intravenous Regional Analgesia (IVRA)

A modified Bier's block is an alternative method in cattle for desensitising the lower limbs and the digits. A suitable tourniquet is applied above the hock and some 10-20 ml of 2% lignocaine is injected into a vein distal to the tourniquet. This block does not always desensitise all the expected area possibly due to the fact that in a large animal it is not possible to reduce the lower limb blood volume. Intravenous regional analgesia has also been used in the dog as an alternative to interdigital blocks particularly in greyhounds where injury to the digits is not uncommon and, conveniently, it is a breed which has prominent limb veins.

Local analgesia for castration

Small animals should be given a general anaesthetic but local techniques are used for farm animals, i.e. cattle, sheep and pigs and are described for horses. Essentially, the line of incision and the spermatic cord have to be desensitised.

Regional analgesia for laparotomy through the flank

One method for this, already mentioned, is a regional infiltration block. A more specific blockade was introduced for cattle by Farquharson in 1940.[7] This consists of blocking the last thoracic and first three lumbar nerves as they emerge from the spinal canal through the intervertebral foramina, i.e. a paravertebral nerve block (Figure 1).

The dorsal branch of each spinal nerve must be blocked to render insensitive the skin and subcutaneous tissue and the larger ventral branch running beneath the intertransverse ligament is blocked, rendering insensitive the whole muscular flank wall and the parietal peritoneum. If the block has been successful there is warmth and relaxation of the wall of the flank and if the animal is viewed from behind it should be possible to detect a curvature of the spine due to the muscle tone on the opposite side. This technique is especially useful for performing a rumenotomy or caesarean section through the flank in a cow (Figure 2). This technique can also be used on sheep, and less often on pigs.

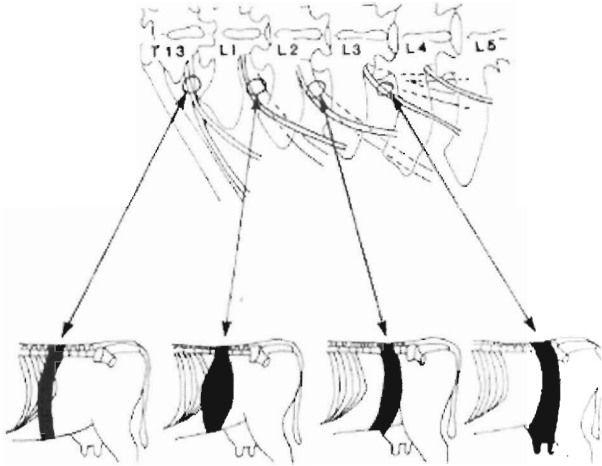

Figure 1
Patravertebral block for caesarian section

Figure 2
Caesarian section under patravertebral block

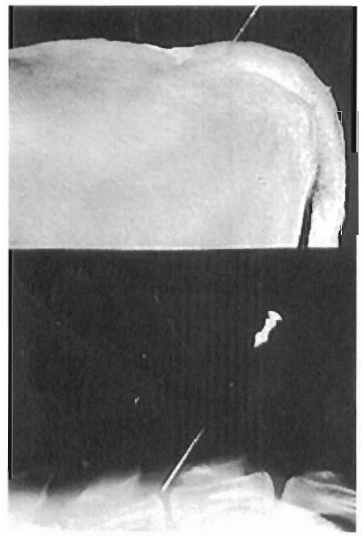

Figure 3
Needles sited for epidural block in a cow

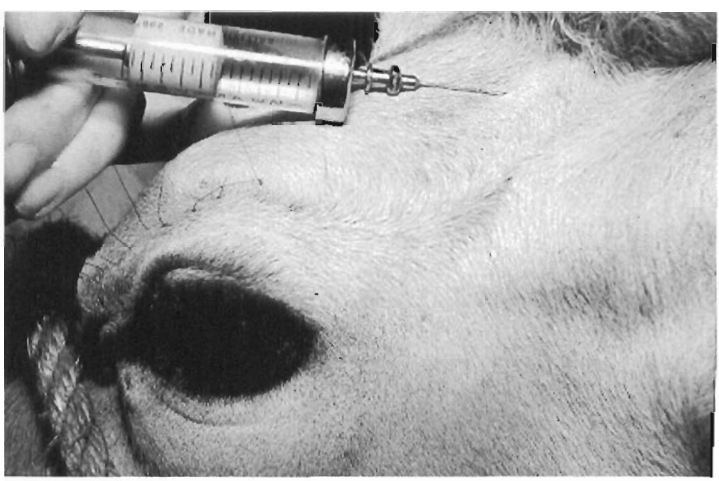

Figure 4
Cornual nerve block

Epidural analgesia

Subarachnoid injections have been used in animals but have been associated with difficulty and risk and so for spinal analgesia it is usually an epidural block which is used. In the history of anaesthesia new techniques are usually studied experimentally in animals, then introduced into clinical medical practice before they are adapted and used in clinical veterinary practice. But epidural analgesia is an exception. It was introduced into veterinary clinical practice for a number of surgical procedures in the early 1930s, notably in this country by Geoffrey Brook.[8] It soon became widely used in cattle practice especially in dealing with cases of dystocia

Two methods soon became recognised and termed *anterior* or *posterior* analgesia, the difference being how far the analgesic solution, largely due to the volume injected, permeates forward or towards the anterior of the animal. Thus an anterior epidural would mean motor nerve involvement and loss of motor control of the hind legs so that the animal would not be able to stand. This is not a practical problem with a sheep where the injection may be made at the lumbo-sacral or sacro-coccygeal junction, or in the pig, but in a large animal such as an adult bovine considerable care would have to be taken to avoid injury. In the conscious horse, where the injection is made at the first intercoccygeal junction, the consequences would be disastrous.

A posterior epidural in cattle is useful for any surgical procedures on the tail or perineal region. For a cow having difficulty delivering her calf it stops the voluntary straining but not the involuntary uterine contractions facilitating, for example, the correction of a malpresented calf. The injection is usually made between the 1st and 2nd coccygeal vertebrae which is located in several ways but most readily by so called 'pump handling the tail' when the first obvious articulation behind the sacrum can be palpated. A prior block of the internal pudendal nerve does prevent the animal swerving and thus facilitate correct insertion of the needle but it is somewhat difficult to do as the nerve is close to the pubic blood vessels and the rectal wall.

Figure 3 shows the epidural needle correctly placed and the position of the needle in the epidural space verified by x-ray.

Blocks around the head

Nerve blocks of the head of the horse were first described in 1917 by Bemis in America. The infra-orbital, supra-orbital and mental nerves are those that are most commonly blocked for wound suturing or minor dental surgery. Blocking the mandibuluar nerve would de-sensitise all the teeth on the blocked side but the technique, passing a needle some 7.5 cm up the medial aspect of the vertical ramus, is difficult and dangerous.

In cattle, similar nerve blocks of the head have proved useful but more specific to this species is the de-sensitisation of the horn or horn bud for the purpose of de-horning or, what is the more common practice now, the dis-budding of calves so that the horns do not grow. This entails blocking the corneal nerve which is a branch of the ophthalmic division of the trigeminal nerve. It is blocked along the posterior edge of the frontal bone where the nerve is subcutaneous and before it divides (Figure 4).

This is a simple block to do but branches of the 1st and 2nd cervical nerves along the posterior aspect of the horn should also be blocked as should the infratrochlear nerve.[6] This latter nerve is, unfortunately, often forgotten except in goats where the horn arises closer to the eye than in adult cattle and there is realisation that the infratrochlear nerve contributes substantially to the sensation of the horn. However, this is also the case in calves and, whereas with growth the skull lengthens and the horn grows away from the eye region, it is also advisable to block this nerve in the adult. (Butler, 1967). It is very easy to do by injecting some local analgesic solution over the frontal ridge after blocking the corneal nerve.

For the eye, in addition to corneal and conjunctival surface analgesia, a retrobulbar block can be used. This is generally done by passing a needle under the bony orbit to the back of the eye. However, in 1959, Peterson in America described a method whereby the needle is inserted in the adult bovine to a depth of some 3"- 4", behind the supraorbital process at the point where it meet the zygomatic arch. Just below the zygomatic arch and in front of the ear, the auricular palpebral nerve can be blocked. This is a motor not a sensory nerve but it can be useful to prevent the eyelids blinking and thus assisting, for example, the removal of a foreign body.

Perioperative pain control

Over the past two decades, neural blockade in veterinary anaesthetic practice has more frequently become a part of balanced anaesthesia, increasing the analgesic component. For example, nerve blocks around the head of a dog are not generally carried out in the conscious animal because a general anaesthetic would be preferable. Following radical surgery on the jaw for the removal of a malignant growth however, no amount of systemically administered opioids may relieve pain on emergence from anaesthesia but a mandibular block can give instant relief. Similarly, analgesia for surgery on the limbs can be enhanced by regional techniques as, for example, a brachial plexus block for the forelimb, and an intercostal blockade can provide analgesia during recovery from intrathoracic surgery.

Recently, opioid and alpha 2 agents have been injected epidurally, alone and in conjunction with local analgesic drugs. Over the last five years there have been some 250 references to this development. One example of this type of epidural analgesia assisting in perioperative pain control has been with total hip replacement in the dog. A large heavy dog needs to take weight on the leg the next day, so the hip has to be good and strong, and pain under control.

Balanced anaesthesia as described by Lundy[9] was to avoid overdosing the patient with any one drug and this he achieved in part with the use of regional analgesia and light general anaesthesia. The concept of balanced anaesthesia increasingly improved patient safety and led to the techniques of general anaesthesia practised today. In recent times, with improved methods and available agents, a return has been made to Lundy's idea of using neural blockade as a component of balanced general anaesthetic techniques.

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A MEDICAL STUDENT'S APPRENTICESHIP WITH C J MASSEY DAWKINS

Dr E N Armitage
Consultant Anaesthetist, Royal Sussex County Hospital, Brighton

Charles Massey Dawkins was born on 13 July 1905. He was educated at Mill Hill School, Emmanuel College, Cambridge and at the Middlesex Hospital where he qualified in 1930. He was the son of C W Dawkins, CBE, a banker. Massey's grandson, Guy, a urologist, has told me that CW encouraged Massey to go into medicine because he quickly realised that he was far too generous with money and would never make a banker. Guy also mentioned that the name Massey came from a Canadian branch of the family which made the Massey Harris tractor, now known after a merger as the Massey Ferguson. Although generally known as Massey, he was Jack to his close friends. He was Consultant Anaesthetist at University College Hospital, Hampstead General and at Paddington Green Children's Hospital. He was elected President of the Anaesthetic Section of the Royal Society of Medicine for the year 1974-75 and he died in office on 8 August 1975.

I first came across Massey Dawkins when I was dealt out to him from the medical student pack at UCH for my four weeks of undergraduate anaesthetic training. Although I did not realise it at the time, those four weeks were critically important for me. I had always intended to be a GP. At the end of my four weeks with Massey, I think I still intended to be a GP, but a career in anaesthesia had emerged as a serious alternative.

Alone amongst my teachers, Massey operated an apprenticeship system and although most of my time with him was spent at UCH, he took me to some of his other hospitals as well. I particularly remember Paddington Green where we spent Friday afternoons doing dental gases. His first act was to hand me over to Mr Lawton, the long-suffering dentist, who taught me the correct way to extract teeth. Massey believed that, before you could give a satisfactory dental gas, you had to understand what the dentist was trying to do and the difficulties of doing it when he was competing with the anaesthetist for the airway. He then showed me how to anaesthetise these children with Vinesthene (divinyl-ether) delivered through an Oxford inhaler.

He also took me next door into a room in the ENT outpatients department where children were waiting to have their sinuses washed out. There was a table in the middle and each child came up in turn and, in full view of the others, lay on the table with its head dangling over one end while a large sister stuck a skewer into its previously cocainised maxilla and injected saline. There was a fair bit of coughing and spluttering, but the children tolerated it remarkably well and many of them came back a week or two later for a repeat dose. Looking back, this was probably the first demonstration of topical anaesthesia I had seen.

Afterwards, I went with Massey to the antique shops along Church Street off the Edgware Road. He had been there every Friday for the past twenty years. He always bought something so all the dealers were very pleased to see him and often had things ready to show him: 'Just been holding this one back for you, doctor'. When I pointed out to him that if he had been doing this for the last twenty years he must have accumulated close on 1,000 bits of junk, he replied airily that he had a large house with a very large attic.

His car at this time was a battered old Morris 8, bought from a second-hand dealer in Camden Town. As he had a very good private practice with rooms in Wimpole Street I could not understand why he drove such an awful banger and, with the insouciance of youth, I told him so. He said that he had only bought it for the number plate and when he took delivery of a new Rover some months later the plate was transferred. Guy Dawkins tells me that until a couple of years ago it was still in the family. The number proclaimed his professional interest - CSF 2.

It is, of course, for his pioneering work on epidural anaesthesia that Massey is best remembered today. He is generally credited with being the first to perform an epidural in this country. This was in 1942. It was given for a second stage thoracoplasty on a tuberculous patient who could not have a local because his first-stage wound was septic and he was too ill for a general. Massey described it at a meeting of the Section of Anaesthetics at the Royal Society of Medicine on 5 January 1945. By then, he had done over 745 epidurals in patients ranging in age from 9 to 65 years, and was using the technique for all thoracic surgery, for gastrectomy, radical mastectomy, cesarean section and for obstetric analgesia.[1] By the time I met him, he must have been well on the way to the personal series of 4,000 cases which he analysed and published in 1969.[2]

I have selected three memories of Massey from the very many remaining from those four undergraduate weeks. Massey took great pleasure in seeing an operation being performed on fully conscious pain-free patients and he went to considerable trouble to make sure all their needs were met, but on one occasion he went too far. Having established that the patient was comfortable, he asked: 'Is there anything at all you'd like?' The patient thought for a moment, then seized his chance: 'I'd like a Guinness.' This raised one or two problems: firstly, there was no Guinness in the theatre suite - not that anyone would admit to anyway - and, secondly, the patient was in a fairly steep Trendelberg position. But Massey was a man of honour, so he found a very junior student nurse, one who hopefully would not be missed, and sent her out of theatre and down five floors to the hospital kitchens with a chit authorising the release of one bottle of Guinness. She had to accomplish this mission without being detected by Jean Hudd, the formidable, all-seeing theatre superintendent. The girl managed what sheepdog trialists call the outrun all right, but got caught on the home run. Miss Hudd took custody of the Guinness bottle, confronted Massey with it and only handed it over after he had promised to clear up the mess if the patient was sick. About ten minutes later, the patient, quite predictably, was sick, but fortunately he was reasonably quiet about it and hardly anyone knew what had happened. Massey realised that starting up the anaesthetic suction would give the game away so he bravely cradled the pool of Guiness, now mixed with gastric juice but still with its head on, and sent me off to get some paper towels and pillow cases to mop it up.

There was another episode, also involving alcohol, in the private wing. The patient, a bon-viveur, and an optimist, had undergone major thoraco-abdominal surgery, but was pain free and alert due to Massey's system of continuous epidural infusion - 0.4% lignocaine gravity-fed through an ordinary drip set.[3] On the first postoperative day, the patient was told the operation had been a success and straightaway decided to celebrate by uncorking a bottle of champagne, days before oral fluids would be allowed. He consumed much more than the therapeutic dose, but nobody was very worried because no sooner had it been quaffed than it

appeared in the gastrostomy drainage bottle where, like all the best champagnes, it continued to fizz.

My favourite memory is of the time when a senior registrar was sent from the Middlesex Hospital to find out what this epidural business was about. Massey's demonstration was a disaster from start to finish, Landmarks were impalpable, the ligamentum flavum was difficult to locate, Massey's method for identifying the epidural space was inconclusive and the catheter would not pass. But, as one setback followed another, Massey, far from being flustered or embarrassed, seemed to become more serene. But the young man from the Middlesex was unimpressed. He muttered perfunctory thanks and took his leave before the start of surgery. Unlike Massey, I was mortified that things had not gone better, and said: 'Wasn't it awful'. 'Oh no', said Massey, 'that young man has seen in the space of 45 minutes all the difficulties he is likely to encounter with an epidural in an anaesthetic lifetime and, with any luck, he'll think very hard before he tries one himself'. It was a lesson in practical philosophy for which I have been very grateful when my own demonstrations have been less than ideal.

For a last memory of Massey, I am going to jump ahead a few years to the time when I was working as junior house anaesthetist at UCH. It is always said that people of our generation can remember precisely what they were doing when they heard of President Kennedy's death. Not many of us were able to watch the funeral on TV, but Massey did, and he came in the next day very excited by the way the American flag had been ceremonially folded on top of the coffin. He reckoned that this was exactly how a sterile towel should be folded to enclose an epidural catheter and syringe so that top-ups could be given without breaching sterility. This was a problem which had worried him for some time and the flag folding at the funeral gave him the solution.

I would like to finish by summarising Massey's professional achievements and attempting an assessment of his place amongst the pioneers of regional anaesthesia, something which I think is overdue. It is fair to say that Massey Dawkins lit the torch of epidural anaesthesia in this country and, with his friend Alfred Lee, was one of the very few anaesthetists to keep that torch alight during the difficult years in the 50s and 60s when it very nearly went out.

He wrote extensively and lucidly on a variety of related subjects such as the negative pressure in the epidural space and methods of locating the space,[4] thoracic epidurals for upper abdominal surgery, epidurals in obstetrics and gynaecology and in major geriatric surgery, and as early as 1966 he had measured the plasma lignocaine concentration which resulted from his gravity-feed infusion technique.[3]

In 1969, years before computerised information retrieval, he assembled from the world literature, and reviewed, over 350 articles in which epidural complications were mentioned. He then pooled this information with his own 25 years' experience and produced a comprehensive analysis of epidural and caudal complications which still holds its place in the reference lists nearly 30 years on.[2]

He recognised the need to match the dermatomal extent of the block to the dermatomal extent of the surgery and, to this end, he realised the importance of the position of the epidural catheter, the posture of the patient and the method of delivery of the local anaesthetic

solution, points which seem to get downgraded today, but which we ignore at our peril. He put lipiodol down the catheters and took X-rays to see where they had gone.

He was highly regarded by those best placed to judge. Philip Bromage, for many years a leading player on the world regional anaesthesia stage, shared a platform with Eckenhoff and Bonica at the 1968 World Congress in London and paid a warm tribute to the pioneering work of Massey. I believe that if his papers had been more widely read and his methods more widely adopted, anaesthetic practice in Britain might have developed a very different culture which would have laid proper emphasis on postoperative analgesia and pain control.[5] Instead, we had to wait 30 years for the Joint Commission on Pain after Surgery to kick-start the subject.

As a man, Massey was a delight: avuncular, but slightly reserved; intellectually rigorous, but entirely without affectation; iconoclastic, but with no trace of malice, and a master of the pithy one-liner delivered with a snort of laughter through his luxuriant moustache.

I am indebted to Guy Dawkins for details of Massey's death. He was walking home up Haverstock Hill one August evening, having done a list at Hampstead General, when he felt a pain in his chest. He stopped to buy a newspaper and sat on a wall to read it until the pain eased a bit. When he got home he told his wife Sylvia that he thought he was having a heart attack. She was a doctor, so she disagreed. Massey persisted and their GP, Dr John Horder, was sent for. He agreed with Massey, put him to bed and gave him one injection of morphine followed by another some time later. Massey died in his sleep that evening within hours of having given his last anaesthetic.

My four weeks with him were among the happiest of my undergraduate training and they did in the end persuade me to take up anaesthesia. He has, therefore, a lot to answer for. His obituarist in the *British Medical Journal* expressed it more seriously and more eloquently:

> 'His memorial is the vast number of those who undergo major surgery with minimal shock and trauma; in those who pass through the recovery period completely pain-free yet not disorientated with opiates; in those with malignant disease whose last days remain lucid yet pain-free; and in the thousands of women who experience childbirth freed from the curse of Genesis. 'He nothing common did or mean'. He gave warmth to us all, and the world is that much colder for his going.'[6]

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THE COXETER - MUSHIN ABSORBER: AN IDEA BEFORE ITS TIME

Dr M A Rucklidge
Formerly Consultant Anaesthetist, Royal Lancaster Infirmary, Lancaster

This circle absorber system was designed in 1941 by Mr Coxeter of Coxeter & Sons, the long established firm of anaesthetic apparatus manufacturers, in conjunction with Dr William Mushin. It was introduced for use in the Emergency Medical Service in 1942 and described in the *British Journal of Anaesthesia* in 1943.[1] This is an interesting paper, for not only is the absorber described but the various requirements for the ideal design of an anaesthetic machine are detailed. These include fourteen anaesthetic requirements, eight mechanical requirements, four chemical and physical requirements and one aesthetic requirement:

> 'If at all possible, the apparatus, while conforming to all the above requirements, should by its symmetry and colour be pleasing to the eye and harmonise with the rest of the theatre furniture.'

It seems amazing that at a time when England was in danger of invasion and London was being bombed nightly, Dr Mushin should be worrying about the colour of his anaesthetic apparatus!

The circle absorber system is shown (Figure 1) and its individual components can be seen in the circuit diagram (Figure 2). It is curious that the circuit diagram shows a reservoir bag whereas the actual apparatus has a bellows. This must be an error in the drawing for it is difficult to believe that Mushin did not appreciate the difference between having a bag or bellows in the circle, in that a bellows allows air or other gas to be drawn into the circle, which a bag cannot do.

The bellows (Figure 3) has a capacity of 2.5 litres and is fixed to a balanced crank which oscillates on a robust roller bearing, so resistance to spontaneous breathing is minimal. The movement of the bellows is magnified by the attached lever at the front (Figure 4) which moves along a volume scale so tidal volume can be measured. The lever can also be used to ventilate the patient and on its end is a knob made of luminous material so that respiratory movements can be seen in the dark, eg. X-ray rooms in the 1940s. This luminous property can still be demonstrated on a Coxeter-Mushin absorber, 56 years after its manufacture. The carbon dioxide absorber is an example of 'double phase absorption', i.e. gas passes through the soda lime canister during both inspiration and expiration. Mushin clearly believed this was more effective than single phase absorption as used in earlier systems,[2,3] though this is now not thought to be true.[4] The soda lime canister (Figure 5) is essentially the same as a Waters' canister[5] and is contained within an outer cover that can be easily removed to change the canister. The degree of absorption is controlled from 0-100% by the graduated switch on the side of the absorber.

Incorporated as an integral part of the absorber block is an ether vaporiser (Figure 6) which functions as a 'vaporiser in the circle' (VIC). This was quite a common feature of circle absorbers of that time but then fell out of favour when halothane replaced ether in the late 1950s, for lethal concentrations of vapour could be produced if halothane was put in this

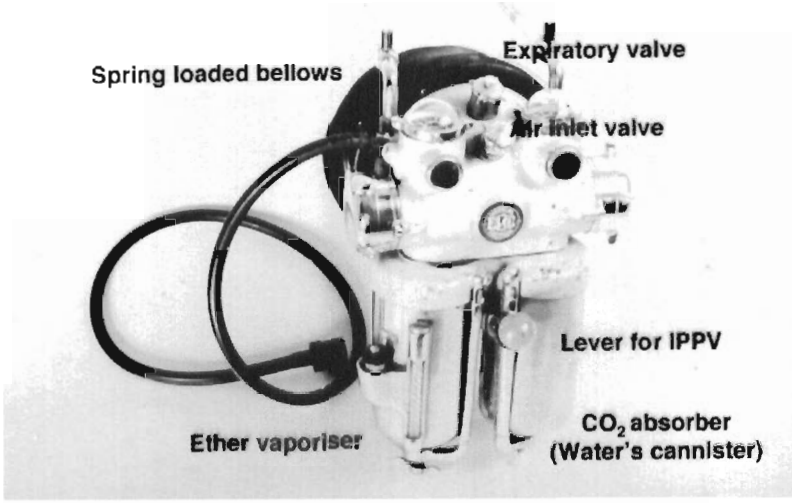
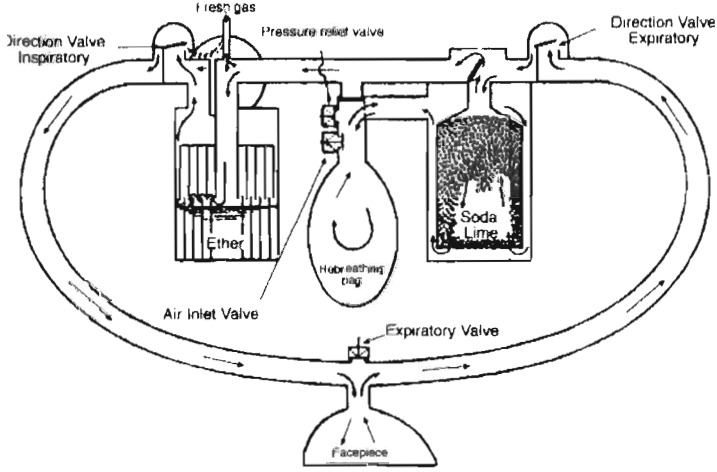


Figure 1



Circuit Diagram. Soda-lime and ether both "on"

Figure 2

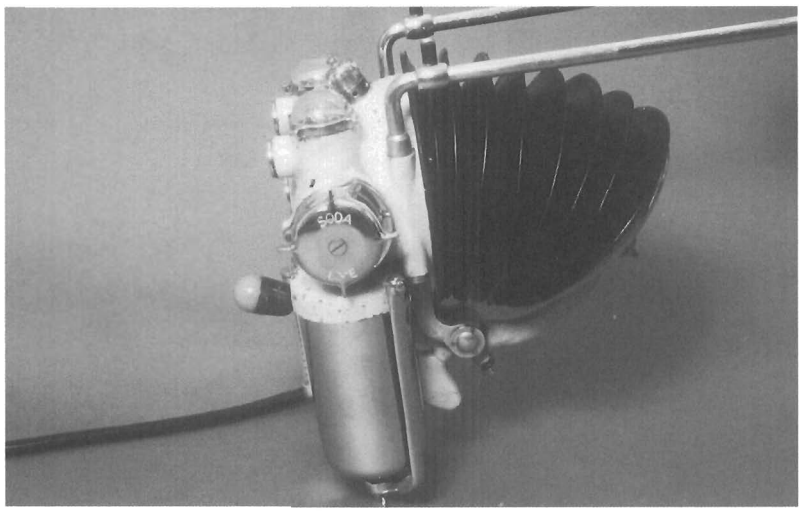


Figure 3

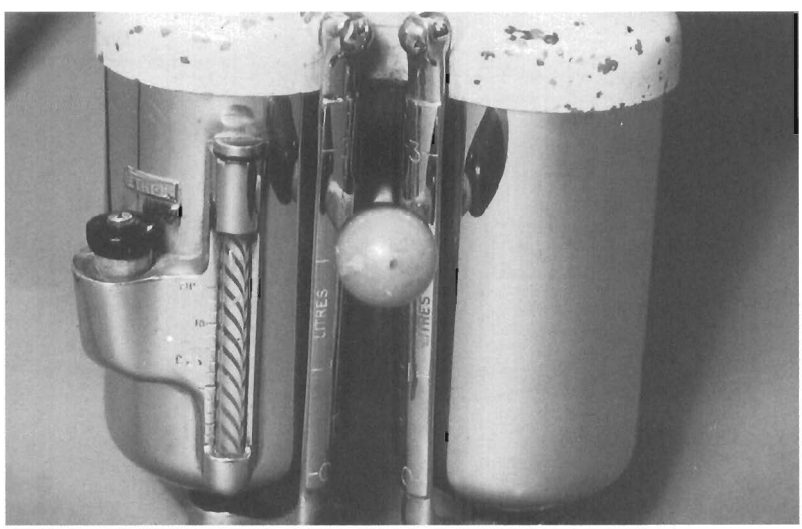


Figure 4

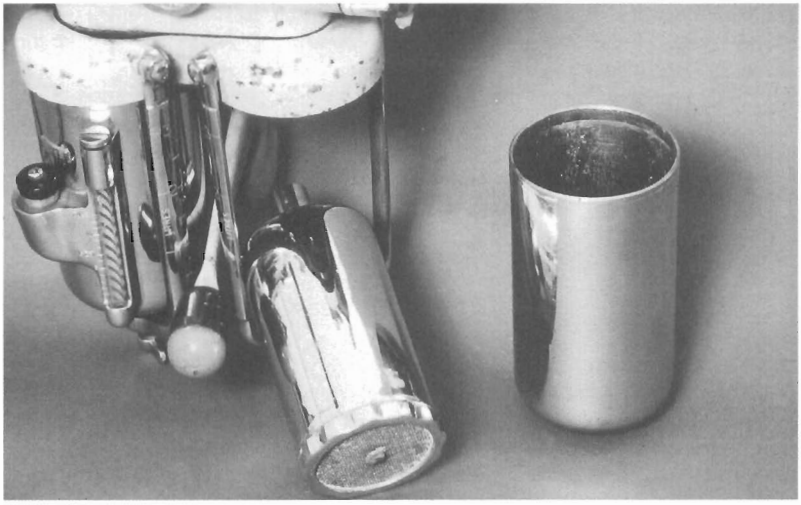


Figure 5

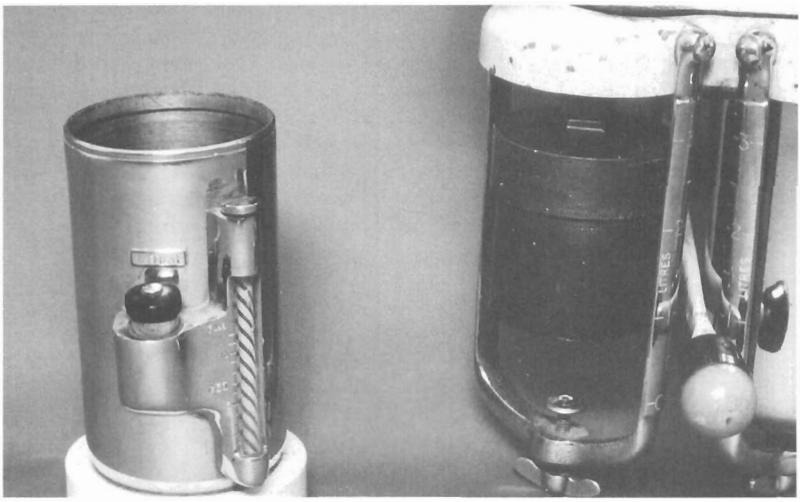


Figure 6

vaporiser.[6] Only now, 40 years later, are vaporisers in the circle again becoming acceptable through the ability to measure vapour concentrations within the circle. Another innovative feature of this absorber is that, in addition to the expiratory valve which is situated for easy access on the block, there is also an inspiratory valve that allows air to be taken into the circle. This can happen by opening the bellows or by the patient's inspiration should the fresh gas supply fail. It is not clear why this inspiratory valve was included in the design. It could be a safety feature should the fresh gas supply fail or a means of rapidly exchanging the contents of the circle for air at the end of the anaesthetic.

All in all, this is an extraordinarily well designed and engineered piece of anaesthetic equipment, particularly considering it was developed and manufactured in the early years of the war. There is, however, a supreme irony about the apparatus in that it was designed to fit underneath the shelf of the standard EMS Boyle machine. This Boyle machine was constructed to deliver a nitrous oxide/oxygen/ether (or chloroform) mixture to the patient through the Magill attachment, which is now known as the Mapleson A system and is the simplest and most efficient of the non-circle breathing systems. In contrast, the Coxeter-Mushin absorber also delivers a nitrous oxide/oxygen/ether mixture to the patient by the most complicated breathing system that exists, namely the circle system with a vaporiser in the circle. Given the choice of administering the same anaesthetic mixture by a complicated or simple system, it is interesting to speculate just how frequently this absorber was actually used in practice. At that time theatre pollution was not seen as a problem and economy in the use of ether as against cyclopropane was not important.

So is this absorber of academic historical interest only? Two current changes in anaesthetic practice suggest that features of the Coxeter-Mushin absorber have a place in the future design of anaesthetic machines. These changes are the developing acceptability of vaporisers in the circle now that accurate and reliable monitors are available, and recognition of the deleterious effects of nitrous oxide such that air/oxygen is becoming more commonly used as a carrier gas. The principles of the Coxeter-Mushin absorber lend themselves perfectly to the administration of air/oxygen/volatile anaesthesia. The use of the inspiratory valve and the bellows would allow an air/oxygen mixture to be generated within the circle. A simple draw-over vaporiser as a modular component in the circle could easily be changed according to the volatile agent required. The addition of a ventilator and standard patient and machine monitors would make a low cost but effective and economical anaesthetic machine. Perhaps, some 60 years after its introduction, the Coxeter-Mushin absorber will come into its own in the next millennium.

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HAROLD WILLIAM CHARLES GRIFFITHS (1915-1990)

Dr A G McKenzie
Consultant Anaesthetist, The Royal Infirmary of Edinburgh

Harold Griffiths is probably best remembered for his pioneering work (with John Gillies) on hypotension induced by high spinal anaesthesia. He was born in October 1915 in Rawalpindi and was brought up in India. His father, a Captain in the British Indian Army, was very strict and withdrew his support when Harold declined to pursue a military career. Hence Harold paid his own way through medical school in Calcutta, where he graduated MB in early 1941 (personal communication, Mr John Griffiths).

Military anaesthesia

Griffiths was immediately posted to a British Military Hospital in the Punjab where he became acting official (and only!) anaesthetist - largely self taught.[1,2] His anaesthetic equipment comprised cans of ether, mouth gags, a wooden wedge and (later) a rubber endotracheal tube. Finding that the operating conditions for major abdominal surgery were unsatisfactory with open ether, he was encouraged to try spinal analgesia. He read the instructions in a box of Stovaine ampoules and sensibly confined his initial attempts to patients having perineal or lower limb surgery. He soon found that spinal analgesia 'offered incomparably better operating conditions than open ether' but encountered the problems of nausea and vomiting, circulatory collapse, restlessness and occasional air hunger.[2] After much anxiety, he managed to reduce these alarming incidents by substituting light Nupercaine, adopting the Trendelenburg position for all cases and administering oxygen through a glass funnel.

Early in 1942 he was posted to the 14th Army on the Burma border. He was stationed at the field hospital in Dimapur (base) during the Japanese siege of Kohima (1944) - one of the most bitter and bloody battles of World War II.[3] This made a great impression on him. Years later he recounted his experiences:

> 'Malnutrition, tropical disease, anaemia and suppuration presented themselves with multiple severe injuries. The whole shock problem was on the doorstep - in an inhospitable environment of heat and humidity. Then came the impressive results of blood transfusion and the introduction of antibiotics. Procrastination was not the best treatment of acute circulatory failure! Continuous iv thiopentone was not the anaesthetic of choice for the severely wounded or for those with severe infection.'

Probably Dr Griffith avoided spinal anaesthesia at the field hospital. Shock was known to be a contra-indication to the technique.[4] Furthermore, the danger of dehydration in the hot climates of India and Burma was well recognised.[5]

Late in 1944 he was posted back to India to a course run by Dr Victor Goldman. There he learned to use controlled respiration (with ether as a central depressant). Next, he went to a depot of Ghurka regiments where he learned many local anaesthetic techniques (and also took up fishing!).

After the war he contemplated joining the Colonial Service, but went to Britain in February 1946, determined to take up anaesthesia as a career. He obtained the Conjoint DA in June of that year. When the NHS started in 1948 he was appointed Consultant Anaesthetist at the Royal Infirmary of Edinburgh in Dr John Gillies' Department, where he remained until his retirement.[6] He worked in the Professorial Surgical Unit, initially with Prof J R Learmonth.

Induced hypotension

At this time Prof Learmouth was performing the operation of thoraco-lumbar splanchnicectomy and sympathectomy as a treatment for severe essential hypertension. The surgery involved opening extensive tissue planes to expose the nerves, and the resultant haemorrhage in the hypertensive patient was a major problem. For the bilateral procedure the second side was operated on a fortnight after the first. In the 1930s high spinal block analgesia had become a recognised technique for thoracic surgery upon patients with excessive sputum[4] and the concomitant profound fall in blood pressure was noted. Griffiths and Gillies tried the technique on Prof Learmonth's splanchnicectomy sympathectomy cases with the planned intention of inducing hypotension. Their aim was to create an ischaemic surgical field, thereby limiting blood loss and assisting in the performance of a difficult operation. They produced (probably) total sympathetic block in a series of 44 patients. Encouraged by his Head of Department, Griffiths prepared a report on this series, which was published in *Anaesthesia* in October 1948[7] Most of today's anaesthetists will find the technique salutary reading!

> Premedication was Omnopon and hyoscine (no vasopressor). Induction was iv thiopentone (usually 1 g) followed by subarachnoid injection of 150-250 mg procaine (dissolved in 3-4 ml of csf) at the 2nd lumbar space. Then the patient was turned on his back and the table immediately tilted into steep Trendelenburg position. Having noted rapid fall in blood pressure an airway was inserted and 100% oxygen administered. The patient was then put into the lateral 'jack-knife' position, the pelvis being at the highest point of the table. While emphasising the need for a clear airway the authors relied on a well-fitting facemask: the patients were not intubated and breathed spontaneously. An almost blood-less operative field was achieved at a cost of unrecordably low blood pressure for about 40 min (Figure 1). Monitoring during this period consisted of:
>
> - palpating the apex beat (arterial pulse was not palpable at the wrist);
>
> - testing capillary filling time by pressure on skin;
>
> - observing colour;
>
> - observing respiration, i.e rate and tidal exchange.
>
> ECG was not recorded.
>
> Cyanosis was observed in 4 cases; this persisted in 2 cases where active ventilation produced no improvement, but injection of methedrine caused an immediate marked response. Respiratory arrest occurred on 2 occasions, necessitating 'passive ventilation'.

This seems curious terminology because Waters had already coined the term 'controlled respiration' in 1936;[8] furthermore, the authors noted that if the pleura was opened producing collapse of the lung and paradoxical breathing, it would be necessary to correct this by 'controlled pulmonary inflation'. There was only one table death (second stage operation): this resulted from failure to maintain oxygenation due to a large pleural effusion on the first side and restricted lung expansion on the open side by retractors.

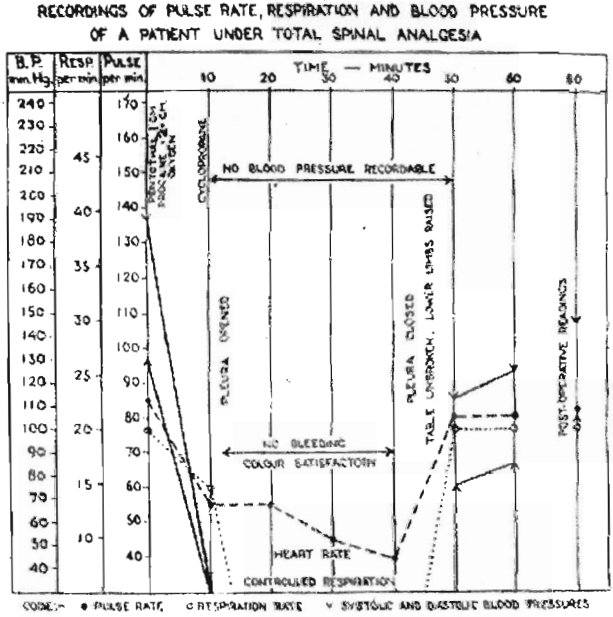

Figure 1

Viewed from the perspective of today's monitoring equipment, these anaesthetists demonstrated outstanding clinical judgement and insight of 'physiological trespass' - a term coined by John Gillies.[9]

The publication by Griffiths and Gillies was a landmark indeed, as the first deliberate use of hypotensive anaesthesia. Observers were deeply impressed by the dramatic avascularity it conferred, yet the technique was so contrary to established practice that readers of the paper were astonished and controversy ensued.[10] Controlled hypotension was discussed at the Joint Annual Meeting of the British Medical Association and the Irish Medical Association held in Dublin in 1952. Dr H W C Griffiths was one of the delegates and he expressed the view that respiration and circulation could be modified by the anaesthetist as long as the basic oxygen requirements of the patient's tissues were met.[11] This topic was again discussed by the Sections of Anaesthesia and Surgery of the Royal Society of Medicine in February 1953. By then the Edinburgh series of high spinal block for patients undergoing surgery for vascular diseases had reached 802 operations. From the experience of this series Dr Gillies enumerated the contra-indications to inducing hypotension.[12] He felt the *only indication* for

hypotension was when its advantages to the patient and surgeon were definite and likely to outweigh the accepted risks.

Griffiths's and Gillies's paper was the impetus for pharmacological trials, starting with methonium compounds in 1950[13,14] The introduction of better drugs for inducing hypotension, e.g. trimetaphan camphorsulphonate in 1953,[15] sodium nitroprusside in 1962,[16] labetalol in 1976[17] and glyceryl nitrate in 1981,[18] led to the demise of intentional total spinal analgesia.

IPPV for crush injuries to the chest

In 1956 the regius chair of clinical surgery at the University of Edinburgh was taken over by John Bruce, whom Dr Griffiths had first met in Burma. Bruce had been Brigadier and consulting surgeon in the 14th Army and had a deep interest in bone and joint surgery.[19] Harold Griffiths produced another landmark paper in 1960 on crush injuries to the chest, wherein he advocated intermittent positive pressure ventilation (IPPV) for cases with intractable respiratory insufficiency.[20] Prior to this, most cases of crush injury to the chest were treated by mechanical fixation of the flail segments of the chest wall. Usually pleural drainage and tracheostomy were performed and, if paradoxical respiration persisted, the affected ribs were surgically fixed by wiring. Strapping the chest and weighing it down with sandbags was also recommended. Laboured respiration frequently dislodged the fragments after fixation and mortality was high. Harold Griffiths's paper showed that the alternative method of applying IPPV abolished paradoxical respiration, controlled respiratory insufficiency, permitted adequate relief of pain without fear of ventilatory depression and facilitated tracheobronchial suction. Following this paper, IPPV was increasingly used for flail chest injuries with dramatic reduction of mortality.[21] Griffiths maintained his interest in intensive care[22] and in 1963 he was awarded the Fellowship of The Royal College of Surgeons of Edinburgh without examination (personal communication, Archivist, RCSE).

One of Griffiths's later clinical interests was the close similarity in anaesthetic performance between halothane and chloroform. He published one of the first studies on the comparative effects of these agents on human hepatic function. [23]

Griffiths the man

What of the character of the man? Harold Griffiths was good-humoured, kind and able to empathise. His extreme dedication to anaesthesia left little time for domestic matters. Though not a socialite, he was a committee member of the Scottish Society of Anaesthetists in the 1950s and was President of the Edinburgh and East of Scotland Society of Anaesthetists in 1960. Probably his greatest joy was teaching young doctors. In 1954 he spent time in Copenhagen participating in the WHO training program for overseas anaesthetists.[24] He also taught anaesthesia at the University of Cheng Mai, Thailand in 1967 and at the Hudson Bay Company in Canada in 1970. He insisted on applying physiological principles to medical problems and this made him a superb teacher. He was known affectionately as 'Griff'. Fishing was his recreational outlet, but this was not enough to satisfy him on his retirement in 1980 - he missed anaesthetics!

Griff's work in the advancement of spinal analgesia and improved management of chest wall trauma deserve acclaim. These two fields of interest seemed to find a common path when spinal opioids were introduced just before his retirement. In 1984 he delivered the John Gillies Memorial Lecture for the Scottish Society of Anaesthetists on *Clinical Anaesthesia, retrospective and prospective.*

He died in December 1990, assured of an honourable place in the history of British anaesthesia.

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CHURCHILL'S NEW YORK ACCIDENT*

Dr G L Zeitlin
Newton, Massachusetts

On 11 December 1931, Winston Churchill arrived in New York to begin a long lecture tour of the United States. Two days later he received a phone call from his friend Bernard Baruch, the financier, inviting him to visit at his apartment on Fifth Avenue. Churchill had forgotten to ask for directions and after trying for some time to recognise the correct building through the cab window, instructed the driver to deposit him on the Park side of Fifth Avenue - saying he would do better on foot. When he recognised the building he crossed Fifth Avenue; having reached the middle he looked to the left, as he would in England - the wrong way in the USA. Almost immediately he was hit from behind by another taxi travelling uptown at 30 miles per hour.

Dazed, with an injured shoulder and bleeding freely from a deep laceration of the forehead, he was taken to nearby Lenox Hill Hospital where he was admitted under the care of Dr Otto Pickardt. He was given a general anaesthetic for the repair of the laceration. During the early recovery phase and while still in hospital he wrote three articles about the accident. These were published in the *Daily Mail*. They describe the whole experience and include a vivid description of the anaesthetic he was given. The *Daily Mail* articles provide another example of Churchill's extraordinary wide knowledge of and insight into many subjects - this time about anaesthesia.

*** Abstract only at Dr Zeitlin's request**

BREATHE OUT - MORE THAN THE HEIDBRINK VALVE

Dr I McLellan
Consultant Anaesthetist, Glenfield Hospital NHS Trust, Leicester

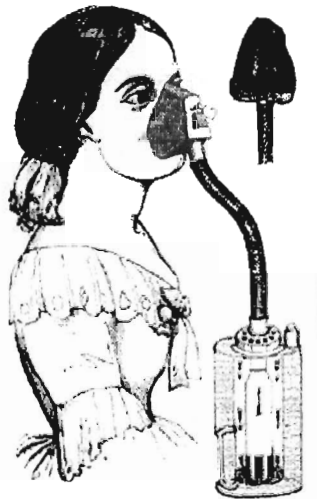
I am an angler fishing for information about a subject which fascinates me. The Heidbrink valve is familiar to us all as an expiratory valve. A constant theme of anaesthetic apparatus has been the ability to breathe out. The very first pieces of apparatus had a valved mechanism for expiration and this was continued in other inhalers of the early period of anaesthesia. Sibson's mouthpiece inhaler (Figure 1) was of course developed for oxygen therapy, but even then the expiratory function does seem to have been understood, and this earlier time I hope to explore in the future.

The face mask of Snow's ether inhaler is derived from Sibson's. The expiratory flap valve could be moved sideways to allow the free passage of air. When closed, the pressure to open the valve, and thus the volume of retrograde flow is countered by the height of the air intake column. The same is true of his chamber for chloroform (Figure 2). This obviously decreases pollution. So the multi-faceted importance of the expiratory valve and its resistance were known and dealt with at an early stage. Further vaporisers were introduced using a simple expiratory valve built into the mask as with that shown (Figure 3) on Clover's chloroform apparatus. Hewitt's stop-cock was part of his inhaler (Figure 4). The stop-cock can be opened in two ways. One gap allows free ingress of air, or the passage of an anaesthetic mixture to and fro. The upper slot allows the expired gas to pass out of the apparatus. Even more important of this later 19th Century period was the Barth valve (Figure 5) with its ability to allow rapid change from a completely closed set-up with no valves, through a valved expiratory system, to a completely open mode with free ingress and egress of air. The slick anaesthetist could switch swiftly between the systems by sleight of hand. HEG Boyle in his *Practical Anaesthetics* describes the use of the Barth Valve with nitrous oxide:-

> 'Having filled the bag and the face piece being applied, the Barth valve is with the lever in position A and the patient allowed to take one or two breaths of pure air. The lever is then gently turned to position B so that the patient is breathing gas and air and expiring through the valve. When the lever is moved the stream of gas is turned on. The respirations are at first jerky and irregular but become deep and regular and continuing for some seconds become jerky again. There is slight stertor and there is a short sharp expiration followed by a similar inspiration. As soon as this occurs the gas is turned off and the patient takes two or three more breaths and the face piece is removed and the lever is turned back to A. Another method is for the lever to be turned to position C and at the same time gas is turned off and so to and fro breathing occurs including exhaled carbon dioxide in the mixture.'

S H Guilford in his 1887 book *Nitrous oxide, its Properties, Method of Administration and Effects* described a similar method of administration in which the gas is drawn off into a bag or gasometer:

> 'The face piece or hood of the inhaler should now be put on the face and the patient requested to breathe. Until he has acquired the proper manner of respiration the patient should be allowed to breathe only air through the exhaling valve. This will inspire



From Duncum B. *The Development of Inhalational Anaesthesia.* Courtesy RSM Press.

Figure 1 **Figure 2**

confidence and allow time for further allaying of any fear. This accomplished, the lever controlling the inhaling valve should gently and cautiously be opened and the gas admitted. As well as the jerky breathing previously mentioned the countenance will also usually give indication of the progress towards the anaesthetic state. The natural colour will gradually give way to pallor which will continue while the effect lasts. The pallor is sometimes accompanied by greater or less lividity of the eyelids and lips. This is less likely to be manifested when the supply tubing is of the large diameter and the valves are of such character as to permit the full and free supply of gas.'

The Barth valve was adapted for other types of induction of anaesthesia. With the ethyl chloride induction unit in Figure 6 the valve could be closed out to allow total rebreathing for a short time. At the time I started training it was the sort of apparatus used for chemical convulsive therapy with an ether, which technique some may remember. There were many variations. Figure 7 shows a simple flat valve with a control knob allowing to and fro passage of gas and opening to air. Other Barth valves are shown in inspiratory - expiratory (Figure 8) valved mode and using the closed bag (Figure 9). A similar valve is used on the Codman Shurtcleff (Figure 10), an American dental inhaler. Other examples of expiratory valves are shown on a nitrous oxide gasometer (Figure 11), and on the Sudeck/Draeger mask which has a simple flat insert screwed onto the side (Figure 12). A simpler mask associated with the Junker's inhaler again has a basic spring-loaded expiratory valve.

We now move on to the use of the expiratory valve in controlling respiration. Figure 13 shows a valve for positive pressure during thoracic anaesthesia to help keep the lung inflated.

Figure 3

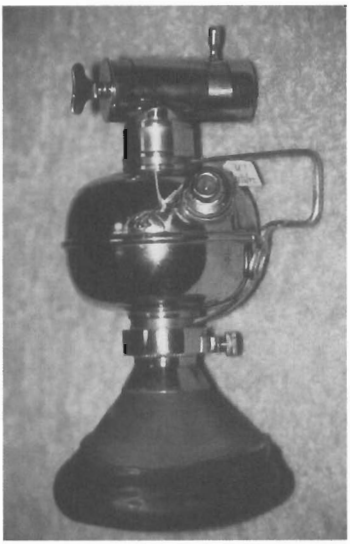


Figure 4

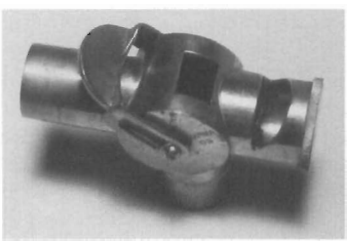


Figure 5

Figure 6

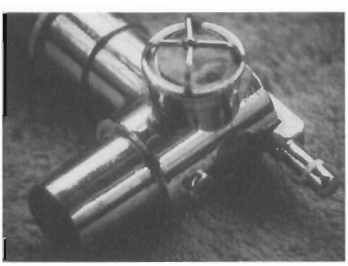


Figure 7

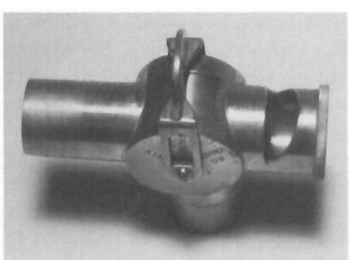


Figure 8

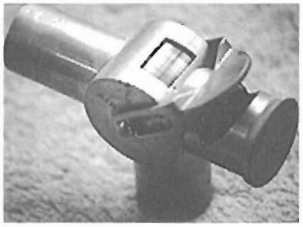


Figure 9

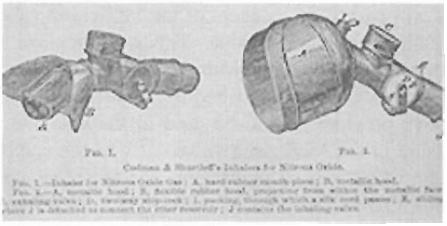


Figure 10

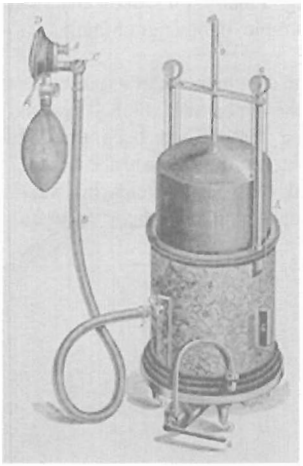


Figure 11

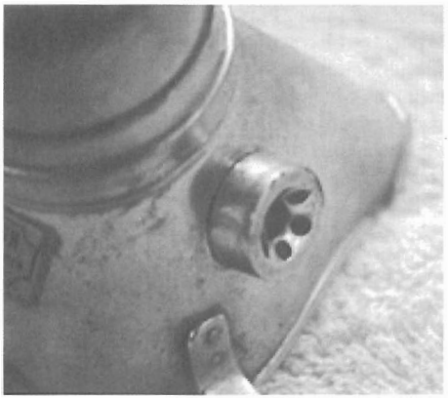


Figure 12

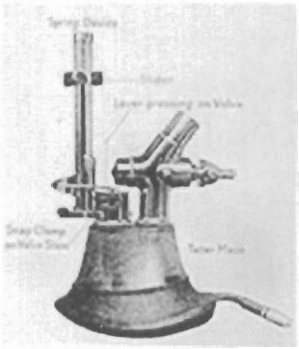


Figure 13

Figure 14

This was part of the concept of the McKesson valve with its adjustable tension in the spring, which had a numerical value. This was of course used for the partial rebreathing methods of the McKesson apparatus with the rebreathing bag. The utilisation of pressure change during anaesthesia was accomplished by adjusting the tension of the exhaling valve on the mask; if positive pressure was to be used in the machine one needed to appropriately increase the pressure in the McKesson valve. It was the combination of this valve with the rebreathing system which was so significant. The technique could be used with open mouth anaesthesia, as was reported in F W Clement's 1939 book *Nitrous Oxide-Oxygen Anaesthesia*. There could be problems with this valve because of possible excess pressure if the spring was damaged.

Paediatric expiratory valves deserve a brief mention. Figure 14 shows a version which has some connection with the Salt valve, but does have a spring. Finally, for British anaesthetists, the most familiar of the spring-loaded valves must be the simple, lightweight Magill.

This presentation has just picked out a few elements in the development of expiratory valves and systems. I have missed out such important things as the Ambu and Mitchell systems and the Heidbrink valve itself. In recent history the added feature has been antipollution connections which take us almost back to Snow. Breathing out during anaesthesia is a story in itself, which requires more information and detailed study. The Heidbrink valve, its precursors and its successors are too often left out of discussion on anaesthetic apparatus and techniques.

Guest Lecture

IMPRESSIONS OF SOUTHEND

Mr K Crowe
Keeper of Human History, Southend-on-Sea Borough Council

Mr Crowe gave a most interesting and amusing account of the development of Southend. We learned that the town's name came from the south end of the Manor of Prittlewell Priory. From about 1860, its tranquil nature was progressively changed by visiting holiday makers. Because it was the nearest seaside resort to London's East End, a 'useless, unruly rabble' came by ferry to 'Winkelton Pier' and by railway on the Southend Line or the Great Eastern railway from Liverpool Street. By 1895, on Bank Holidays, visitors outnumbered the townsfolk by some 5:1. The still rural town was altered when Arnold's Farm was sold to provide a park for the trippers. The Marine Park, opened in 1894, had an open air theatre, cycle track, cricket ground, gardens, shrubberies, lakes, fountains and a switchback railway. There were plans for a 400 foot tower, but the company went bust. The Kursaal (a place of healthy amusement) opened in 1901 and was popular for many years. It closed in 1986, to be restored and redeveloped in the 1990s. By 1910 the holidaymakers were increasing the population by ten times, and the Council had to come to terms with the situation. The shanties and cheap kiosks were confined to the eastern side and the western side became the higher class area.

We were delighted by the anecdotes and historical illustrations, relieved not to be regarded as a 'plague of locusts', but worried that our allocated hotels seemed to be rather to the east!

AMB

IN MEMORIUM

Death of Dr Gwen Wilson

We have learnt with deep regret of the recent death of the Australian historian of anaesthesia, Dr Gwen Wilson, who was so recently honoured as Laureate of the Wood Library-Museum. A full obituary will appear in the next volume of the Proceedings.

BOOK REVIEW

The Genesis of Surgical Anesthesia*

Bergman, NA, pp 448, illustrated. $85.00. ISBN 0-9614932-0-0
Park Ridge, Illinois: Wood Library-Museum of
Anesthesiology, 1998.

Surgical anaesthesia has been practised for just over 150 years since Morton demonstrated its possibility in Boston in 1846 with ether. The literature describing its development since then is very extensive, but only a few writers have gone back to the beginning of recorded history and tried to analyse how men and women throughout the ages had tried to relieve pain, and these accounts were all published more than 30 years ago. Since then, the approach to the writing of history has changed. Events are not merely recorded but interpreted in the light of research into primary sources. In particular the history of medicine has become a study for professional historians as well as doctors interested in the background of their subject, although surprisingly anaesthesia has attracted little attention from academic historians.

This book therefore is opportune. Bergman is an anesthesiologist practising in America. He started this work when he was on sabbatical leave in Britain at the Clinical Research Centre, Northwick Park, in Dr John Nunn's department in 1982. He became sufficiently engrossed to return for a further sabbatical period devoted to completing his historical research.

Bergman traces his story from ancient times, from Greece, Mesopotamia, China and India, up to 1846, and shows a clearly linked chain of events. There are few aspects of the English and American literature that have escaped his attention, though he admits that he has not been able to study that of Europe. The result is a large book with more than 900 references.

Has he succeeded in his task? In two words, yes, superbly. He writes with the attitude of the modern historian. He has studied original sources as far as possible and hence is critical of some earlier published accounts. His approach is biographical analysing not only the scientific contribution of a large number of individuals, but telling sufficient of their life stories to give a fascinating insight into their motivations and personalities as well.

Bergman has not been afraid to offer his own conclusions. He records the various herbal concoctions with which classical and medieval writers claimed to have produced surgical anaesthesia and asks whether they could actually have achieved what they claimed. He regretfully concludes that, in the light of our experience with many of the same drugs today, they could not have done so, certainly not consistently and dependably. This section could only have been written by a practising clinican such as the author and provides a good example of how medically qualified historians have their special place because of their understanding of some things that elude the pure historians.

* This review appeared in the *Journal of Medical Biography*, 1998; **6**: 185-6, and is reproduced with permission of the publishers, RSM Press.

He relates in detail those influences he feels to have been insufficiently appreciated by earlier historians. These include the role of the Lunar Society of Birmingham in bringing together enquiring minds from many different fields and he goes on to show that pneumatic medicine was studied long before Beddoes. He cites a neglected work by Tiberius Cavallo, an Italian who came to practice in London and who wrote in 1798 a most comprehensive and objective account of all that was known of pneumatic chemistry, physiology and medicine at that time. Bergman emphasises Beddoes' medical writings rather than his chemical and sociological works and shows that pneumatic medicine did not die with Beddoes, as sometimes claimed, but persisted until well into the 19th century. Michael Faraday, too, he feels has been unjustifiably overshadowed by Humphry Davy, though he adduces no additional evidence to support the belief that it was Faraday who wrote the crucial unsigned communication in 1818 pointing out the similarity between the effects of ether and nitrous oxide. Like writers before him, Bergman concludes that in the light of knowledge available in 1800, anaesthesia could have been introduced then rather than half a century later. It was tantalisingly close and he offers no new ideas about why it did not happen.

A most valuable aspect of this book is the way the author links the events not only to the science of the time, but also to the cultural, literary and political background. His chapter on 'The long 18th century' from 1675 to 1825 in which anaesthesia arose, covers as diverse subjects as the philosophy of medicine and surgery, the establishment of hospitals, the education of the different sorts of practitioners and the emergence of philanthropic attitudes. There are little gems such as how beliefs about the breathing of airs and vapours were introduced in the search for the cure for scurvy and the taking of medicinal waters in spas. He tells of the aurist William Wright who, having observed that breathing nitrous oxide increased sensitivity to sound, advocated it as a cure for deafness. Wright also got his patients to breathe ether when he found that it suppressed the irritating cough that sometimes accompanies instrumentation of the ear canal. Others thought of reasons for using nitrous oxide to treat cholera and hydrophobia. Yet it was slow to be used for anaesthesia, its ultimate place in medicine.

Bergman's interpretations are well argued and fully referenced, though his publisher has chosen an infuriating way of recording these. Each reference has to be checked in three separate places, first in the text, then in the chapter index and, finally, in the alphabetical index before the full citation can be found. Also, there are many misprints, starting with six conspicuous ones in a preface of four pages.

In summary, Bergman has written a book that deserves to become a classic in the field. It is comprehensive, wide-ranging, meticulously referenced and written in an attractive and eminently readable style. Like a detective story, it carries the reader forward inexorably as the trail of knowledge is unravelled. I shall treasure my copy and I suspect it may spend as much time on my desk or by my bedside as on my bookshelf.

Aileen K Adams

BOOK REVIEW

Proceedings of the Fourth International Symposium on the History of Anaesthesia

Jochen Schulte am Esch and Michael Goerig, eds.
Lubeck. Drager 1998. ISBN 3-925402-00-4; pp 878. illus.
DM150.00. Delivery charge DM20.00

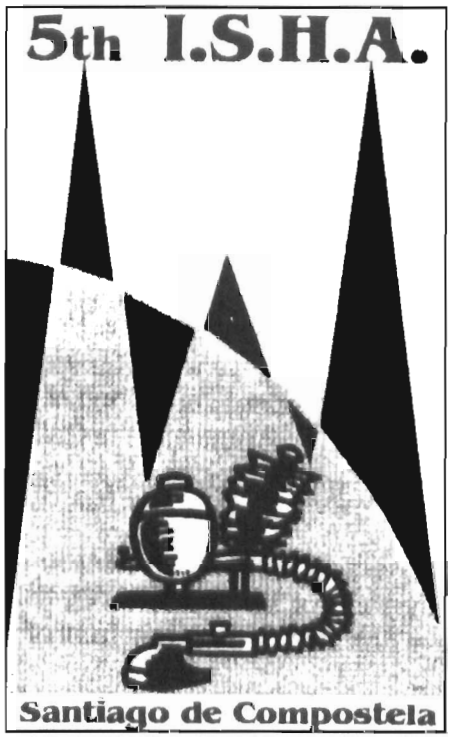
With its handsome binding, beautifully designed cover and abundance of illustrations, this volume will grace many a library on looks alone, but it deserves to be read as well as admired. The complete Hamburg proceedings including the poster presentations provide a breadth, diversity and a quality of information which is quite remarkable. The opening review by Rupreht and Erdmann is as useful as it is unusual; they sort through the tangled developments of the first international symposia to give an accurate record of important early stages in our rapidly progressing specialty. More conventionally, there follow excellent reviews on pain and analgesia up to 1846 (Tom Boulton) and from 1847 to the present (Lucien Morris). The scope of the proceedings is truly international. Germany is, of course, strongly represented and there are contributions from Scandinavia, UK, the Netherlands, Belgium, France, Spain, Portugal, Austria, the Czech Republic, Rumania, Poland, Israel, Japan, North and South America, Australia and South Africa. We learn a great deal of the pioneers and innovators of anaesthesia in many different countries and we are treated to first-hand accounts of more recent history - Safar on resuscitation, for example, and Severinghaus and Astrup on blood gas analysis. Everyone will find something of interest, while some presentations will be fascinating to all. Do not miss the assessments of the evidence for tracheostomy and resuscitation in ancient Egypt, the use of 'balanced anaesthesia' in medieval Europe or the Lahey cyclopropane explosion of 1938!

The illustrations are of very high quality, complementing the texts and bringing famous names and lesser known techniques to instant life. References are profuse and the indexing of both names and topics is most helpful. There are a few problems: repetition is inevitable, but is minimal; I noticed a mix-up of captions on pages 806-807; the space-saving hyphenations are irritating. Misprints and faulty translation are more serious but result only occasionally in ambiguity or misinformation. Those of us with just English cannot complain. We should applaud the wider skills of our international colleagues - and buy a copy of this excellent book.*

Marshall Barr

* *I understand there have been problems with Eurocheques and that electronic transfer is better. Contact Mrs B Witt, Secretary, Department of Anaesthesiology, University Hospital Eppendorf, Martinstr. 52, D-20246 Hamburg, Germany.*

A DATE AND PLACE TO REMEMBER ! !



Santiago de Compostela
12-15 September, 2001

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