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THE HISTORY OF ANAESTHESIA SOCIETY PROCEEDINGS

Volume 27

Proceedings of the meeting in Leicester
7th and 8th July 2000

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THE HISTORY OF ANAESTHESIA SOCIETY
Leicester Meeting 7 – 8 July 2000

Acknowledgements

The Society expresses its gratitude to the Organising Committee: Dr Roger Eastley, Mrs Sally Garner, Dr Ian McLellan and Dr Nico Volpe.

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Proceedings of the History of Anaesthesia Society

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

Editorial

An enjoyable return was made to Leicester in July 2000 for the Summer Meeting of the HAS. Leicester has great significance in the life of the Society since it was here, in September 1985, that an exploratory meeting was held which led to the inaugural meeting in the following year. It was trebly appropriate therefore that Ian McLellan, one of the movers of the original meeting, should organise this one, deliver a paper, and receive the Presidential badge of office from the retiring President, Jean Horton.

In a varied programme Jean Horton gave an account of her days 'on the house' (which included a spell at Leicester General), and this, together with Graham Smith's history of the Leicester Department, reminded us how far we have come in the last few decades of the second millennium. Of clinical interest also were Keith Sykes' account of the treatment of neonatal tetanus in South Africa, and Richard Bodman recalling the first opiate antagonist, nalorphine.

Detailed histories were given by Christopher Sharpe (resuscitation), Yash Pole (the computer), and Peter Hutton (monitoring), and by our ODP colleague, Sally Garner, on that indispensable group who started life as beadles and bag boys. Adrian Kuipers expanded an account originally given by Alfred Lee on Frederick Axham, who was struck off the Medical Register for administration of anaesthesia for an unqualified practitioner.

Ian McLellan told us about the local connections of some well-known names, and the Guest Lecturer, Richard Gill, spoke enthusiastically about the city and county of Leicester.

There was a moving tribute to the late and very much lamented Dick Atkinson, President of the Society 1997-1998.

David Zuck was prevented by indisposition from attending, but his philosophical paper was read by Neil Adams. We owe Neil an apology for failing to credit him with the summary of the Time Team lecture by Carenza Lewis in Vol 25.

Peter Drury
Honorary Assistant Editor

Future Meetings

History of Anaesthesia Society - Edinburgh:	29-30 June 2001
Fifth International Symposium on the History of Anaesthesia - Santiago de Compostela, Spain:	19-23 September 2001
Anesthesia History Association – Madison, Wisconsin, USA:	Spring 2002
History of Anaesthesia Society – Norwich:	Summer 2002
History of Anaesthesia Society – Sheffield:	Autumn 2002

Members and Guests attending the Leicester meeting, 7-8 July 2000

Dr C K Adam
Dr A K Adams
Dr N Adams
Dr A M Barr
Dr F E Bennetts
Dr R C Birt
Dr J W Blizzard
Prof R Bodman
Dr T B Boulton
Dr J Burton
Dr J A Chamberlain-Webber
Dr Cook
Dr P M Drury
Dr R J Eastley
Dr A M Florence
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Dr G Hall-Davies
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Dr N Nichols
Dr D A Nightingale
Dr A Padfield
Dr Y L Pole
Dr B Roberts
Dr A M Rollin
Dr N M Rose
Dr M A Rucklidge
Dr C Sharpe
Prof G Smith
Dr T Smith
Dr A Stewart
Prof Sir Keith Sykes
Dr A Trench
Dr W D Turner
Dr M van Ryssen
Dr C S Ward
Dr B Weaver
Dr C Webb
Dr S Yusuf
Dr M Zimmer

Installation of the new President, Dr I McLellan, by Dr Jean Horton at the Leicester Meeting, July 2000

Speakers at the Leicester Meeting

Dr I McLellan

Mrs S Garner

Speakers at the Leicester Meeting

Dr N Adams
presenting Dr D Zuck's paper

Professor R Bodman

Dr C Sharpe

Dr J Horton

Speakers at the Leicester Meeting

Dr A Kuipers

Professor Sir Keith Sykes

Dr Y Pole

Dr T B Boulton

Speakers at the Leicester Meeting

Professor G Smith

Professor P Hutton

Mr R Gill

HISTORY OF ANAESTHESIA SOCIETY
Papers presented at the Leicester Meeting 7-8 July 2000

WOURALI, OWLS AND CHLOROFORM

Dr I McLellan
Consultant Anaesthetist, Leicester

I am going to take a trip round my part of England to discuss some of the leading figures who had an effect on anaesthetic practice over the last 170 odd years. Obviously the first of these must pre-date anaesthesia and in this I include Francis Sibson, a surgeon at Nottingham General Hospital, high on the hill above the castle and now largely related to care of the elderly, eyes and other non-acute areas.

Sibson and Waterton

Francis Sibson had an investigative mind and worked in two areas related to anaesthesia. The first was in the development of his mask for inhalation of ether from a vaporiser rather than for anaesthesia, and then his inhaler for chloroform. These were used in conjunction with John Snow's apparatus and the mask in fact formed part of the early inhalation equipment in the UK.

His other area of interest was in the treatment of tetanus and rabies. He corresponded with Charles Waterton and planned to administer Wourali to patients suffering from these diseases whilst under his care at Nottingham. Charles Waterton stated: 'supposing a person had been bitten by a mad dog that person may or may not go mad, but should symptoms of the disease break out, a competent practitioner in medicine pronounce it to be undeniable hydrophobia, and the family wish to have Wourali tried I beg attention to the following remarks: *Lose no time in telegraphing for Dr Sibson and for Charles Waterton, Walton Hall near Wakefield, Yorkshire, and we will promptly attend*'.

On a previous occasion they were about to apply the Wourali but the patient died as they arrived and they did not administer it. On another occasion that Charles Waterton went to Nottingham they decided to experiment on a donkey with a surgeon (Mr Higginbottom). They gave the donkey Wourali: 'producing apparent death but made an incision in the windpipe and caused artificial respiration. The donkey got up on its legs and the squire mounted it and rode it round the room. The animal was henceforth named Wourali and lived for many years on a large grass plot attached to the General Hospital'. This was a comment by Dr Hobson at Leeds, a close acquaintance of Waterton and thus also Sibson. In fact, Wourali was used in Nottingham again, with six men bitten by a dog and one must presume that they did develop rabies as Waterton was close by and organised a visit.

In1839 he wrote to George Ord that he had again been to Nottingham where they had a meeting of scientific men, and one must presume that Francis Sibson was present in order to make some experiments. These may have included the donkey previously mentioned, but in his letter he does talk of 'reducing the patient to apparent death by the poison, he is completely under the power of artificial respiration'. This was attempted on several occasions, but because of the time taken to travel he was not always able to receive Mr Waterton in time. Sibson moved to London after thirteen years as did many practitioners of this time and became a physician.

Benjamin Ward-Richardson

Another example which has been discussed before is Sir Benjamin Ward-Richardson. As an undergraduate in Glasgow he believed that he saw the first demonstration of anaesthesia in Scotland. He moved as a young assistant in general practice to the village of Littlethorpe just south of Leicester. Whilst there he took part in resuscitation attempts following respiratory obstruction, which at first seemed successful; let us presume he developed some of his ideas from this. He was of course a great friend of John Snow and was offered his practice on Snow's death in 1858. He declined, as he wished to be a scientist rather than being tied down to actually dealing with patients, so that passed on to Joseph Clover.

Richardson still continued with his experiments and worked on local anaesthesia and resuscitation bellows. In his mind he drew up some plans of an early artificial circulatory assist device and he could be considered to have promoted the use, at least in theory, of the ECMO [extra-corporeal oxygenation] system. He reviewed anaesthetic aspects in his journal.

Florence Nightingale

In the Peak District of Derbyshire close to Matlock Bath is a small village called Lea and in it was a house known as Lea Hurst. In this house a remarkable lady developed her thoughts. She was of course Florence Nightingale, and Lea Hurst was the northern house of her family who originated from a farm house close by. There were reasons why Florence who, rather akin to the offspring of a famous couple today - the Beckhams - was named after her birthplace, and her family did not find Lea Hurst a pleasant place to winter, owing to the cold and darkness of the Derbyshire hills. It also only had 16 bedrooms!

She believed in pain relief in surgery and was an advocate of chloroform and in July 1851 described its use for an amputation. It is interesting that during the Crimean War Dr John Hall, the Inspector General of Hospitals, was in fact opposed to the use of chloroform and he said: 'the smart of a knife is a powerful stimulant and it is much better to hear a man bawl lustily than to see him sink into a grave'. Hall never actually directed, which he could have done, that chloroform should not be used, and indeed it was in the Crimea. He was obviously at loggerheads with Florence Nightingale over this; she promoted quite strongly the use of chloroform and we have a debt, often unappreciated, to her for this as she helped to push anaesthesia forward.

She was a great fan of the owl, and the more famous stylised illustrations of her at Scutari are well known. She probably became infected with brucellosis during this period of her life and eventually turned into someone who was considered to be irascible and unpleasant. She took to her bed (ME) and her public face was not well appreciated in later life. She is well recognised round the East Midlands and commemorative statuettes of her were sold in many towns.

Joseph Merrick

Let us now continue into another aspect which is not really good for us in Leicester and the East Midlands because it showed our lack of keeping basic records even in the 19th century. Joseph Merrick, the elephant man, was born in Lee Street, Leicester. During his childhood and teens he developed signs of the growths on his face which by the early 1880s were

causing him a considerable problem, and he had surgery under anaesthesia, presumably at the Leicester Royal Infirmary (then the Leicester Infirmary). There are no records of this, which I find rather strange, as his later exploitation and his stay in the London Hospital at Whitechapel were fairly contemporary.

Robert Marston

I have had to be fairly selective about whom I discuss and I would just pass briefly on to Robert Marston, who I have talked about previously on several occasions. Robert Marston was a dentist who fought the medical establishment, and particularly the anaesthetic establishment (Dudley Buxton, Frederick Hewitt) over many years for the rights of dentists to give anaesthetics. In fact he went further than this, believing that most doctors were inappropriate people to give anaesthetics as they gave so few. One can have some sympathy with him as it was the new boy, i.e. the house officer, who was the anaesthetist for most procedures within the city of Leicester. He had standards in which he believed that the percentage of vapour of his anaesthetic mixture should be known and that the operator should not be the anaesthetist.

He was also concerned over the post-operative care of the patient. He obviously irritated the medical profession and in my opinion was 'set up' with a legal case against him which changed the course of his life. He is contemporary with our next figure.

Jean McNeal

Dr Jean McNeal was appointed resident anaesthetist in 1920. She worked in Leicester until 1959 and stayed on until her death in the 1980s. She was a Scot, trained in Edinburgh, and therefore a doyenne of chloroform administration which she continued until her last anaesthetic. She had a fairly strong but quiet personality and obviously developed a service role within the city, particularly in the later phases. During the Second World War she was one of the few anaesthetists still remaining. She had quite an extensive private practice and carried a Boyle's machine in and out of the houses and up the stairs. She kept a notebook of all her special anaesthetic techniques which I have found fascinating to read. She practised tracheal insufflation and carried her own emergency drugs including an ampoule of strychnine.

She and other anaesthetists were not granted Consultant status by the Medical Committee of the Leicester Royal Infirmary until the night before the National Health Service came into being; the next day it would have been automatic. She did not easily forgive them for that.

A I Parry Brown

We were lucky in Leicester that in the TB isolation hospital the visiting anaesthetist was Dr A I Parry Brown, who later became the resident RAMC anaesthetist during the Second World War dealing with chest casualties.

Rex Marrett

Another local figure near us is Rex Marrett. Rex came to Coventry, which is 20 miles or so to the south of Leicester, just after the war where he had developed some concepts of his closed

circuit apparatus from captured mine rescue apparatus and a coffee tin. The equipment was a very efficient vaporiser within the circle giving high concentrations of halothane when used in this way, ensuring that the patient was not only well anaesthetised but also well relaxed. They used to get the 'halothane shakes' about four or five hours after anaesthesia ceased. I was anaesthetised with this apparatus by George Ellis of Barts when I had my tonsillectomy. It further developed into the Marrett Head and was used in several other machines in his dental practice.

Finally, let me mention the son of a vicar of a local church who had a late influence on anaesthesia in Leicester. He did his 1st MB at University College, Leicester and went on to have a distinguished anaesthetic career - Professor Andrew Thornton.

As a result we in Leicester gained our own department.

FROM BEADLE TO BOX BOY AND BEYOND

Mrs Sally E Garner FIOT, Leicester
Vice Chair and Archivist, Association of Operating Department Practitioners

The forerunners of the present day Operating Department Assistants/Operating Department Practitioners are to be found among the Beadles, Porters, Boxmen, and Surgerymen that have existed in hospitals from earliest memory. The history of any profession and its Association must of necessity include a brief look at the history of the profession as a whole. Theatre Technicians and ODAs can claim to have been around in one guise or another longer than organised operating theatres and certainly longer than anaesthesia.

The Handler

Early surgery relied upon 'surprise and speed'and without any form of anaesthesia the patient had to be held down. Straps alone were not enough to restrain a 'half-crazed man' so the handler, the earliest known ODA, became skilled in the where and how of holding the poor fellow down without causing further harm. In the history of Moorfields Eye Hospital, Collins writes of Sir William Lawrence: 'In those days since all eye operations had to be performed without anaesthetic, at least four handlers had to be employed to hold the patient down'. (Figure 1)

Sir Edward Morris writes in his history of the London Hospital:

> 'There are still ghastly relics in the hospital of those terrible days; the great wooden operating table with its straps; the bell which was sounded before an operation to call the handlers to hold down a patient, a bell whose terrible clang could be heard by every shivering patient in the building, including the patient, often a child; a bell with a voice loud enough and harsh enough to make all Whitechapel shudder'.

Porters and Beadles

These were the elite of the hospital service and their earliest history goes back to Elizabethan times. The porters were appointed to open the hospital gates to let the poor in and out. Benjamin Golding in his 1819 historical account of St Thomas' Hospital listed some of their duties:

> 'To guard the gates to prevent ingress of improper persons, to admit relatives if decently apparelled.
>
> To check patients' passes since they were inclined to steal out and purchase strong drink.
>
> Notify relatives to remove bodies of the deceased.
>
> Summon the Governors to meetings, attend Coroners' inquests and to maintain the pumps in good order and frequently exercise the fire engine.'

The Beadles were a lower grade than the porters and their role was to see that the streets of London were clear of beggars, whether infirm or healthy. Proudly carrying their staves of office and wearing their blue coats, they were the only members of the hospital to wear a uniform until 1860, when Florence Nightingale introduced a uniform for nurses.

The beadles were a mixture of policemen and ambulancemen. The children were taken to Christ's Hospital, the able-bodied to St Bride's House of Correction and the infirm to either St Thomas' or St Bartholomew's Hospitals. The practice of patrolling the streets presumably ceased when the bed shortage made it unnecessary to go out and look for patients.

Both porters and beadles were able to be financially advantaged. For instance the porter Henry Parker in 1594 was paid for curing sore heads and ran an out-patients department of his own, and in 1584 it was recorded that the beadle Hartford was no longer to make the hospital candles for which he used to make a charge.

As early as the 19th century there was a porter working in the dissecting room at both St Thomas' and Guy's Hospitals. The porters were also charged with keeping order among the medical students. It was reported in 1836 that a dispute broke out at St Thomas', when the porter tried to enforce the rule that only the dresser of the surgeon operating might stand in the centre area of the theatre. There was a fracas and the porter was forced to eject two over-eager medical students from the theatre.

Rampley

One of the most famous of the beadles was Rampley at the London Hospital. In an article in the *London Evening Gazette* of November 1898 Dr May, the Dean, refers to him as the 'Grand Old Man of the London Hospital'. Rampley was connected with the theatre in about 1871 having duties in the post-mortem room. He was appointed surgery beadle in 1893, his predecessor, Stuckey, having been dismissed for not having the stomach pump ready for the surgeon.

Rampley was closely associated with Sir Frederick Treves. He and Treves would go straight from the post-mortem room to the operating theatre, with or without washing their hands as they felt inclined. Treves would always have a searing iron in the fire to check haemorrhage, and his instruments, kept in a box under the flue were often covered in soot. Rampley attended nearly 40,000 operations and he designed the sponge-holder and needle-holder that bear his name.

Surgerymen

At St Thomas' during much of the 19th century there were the surgerymen whose responsibility it was to see to the theatre instruments. The first to be mentioned was John Lukis in 1801, and John Garde who was appointed in 1846 also acted as a cupper. When the surgeryman was not available his place was taken by a porter.

Box Carriers

The Box Carriers were employed as attendants to the surgeons and carried their boxes of instruments. They became proficient at anticipating the surgeons' requirements. At St Bartholomew's they were attendant upon three principal surgeons. They were originally recruited from among the patients and were paid 3d for every patient who was ordered to be 'bled'; this practice was discontinued in 1813. There was a custom of 'following the box' where the surgeons carried a box of instruments before them as they went round the wards, and performed small operations there and then. The beadles also followed the surgeon and carried the brazier in which the cautery irons were kept. The box carriers at St Bartholomew's survived into the 20th century as surgeons' attendants or theatre orderlies, disappearing from the records in the 1920s.

In the late 1800s and early 1900s the vast majority of work in theatres was carried out by males. Before the advent of the Great War theatres were said to be 'not a nice place for a lady to work', although the first record of a theatre sister is at St Thomas' in 1893. The handlers had moved over to assisting the new member of the team - the anaesthetist - as the patients no longer needed to be held down.

Theatre Attendants

The First World War took a great toll of the fit young men of the country and many more nurses were recruited to work in theatre to fill the gaps. Upon return from the war the men were happy to fill any position offered and most of these theatre attendants became solely assistant to the anaesthetist. In 1930 five new theatres were opened at St Bartholomew's and six theatre attendants were to be employed. These men were completely untrained, receiving instructions from the Sister Superintendent. They borrowed books on anatomy, theatre technique, and nursing dictionaries, and they learned by asking questions of the doctors and listened to them teaching the medical students.

They discussed the positioning of patients among themselves. Their responsibilities at that time were the operating tables, and the anaesthetic machines and equipment. Their role throughout the operating list was to assist the anaesthetist during the induction of anaesthesia.

Fred Wheedon MBE was first appointed as box boy at the Lambeth Hospital sometime during the late 1930s and soon afterwards he converted to the role of theatre attendant. Fred was the Membership Secretary of our Association until just before his death in 1989. I am proud to say that I knew Fred very well and took over his role as Membership Secretary.

Theatre Technicians

The end of the Second World War brought a further exodus, but this time with a difference. The usefulness of the attendants was recognised; the armed forces trained them and the theatre technician was born. Following the war these men were anxious to carry over their considerable skills into civilian hospitals, although few could find such employment as recognised theatre technicians. In 1945 Dr (later Sir) Ivan Magill came into daily contact with two theatre attendants, David Crowley at the Brompton Hospital and Stan Warner at University College Hospital. He was so impressed with the standard of assistance that he received from them that he suggested they get together, and that some form of training should be set up in order to standardise the quality of assistance in all hospitals in the country.

The Association

As a result of these remarks a meeting was called in August 1945. Six men led by Stan Warner met in a London pub and prepared a plan to set up a nation-wide association. On December 13th 1945 a formal meeting was held at University College Hospital and the Association of Operating Theatre Technicians was born. Although technician was a name used by the armed forces it met with some opposition. Three men instrumental in setting up this association, Stan Warner, David Crowley and Alfred Warner (of Bart's) formed the first Executive Council. The minutes from that first meeting indicate that the aims of the Association have remained constant to the present day: 'To increase the efficiency of technicians by training and to approach the Government and controlling bodies to obtain professional recognition'. (Figure 2)

As early as the second meeting on January 10th 1946 they were discussing the setting up of a syllabus of training and the possibility of a Diploma examination. The introduction of more complex apparatus in operating theatres made it essential that some recognised form of training be employed.

Officers

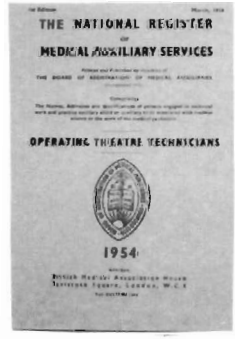
From 1946 to 1948 many discussions took place between the Association, the British Medical Association, the Association of Anaesthetists and the Board of Medical Auxiliaries, all of whom supported the Association and its aims. In 1946 Mr A M A Moore FRCS became the first President, giving way to the late Sir Cecil Wakeley who remained as President from 1948 to 1972. Among the Vice-Presidents were many distinguished names including Sir Ivan Magill (Figure 3) and Professor William Mushin.

The first Chairman, Mr S A Elson, remained in office until 1963; he was a member of the Association until his death in 1979. This support continued through his son, Mr R A Elson FRCS, who is one of our Vice-Presidents.

Figure 2

Figure 3
Sir Ivan Magill

Figure 4



Training

In 1947 St Thomas' Hospital commenced the formal training of Theatre Technicians. The first training groups formed by the Association began in 1951 at the Birmingham Accident Hospital, St George's and in Liverpool. The BMA assisted with the examinations which consisted of two written papers and a *viva voce* to qualify for the Association Diploma. 1951 also saw the Association change its name to the Institute of Operating Theatre Technicians and many hospitals recognised the Diploma.

In 1953, with assistance from the BMA, the Board of Registration of Medical Auxiliaries accepted OTTs on to its register. (Figure 4) Unfortunately there was an error in the letter notifying the Institute of this acceptance, as it stated that all members holding the official Diploma were now Registered Medical Auxiliaries. For some unknown reason the Ministry of Health would not recognise the Diploma and thus the Whitley Council made no special provisions for paying the men who had been trained.

The Lewin Report

The fight for recognition never waned and 1970 saw the publication of the Lewin report on the staffing of Operating Departments. Among its recommendations was that there should be an increased surgical input into the training of the Theatre Technician or Attendant. In order that the new grade of staff be known as Operating Department Assistants (ODAs) they should be interchangeable and fully integrated into the theatre team. At that time the OTT was mainly employed as an anaesthetic assistant.

In consultation with the Institute, the Department of Health & Social Security asked the City and Guilds of London Institute to set up an official training and qualification for the grade. In 1975 the first training centres were established and the first examinations were held in 1976. These were modelled on the question bank from the Institute Diploma course. This also saw for the first time the entry of females to become ODAs. 1977 saw another change of name - the Institute became the British Association of Operating Department Assistants and the emphasis moved from training to professional recognition and development. Another first came in 1980; the first female was voted on to the male-dominated Executive Council of BAODA.

Professional Problems

In 1984 professional status was achieved by the transfer to the Professional and Technical Whitley Council, but remuneration remained a problem, and between 1984 and 1989 the new profession was decimated and UK operating theatres suffered their great depression The only saving grace was the agencies, which allowed a decent standard of living, but at a huge cost to the Health Service. There was criticism of poor utilisation of staff, and the Royal College of Surgeons reported on dangerous standards of practice with regard to patient care.

The Bevan Report

In response to these issues a study was commissioned in late 1988, which reviewed the staffing of all grades of non-medically qualified operating theatre staff. In 1989 BAODA was represented on the steering group for the Bevan Report on the Management and Utilisation of Operating Departments. Bevan recommended that the UK Central Council and the NHS Training Directorate should consider joint training for theatre staff, leading to the Non-Vocational Qualification in Operating Theatre Practice. The NVQ Level 3 became the qualification for what was now named Operating Department Practitioner.

Recent Developments

1995 was another milestone when the Association celebrated its 50th anniversary. 1998 saw another change of title when the Association became the Association of Operating Department Practioners (AODP). This change reflected the development of the profession.

Registration has still to be achieved. In April of this year a circular was issued by the NHS Executive instructing all Chief Executives from both the private sector and NHS hospitals to ensure that the names of ODA/ODPs are on the register of AODP. We are all holding our breath as the light can almost be seen at the end of the tunnel.

Being in existence for 55 years is a major achievement for any organisation and we should look back and celebrate not only the survival of the profession, but also the fact that it has developed from such comparatively humble origins to the force it is today.

Acknowledgements

I am most grateful to Mr Frank Pyke FIOT for his help, advice and encouragement, and for pointing me in the right direction when necessary.

Figures 1, 2 and 4 appear by courtesy of the Association of Operating Department Practitioners and Figure 3 by courtesy of the Association of Anaesthetists of Great Britain and Ireland.

A KUHNIAN REVOLUTION IN ANAESTHETICS

Dr D Zuck*
Past President, History of Anaesthesia Society

Until the 1960s the conventional idea about scientific progress was that it consisted of the gradual accumulation of new information, and the gradual correction of mistaken theories. Then, in 1962, and in an enlarged and much more influential version in 1970, Thomas Kuhn (1922-1996) published his book, *The Structure of Scientific Revolutions*.[1] Its contents immediately stimulated an enormous reaction from historians and philosophers of science, and from sociologists. The historians on the whole gave it a cautious acceptance, the philosophers were strongly against it, and the social scientists, for reasons we shall see, welcomed it with open arms.

Kuhn's thesis, to summarize it briefly, proposed the following: that at any moment, the foundations of a science, or its fundamental beliefs, and that last word is used deliberately, consist of a set of what he called *paradigms*. An example of a paradigm is the belief that the earth is at the centre of the universe, or that the blood flows backwards and forwards about three times a day in the arteries and the veins, and that there is no connection between the two sets of vessels. These are major paradigms, and both held sway for more than a millennium, but there can be intermediate or minor paradigms also. The importance of paradigms is that they are believed in by all those who are accepted as constituting the relevant scientific community, all who are recognised by their peers as astronomers, or as doctors, for example. Paradigms are the standard teaching. Accepting and knowing them gets you through the exams and into the profession, and you are expected to continue to accept, support, and defend them, and teach them to your juniors.

But over the years, or centuries, new observations and experiments begin to cast doubt on the correctness of the paradigm. Things do not fit, anomalies build up, and although to begin with attempts are made to interpret or tweak the observations to fit the paradigm, ultimately the system breaks down. Then, classically, one or a small number of young researchers come along, independent minded, questioning, courageous, not steeped in the old tradition, who after a small number of progressive investigations propose a quite different paradigm, which fits all the observations and makes sense of the anomalies. This new paradigm is strongly resisted by most of the older members of the scientific community, but over the course of one generation it becomes accepted and completely replaces the previous one. This is the *scientific revolution*, and the scientific community then settles down to the recognition of the new paradigm as the basis of its research, and this research becomes the *normal science*, until the next revolution. The essential characteristic of this change of paradigm, the *paradigm switch*, as Kuhn called it, is that the new paradigm is totally incongruous with the one it replaces. Kuhn gives the example of the famous visual gestalt switch, the drawing which can be seen as of either a duck or a rabbit. You can see it as one or the other, but you can never see it as both at the same time. Any research starts with the paradigm as its foundation, and in Kuhn's scheme such research is called *normal science*.

When Kuhn first enunciated his theory it was violently attacked by philosophers, with Karl Popper in the lead.[2] Their main objection was that Kuhn had not given a rigorous definition of a paradigm. One of his critics complained that it was possible from Kuhn's writings to extract

* Read by Dr Neil Adams as Dr Zuck was unable to attend the meeting.

about twenty different ways in which he used the word. On the other hand, the great joy of the sociologists arose from their observation that Kuhn had converted scientists from a group of objective observers to a set who at any time held rigidly to one belief, albeit that it was a belief that could change.[3] Hence in their eyes science lost its objectivity, and became just another cult practised by an in-group, so that both its basic tenets and its methods were susceptible to being challenged, or knocked, by any Tom, Dick or Mary who need not know very much about science. Popper saw this danger, but went to the other extreme of portraying science as an activity independent of any human influence. Many Toms, Dicks, and Marys, have built academic careers and carved out empires exploring the sociology and denigrating the science. Only recently have the scientists started to hit back.[4]

Obvious examples of major scientific revolutions have been the Copernican revolution, which put the sun at the centre of the solar system - and the normal science that followed involved such things as observing and calculating the orbits of the planets; and the Harveian revolution, which established that the blood circulates throughout the body - and the normal science that followed is still being practised today. We can all think of many paradigm shifts, some large, some smaller. For example, the germ theory of disease, and within it the realisation that some microbes are anaerobes, and that some bacteria form spores which are not destroyed by boiling. Each of these realisations opened up a fresh field of normal science. One feature singled out by Kuhn of the normal science which follows a paradigm shift is that its practitioners often meet the new challenge by devising new techniques and inventing or designing new types of apparatus.

Kuhn held a number of prestigious appointments during his career, the last being the Chair of the Philosophy of Science at the Massachusetts Institute of Technology. He acknowledged that some of his ideas had been stimulated by a less well-known but magnificent pioneering classic of 1935, Ludwik Fleck's *Genesis and Development of a Scientific Fact*, to the translation of which[5] he supplied a foreword. Kuhn's ideas have generated a vast number of publications, including a profound philosophical analysis of pre- and post-Kuhnian historiography of science, with which he himself cooperated.[6] His concepts have been applied to a number of other disciplines, the history of art, and of music, for example, and *paradigm* has become a vogue word, freely used by people who have never heard of Kuhn, and cropping up in all sorts of inappropriate places.

Can we apply Kuhn's concept of the scientific revolution specifically to anaesthesia? Usually when we speak of anaesthetic revolutions we are thinking of revolutions in technique. There was the so-called mechanisation of anaesthesia, which took place in the 1930s, the Boyle's machine replacing open or perhalational methods. This is less well recognised than the great revolution of the 1940s, when neuro-muscular blocking agents came into use, and brought the concept of the anaesthetic triad. But these were changes of method, not of a fundamental belief. So what fundamental belief that was held for more than a century after 1846 has changed during the last fifty years, and brought a field of normal science with it?

When John Snow wrote about the patient under ether anaesthesia he said:

> 'An appearance is met that would be truly alarming, if we did not know that it was only due to an agent which is flying away every moment in the breath, to leave the patient, in a few minutes, without any permanent trace of its having been there.'[7]

Whether the belief originated from there I do not know, but it was reinforced by research by Buckmaster and Gardner in 1907, and it became an article of faith among both anaesthetists and pharmacologists, that inhalational agents left the body, mainly by the lungs, 100% unchanged. I cannot claim to have read every textbook published before the early 1950s, but I am confident that in more than 95% of them no consideration of the possibility that inhalational agents are metabolised was ever addressed. Over the years a great deal of information was accumulated about the fate of drugs taken in either solid or liquid form, and much detail was known about some of the metabolic pathways, but the idea that inhaled agents might be subject to a similar fate was just never considered. Beecher's excellent *Physiology of Anaesthesia* of 1938 contains an extensive review of the literature dealing with most aspects of the effect of anaesthetics on the various systems, but not a word about their possible metabolic fate.[8] Beecher states that tribromethanol (Avertin), a popular basal narcotic, is rapidly destroyed in the liver, but the possibility that closely related inhalational agents might be metabolised is not considered. This silence was the general pattern, and the first edition of the *Synopsis* is unusual in that it actually states that chloroform is not altered in the body, and is excreted mainly through the lungs.[9] The book which set a new academic standard in anaesthetics textbooks, the first of what one might call 'the new wave', TAB Harris's *Mode of Action of Anaesthetics*, of 1950, expressed the contemporary paradigm like this: 'Inhalation anaesthetics, being non-reactive gases and vapours, are excreted from the body by the lungs, unchanged and in the same form as that in which they were absorbed.'[10] A further example is the very thorough re-evaluation of chloroform as an anaesthetic by Waters and his colleagues, published in 1951.[11] Although they reviewed its effects on the liver, kidneys, and cardiovascular system, and correlated inhaled and blood levels with clinical effects, nowhere is there any indication that they even considered the possibility that chloroform might be metabolised. It is probably very difficult for younger anaesthetists today to understand the extent to which this belief, this article of faith, that inhalational agents were excreted unchanged from the body, underpinned and pervaded the practice of the specialty.

But in fact the very first indication that a volatile anaesthetic might in part be metabolised came in 1906. During a study of renal function in relation to chloroform anaesthesia, W H Thompson found a steady increase in the amount of chlorides in the urine, reaching ten times the normal after six hours.[12] Such an increase was not seen after ether. Similar observations on chloroform had been made by researchers on the Continent, and the chlorides had been identified as attached to organic radicals. Although Thompson drew no conclusion from his findings, they were mentioned by Levy in his monograph on chloroform in 1922, with the comment that this indicated that chloroform was probably being broken down in the body; but by then Levy had virtually given up the practice of anaesthetics, and the topic was ignored by other textbook writers.[13]

The fact that at least one inhalational anaesthetic is to some extent metabolised could have appeared in any of the textbooks published during the late 1940s. Following a description in 1944 of the hitherto unrecognised clinical picture of chronic carbon tetrachloride poisoning, chemical methods were developed at the Nuffield Department of Clinical Medicine at Oxford for the estimation of the levels of chloro-carbon compounds in the blood. Among these were chloroform, and also trichlorethylene**, which was in wide use industrially as a degreasing and dry-cleaning

** *Trichlorethylene is the spelling in this and other early papers. To avoid confusion, this spelling (not the later trichloroethylene) is used throughout.*

agent, and, as the pure preparation known as Trilene, as an inhalational anaesthetic and analgesic. Other chloro-carbons were used as pesticides, so there were good reasons for developing methods of assay.

Trichlorethylene was selected for study because as early as 1939 it had been shown in dogs anaesthetised with Trilene that 5 to 8 per cent was excreted in the urine as trichloracetic acid. However, a follow-up study on human subjects, while suggestive, was less definite. So using the new method of blood estimation 12 patients were studied at Oxford in 1945.[14] It was found that during the recovery period trichlorethylene disappeared rapidly from the blood, and a non-volatile substance chemically indistinguishable from trichloracetic acid appeared in the blood and the urine, reaching a maximum concentration in two days, and slowly declining to half that level after six. The author, Joan Powell, went on to point out that one of the founding fathers of pharmacology, Oscar Liebreich, in 1869, had injected sodium trichloracetate intravenously in human subjects and produced light anaesthesia. This had been repeated with cats in the present study, and with small doses in man, and it was found that the salt was very slowly metabolised, without any sign of toxic effects. In conclusion it was suggested that the method of assay would be of value for monitoring chronic exposure to trichlorethylene. The paper was not published in an anaesthetics journal, but there is an acknowledgement to the Nuffield Department of Anaesthesia, where the result of this investigation must have been known, though it appears that its significance was not immediately recognised. In fact the first citation of Joan Powell's paper was by Helliwell and Hutton in a publication on the distribution of trichlorethylene in maternal and foetal tissues which appeared in *Anaesthesia* in 1950. They quoted it in relation to blood levels and rate of elimination only, and did not mention metabolism at all.[15] The first anaesthetic publication which did mention metabolism was the monograph on Trilene by Gordon Ostlere, of 1953.[16] He had been working at the Nuffield Department, and might have been expected to be *au fait* with Powell's research. He gave a summary of her findings, elaborated on the chemistry of trichloracetic acid and trichlorethanol, and mentioned the suggestion that chloral might be an intermediate metabolite. It is probably unfair to expect a comment on the wider implications in a small monograph of this sort.

Also in 1953, in the third edition of the *Synopsis*, it is mentioned that a small amount of Trilene undergoes change in the body. A paper on trichlorethylene metabolism was published by Gilchrist and Goldsmith of Edinburgh in *Anaesthesia* in 1956,[17] the same year in which the first clinical trials of Fluothane (halothane) were published in the UK and of Fluoromar (trifluoro-ethyl-vinyl-ether) in the US.[18] In the former no breakdown products were detected in animal trials, and in the latter its possible metabolism was not mentioned. Wylie and Churchill-Davidson, in the first edition of their major textbook in 1960, said that while small amounts of Trilene and chloroform were broken down in the body, the possibility of any metabolic products of halothane had not been reported.[19]

Reports during the early 1960s of jaundice following halothane anaesthesia, and deaths from liver failure, turned attention to the question of the fate of halothane in the body, and the possibility that it was biodegraded with the production of toxic metabolites.[20] Papers reporting research into halothane metabolism began to appear from 1964 onwards.[21] New chemical techniques were developed using volatile anaesthetics radioactively labelled with ^{14}carbon and whole body

radiography which allowed the uptake, distribution, and fate of these agents to be studied in animals. Some will remember the remarkable and unexpected demonstration of gallamine being concentrated in the costal cartilages. A review article by Ian Geddes in the *British Journal of Anaesthesia* in 1972 reported that studies of diethyl ether, chloroform, trichlorethylene, ethylene, cyclopropane, halothane, fluroxene, and methoxyflurane, had shown that all, to a greater or lesser extent, were broken down in the body.[22] In the case of halothane this was an astonishing 25%, and methoxyflurane almost twice as much. Research then continued into the possible toxicity of the metabolites, and the induction of microsomal enzymes.

So the suggestion is that during the decade 1953 to 1963 anaesthesia underwent a Kuhnian revolution, a paradigm switch. From believing that volatile anaesthetic agents were excreted totally unchanged, the teaching became that they are, to a varying and quite considerable extent, metabolised; and the investigation of this process and its consequences became the normal science in which many researchers became engaged. A feature of this normal science was the introduction of new techniques, the use of radioisotopes, and of whole-body radiograms. It became normal science that whenever a new inhalational agent was introduced its fate in the body was routinely investigated - in fact, such information was essential before contemplating a clinical trial.[23] Biodegradation had become an accepted feature of volatile anaesthetics. The 14th volume of *Recent Advances* contained a review of current knowledge, taking in sevoflurane,[24] and the chapter on isoflurane in the 15th volume devoted almost a page to its metabolism, comparing it with enflurane and halothane.[25]

So over a period of some twenty years it became accepted, contrary to a fundamental belief that had survived for the previous one hundred, that volatile anaesthetics are broken down in the body, and this paradigm switch gave rise to a new normal science which devised or adopted special techniques to determine, with regard to individual agents, the extent, and the by-products.

This is the only true Kuhnian revolution in anaesthesia that I can think of; although I believe there is another, the change in the perception of the supine hypotension or caval compression syndrome from idiosyncratic, to respiratory, then to cardiovascular, but that is a separate subject, and more obstetric than anaesthetic.

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NALORPHINE – THE FIRST OPIATE ANTAGONIST[1]

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In the 1940s and 50s the Anaesthetic Section of the Royal Society of Medicine was the principal forum in Britain, and indeed in Europe, for the promotion of research in anaesthesia. All papers presented at the Section were published in the *Proceedings*.

In 1953, in the Barnes Hall, a new film entitled *Nalorphine* was shown by members of the Burroughs Wellcome Research Institute.[1] This demonstrated the action of nalorphine as an antagonist to morphine. A dog was shown deeply narcotised with morphine; nalorphine was injected into a leg vein; the dog woke up with startling rapidity – in twelve seconds he was sitting up and in half a minute he was running round sniffing his food on the floor. This remarkable demonstration provided a solution to the ever-present problem of treating the respiratory depression due to an overdose of opium.

Opium – 'A Dangerous Drug'

Opium has always been with us. Paracelsus, in the 16th century, concocted a mixture he called laudanum, which name has been used to describe tincture of opium up to the present day. In the Middle East, Persia and India, where the poppy is grown as a cash crop, opium was and is usually smoked. When I was in Iran after the war, opium was readily available and its dangerous side effect of respiratory depression often demonstrated in the bazaar, where it was not uncommon to see two young men frog-marching 'grandma' up the street to keep her awake, after over-indulging in the opium pipe! Studies in India[2] maintained that 'moderate use may be indulged in for years without producing any decided or appreciable ill effect' and 'opium smoking may be regarded in much the same light as the use of alcoholic stimulants'. The treatment of overdose, apart from forced exercise, included 'a pint of strong hot coffee administered per rectum'.

In the time of ether anaesthesia morphine might be used as a premedication, but was useless, in fact contra-indicated during anaesthesia, even depressing the response to the addition of carbon dioxide – an old trick used to stimulate respiration and so increase the concentration of ether in order to facilitate intubation.

Opium was denominated a 'Dangerous Drug' and as a result I believe many patients were needlessly denied adequate and available pain relief for fear of the possibility of respiratory depression. It is noticeable that in my old textbooks of that period no mention is made of the treatment of opium overdose, as might have been expected if opiates had been used more generously.

The revolution in anaesthesia

The 1940s saw a revolution in anaesthetic practice. The most remarkable was the introduction of curare by Griffith and Johnson in 1942.[3] They routinely used cyclopropane; this never became popular in the United Kingdom. Not only was it very expensive, when most hospitals were broke, but it was used in the Waters to-and-fro circuit, not easily learned by GP/anaesthetists. Nitrous oxide/oxygen mixtures were supplemented with ether or

barbiturates. Credit must be given to Gray, the first to use curare to intubate[4] (a thing Griffith never did), but Neff, a Canadian who trained in Montreal with Griffith, proposed using pethidine (demerol) to augment nitrous oxide/oxygen anaesthesia instead of using cyclopropane (1947).[5] This was a new idea at the time, but the problem of respiratory depression remained.

The effect of pethidine on respiration

Respiration could be recorded in the operating theatre by using a length of corrugated tubing tied round the chest and connected to a Marrey's tambour, writing on a kymograph. I used a simple apparatus[6] which was inspired by Morton's portable kymograph (1950)[7] to record respiratory depression by opiates and its reversal in patients lightly anaesthetised with thiopentone and cyclopropane.

Figure 1 demonstrates the different effects of pethidine and thiopentone;

Figure 2 indicates the duration of respiratory depression following pethidine;

Figure 3 demonstrates the effect of pethidine in reducing the respiratory response to the addition of 5% carbon dioxide after thiopentone;

Figure 4 shows the effect of nikethamide which was commonly used to stimulate respiration at that time – the effect was transitory.

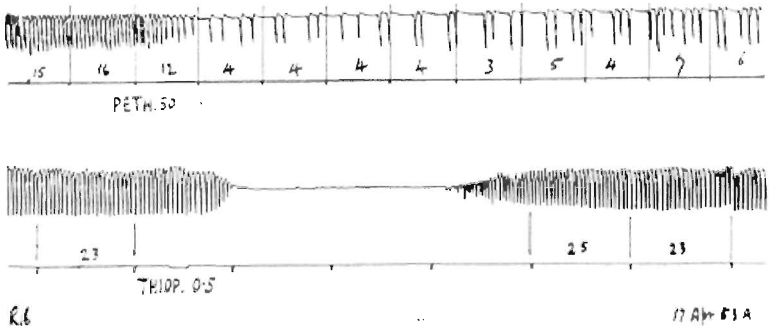

Figure 1. Effects of pethidine 50mg - upper tracing and thiopentone 0.5g - lower tracing, on patients lightly anaesthetised with thiopentone and nitrous oxide. Tracings read L>R, inspiration downwards Figures indicate respiratory rate per minute.

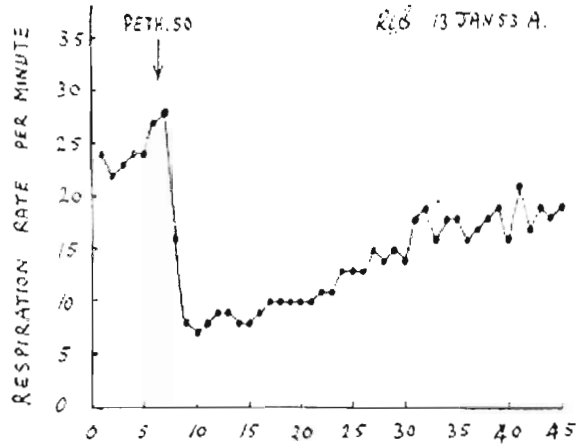

Figure 2. Graph plotted from tracing such as Fig.1 to indicate effect of pethidine 50 mg intravenously on respiratory rate. Note the slow return to normal.

N-allyl normorphine

In 1952 Burroughs Wellcome provided me with samples of their new drug and they also gave me a Gaddum's spirometer. This device had two Marrey's tambours separated by a resistance, which could record both respiratory rate and tidal volume on a kymograph.[8] Using a closed circuit Connell machine and very light cyclopropane anaesthesia, I was able to demonstrate that nalorphine immediately reversed the respiratory depression produced by pethidine (Figure 5).

By using repeated doses of 1 mg nalorphine, the minimum dose required to reverse the effect of 50 mg pethidine could be gauged (Figure 6).

Finally, under very light cyclopropane anaesthesia the irritation of an endotracheal tube would cause the patient to gag and produce an irregular respiratory pattern; this could be abolished by a dose of pethidine, slowing the respiratory rate. At this point nalorphine reversed the slowing effect, but after 3-5 minutes the irregular pattern broke through again, but a second dose of pethidine restored the regular pattern without slowing rate (Figure 7).

Discussion

Meanwhile, Eckenhoff, Hoffman and Dripps (1952)[9] had shown the effect of normorphine in four cases of opiate overdose. They demonstrated its effectiveness in reversing the respiratory depression caused by a variety of opioids. They also showed that in obstetric cases sedated with opiates the exhibition of normorphine before delivery significantly shortened the time from delivery of the infant to the first gasp or cry.

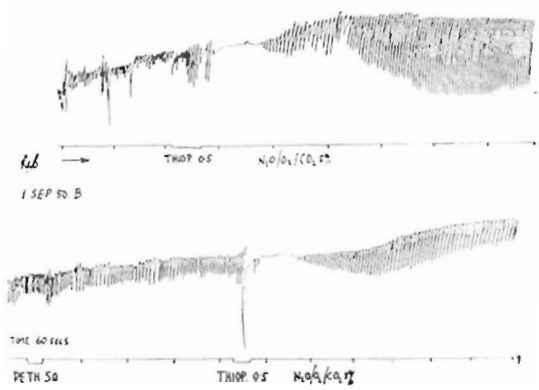

Figure 3. Effect of pethidine on the response of the respiratory centre to carbon dioxide. Upper tracing - control - shows great increase of respiration. Lower tracing - pt received pethidine - shows little response to same stimulus

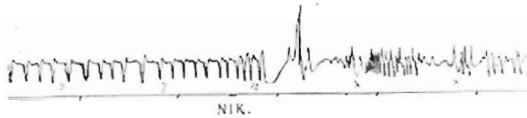

Figure 4. Effect of nikethamide (NIK) on respiration depressed by pethidine

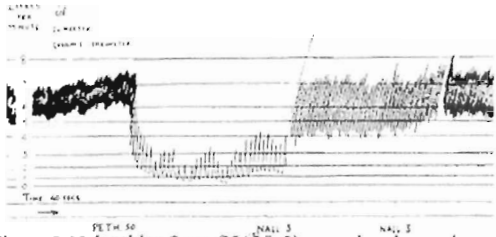

Figure 5. Nalorphine 3 mg (NALL 3) reversing depression caused by 50 mg pethidine. Gaddum's spirometer.

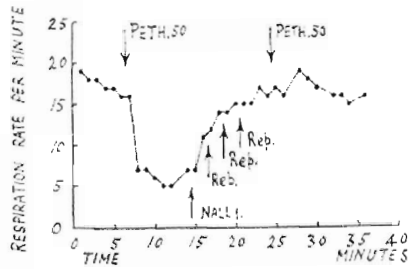

Figure 6. Graph of respn. rates/minute demonstrating method of 'titrating' 50 mg pethidine with nalorphine 1 mg at a time.

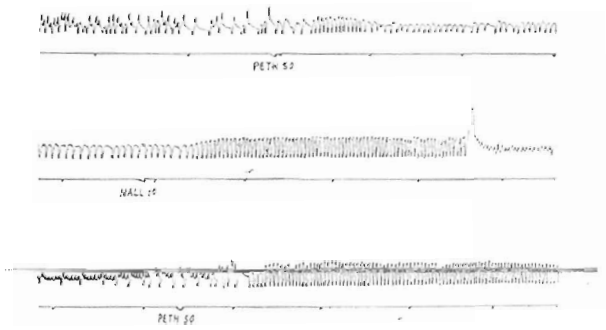

Figure 7. Effect of nalorphine on analgesia produced by pethidine. Tracing L>R from above downwards. Time: minutes

N-allyl normorphine was approved by the *British Pharmacopoeia*, officially named Nalorphine BP and marketed by Burroughs Wellcome as 'Lethidrone'.

Finally, the demonstration that nalorphine could 'over-ride' the respiratory depressing effect of pethidine and allow a degree of analgesia without respiratory depression prompted Burroughs Wellcome to market a combination of pethidine and antagonist (levallorphan) as 'Pethilorphan'.

This combination was approved by the Central Midwives Board, but subsequent doubts as to its usefulness emerged. However, recently my attention has been drawn to a paper by Crain and Shen (2000)[10] reviewing the literature in *Pain*, demonstrating that very small doses of antagonist (naloxone) actually increased the effective analgesia of morphine, while diminishing its side effects.

Perhaps the story of opiate antagonists is not yet concluded!

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A BRIEF HISTORY OF RESUSCITATION IN THE COMMUNITY AND THE CASE OF DR BULLOUGH

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Introduction

Dr John Bullough died on the 9th January, 1999. He is remembered as a campaigner for the teaching of resuscitation techniques to doctors, paramedical staff, and the general public.

In 1963 Dr Bullough successfully resuscitated a young woman, Miss Sylvia Berwick, at the road-side following an accident. This event made headline news in the national press of the day and was heralded as a 'first'. However, the history of resuscitation is one of techniques discovered, then forgotten and later rediscovered. Indeed, examination of the history of resuscitation in the community indicates that it may in fact have ancient origins. This paper discusses the case of Dr Bullough and its historical context.

Ancient times

Throughout history, medicine has sought to thwart sickness and death. The only evidence from the prehistoric era comes from fossil bones and cave paintings. The practice of trephining, (removing a piece of bone from the skull), seems to have been widespread. This procedure was performed on men, women and children and the holes ranged in size from tiny to two inches in diameter. They were round or square shaped. That the unfortunate individual survived this procedure is shown by the healing of the cut bone edges. The reasons for this procedure can only be speculated upon. Attempted resuscitation from drowning has been documented as far back as Egyptian times. Inversion was known as a treatment, as was rubbing the body with salt. Both of these treatments were however forbidden.[1]

That mouth to mouth resuscitation may have early origins is also seen in a possible case in the Bible involving the prophet Elisha and the Shunammite woman in which her son was dead.[2] The reference to this is found in the Second Book of Kings chapter 4, verse 34 and 35:

> 'And he went up, and put his mouth upon his mouth, and his eyes upon his eyes, and his hands upon his hands: and he stretched himself upon the child; and the flesh of the child waxed warm. Then he returned and walked in the house to and fro; and went up and stretched himself upon him: and the child sneezed seven times, and the child opened his eyes.'

The 16th century

In the 16th century William Butler, a physician of Clare Hall, Cambridge, was involved in the resuscitation of a parson.[3] He was preparing a sermon to be preached before King James. He prepared so diligently that he had difficulty sleeping. His wife apparently gave him some opium which made him sleep his last. His wife then sent for Doctor Butler who, after seeing the parson said that she was in danger of being hanged for killing her husband and set about finding a remedy. He had one of the parson's cows killed and opened. The parson was put inside the warm belly, which after some time brought him to life or else he would have surely

died. It is questionable as to whether the parson really had a cardiac arrest but gives some indication as to the emphasis on the theme of warming in apparent cases of suspended animation.

18th century

In 1732, mouth-to-mouth ventilation was used by William Tossach[4] to resuscitate a man who had been overcome by fumes in a mine shaft. This formed the basis for a pamphlet in which John Fothergill[5] suggested in 1744 that those who seem to be dead may be resuscitated by blowing strongly into the lungs.

During these times sudden death as a result of cardiovascular disease was not recognized.[6] Most sudden deaths were by accidents or infectious disease. The most common accident was drowning. The methods of resuscitation in that era included warming of the body, applying friction and blowing tobacco smoke into the rectum. Other techniques included hanging a patient upside down over a fire thereby providing three therapies in one: being drainage of water, warming, and smoke inhalation. It was believed that a drowned person was only apparently dead and their appearance was due to heat loss that could be improved by external means.

It would appear that mouth to mouth ventilation was not generally known to or practiced by medical men in the 18th century although it was used by the common people to resuscitate stillborn infants. Mouth to mouth ventilation was described by Benjamin Pugh in 1753 and later by J G Wilson in 1859. Wilson described the use of a metal tracheal tube for expired air ventilation of the newborn instead of mouth to mouth which was not always pleasant or agreeable, especially if the infant was delivered of a filthy or diseased mother.[7]

Electricity was also coming into the therapeutic armamentarium. Charles Kite designed the first defibrillator. The case of three year old Catherine Sophie Greenhill was described. On 16 July 1774 she fell from an upstairs window and was pronounced dead, but a Mr Squires came twenty minutes later and treated her by passing an electric current through her thorax. Her pulse returned and she began to breathe. She remained in a coma but returned to full health within a week.

Humane Societies

René Antoine Reaumur argued that those who had been drowned for several hours could be resuscitated. His ideas inspired the formation of the Amsterdam Society in 1767.[8] A similar society was formed in London and became known as the Royal Humane Society. This was formed in 1774 by Dr William Hawes and Dr Thomas Cogan, and was first known as 'The Institution for Affording Immediate Relief to Persons Apparently Dead From Drowning'. It subsequently became the 'Humane Society' in 1776 and acquired the prefix 'Royal' in 1787 when King George III granted his Royal patronage. This society was instrumental in the resuscitation of victims of near drowning in the Thames, and the development and dissemination of resuscitation techniques. Records of successful resuscitations were kept and prizes awarded to those who made an attempt to resuscitate those in suspended animation.

Dr Hawes consulted with other medical men of the time including John Hunter, whose views were based on animal experiments that he conducted with his brother William in 1755. In 1776 he published an essay on resuscitation in which he emphasized that in cases of drowning, cessation of respiration was the main cause of death, and that this was followed by cardiac arrest. Prompt treatment was important and every moment lost decreased the chances of a successful outcome. Charles Kite recommended artificial respiration with either warm air from the lungs or dephlogisticated air (Joseph Priestly described oxygen as dephlogisticated air). Many of the techniques described above were advocated, but were abandoned within sixty years of the founding of the Society. The Society was responsible for introducing the use of various tubes and bellows for resuscitation, but these were abandoned in the 19th century when it was shown that they could produce barotrauma. Each year the Society published detailed reports. For example in 1775, out of 67 accidents 33 persons had been successfully resuscitated.

Resuscitation techniques came to America approximately ten years after the formation of the humane societies of Europe. Similar societies were formed in Massachusetts, Philadelphia and New York. These societies were connected with the Royal Humane Society and therefore took their rules and operations from suggestions of its officers.

Diagnosis of death

Though today we take the diagnosis of death for granted, there is still the occasional report of a 'dead person' waking up in the mortuary, for example after barbiturate poisoning. In the context of a history of resuscitation, the diagnosis of death was less certain.

It was known from classical times that premature burial was a problem and this was greatly feared. Jacques Winslow, a French physician, apparently had experienced premature burial in his youth and as a result of this experience developed a preoccupation with this subject. In 1740 he wrote *The Uncertainty of the Signs of Death and the Dangers of Precipitate Interments and Dissections*. This resulted in a renewal of fear and interest in this problem and the importance of attempting resuscitation.

With the advent of resuscitation and difficulties in diagnosing death, came the problem of when to discontinue resuscitation attempts. Kite thought there was no time limit. James Curry however thought that it should be discontinued if there was absolute death described as black swollen face, glassy shrivelled eyes, and most certainly if there was putrefaction.

The 19th century

The techniques for resuscitation did not change much during the early 19th century. Bellows were in use but were removed from the list of the recommended methods of the Royal Society in 1837 after Leroy, in 1829, showed that bellows could kill animals. During the 19th century a number of different methods of artificial ventilation were devised. Dalrymple in 1831, introduced the bandage method of ventilation. This entailed the alternate pulling and relaxing on the crossed ends of the bandage that was placed around the thorax. Relaxation produced inspiration. The Sylvester method was described in 1858. In this method (which was considered natural, imitating the actions of the pectoral muscles), the capacity of the chest was increased by lifting the arms above the head thereby elevating the ribs. The lungs were emptied by placing the arms back to the sides. The Marshall-Hall method consisted of

placing the patient alternately in the prone and lateral position while exerting pressure on the back. The Howard method consisted of emptying the thorax by applying pressure to the lower part of the chest. By relaxing this pressure the thorax would expand and the chest would fill with air. The supine position was not favoured as it allowed the tongue to fall back into the pharynx and did not allow the escape of water, mucus and froth from the lungs, air passages and mouth.[10]

Alexander Graham Bell, known for inventing the telephone, also created an apparatus for artificial respiration. He worked on this intermittently between 1868 and 1905. The apparatus was the Bell 'vacuum jacket' which consisted of an airtight jacket and a bellows. This he presented at the 31st Annual Meeting of the American Association for the Advancement of Science in Montreal, Canada on 25 August 1882. His first apparatus was small and could only be used on small animals and this was successfully used to ventilate a drowned cat, although the resuscitation of the animal was not successful. Bell eventually constructed an apparatus in 1892, which could be used on humans.[11]

Endotracheal intubation was known from early in the 19th century and carried out by palpation. It was primarily used in patients with airway obstruction due to diphtheria and this started mainly in France and Britain. Its use during general anaesthesia did not begin until the beginning of the 20th century. During the period following the advent of anaesthesia, resuscitation was of a similar nature to that practised in the community.[12]

Snow in the mid-19th century was anaesthetising a patient with amylene, a drug about which little is known today. He was distracted for a few seconds and when he looked again at the patient, he noticed that the valve of the face piece had moved so that the patient was receiving a higher than normal concentration. He discontinued the agent and on palpating the pulse felt just a flutter in the right wrist. The patient was breathing well, but the respiration was becoming slower and deeper. Snow drew the surgeon's attention to this and they threw cold water on the patient's face, which did not work well. The patient was now becoming livid and gasping, so they commenced artificial respiration using the method of Marshall-Hall. They continued for one and a half hours but they finally gave up. Post-mortem did not reveal much although it is interesting to note that the patient had drunk a pint of ale a quarter of an hour before the operation.[13]

Schiff in Germany, in 1882, reported cardiopulmonary resuscitation in experimental animals. He utilised the open-chest method. This probably helped to pave the way towards modern cardiopulmonary resuscitation. Closed-chest cardiac massage was pioneered in Germany in the late 19th century by Boehm in animals, and by Maass in patients. This, however, was forgotten until the 20th century.

The 20th century

Resuscitation advanced during the 20th century but was mainly hospital based. This included the use of adrenaline (probably in 1906) by Crile and Dolly in the United States. Resuscitation which previously took place only in operating theatres, became more widely used in hospitals. The open-chest cardiac massage method continued to be the technique of choice. Hospital physicians carried a sterile scalpel blade and anaesthesia teams carried intubating equipment and a bellows. Outside hospital however, cardiopulmonary arrest still meant certain death.

It was in the 1950s that basic life support as we know it today became an entity. In this decade Elam and his associates demonstrated that expired air ventilation can maintain normal oxygen and carbon dioxide values as long as the rescuer hyperventilates. This led to the questioning of the chest-pressure arm-lift method of respiration. Safar and associates then went on to show that the tongue obstructed the airway during coma. They demonstrated the efficacy of head tilt, mouth opening and jaw thrust. They also showed the efficacy of mouth-to-mouth ventilation and that apnoea resulted in rapid deoxygenation, which was remedied by recommencing this technique. External cardiac compression was rediscovered by Kouwenhoven and Knickerbocker by experiments with dogs, and was applied to a patient, a 35 year old female undergoing an emergency cholecystectomy, by Jude, a surgical resident. This technique was then introduced without randomized clinical trials, statistics or computers.[14]

Dr W Kouwenhoven is considered to be the founder of modern resuscitation. Apart from rediscovering external cardiac massage, he developed internal and external defibrillation and studied the effects of electricity on the heart.[13]

In the early 1950s Dr Carlos Parsloe was involved in the resuscitation of a boy who was electrocuted by an electrical cable. By divine providence this occurred in front of Dr Parsloe's residence. He heard the commotion and went to see what was happening. After the boy was disengaged from the cable, it was found that he was apnoeic and cyanotic. Dr Parsloe, then with the aid of a handkerchief, began mouth to mouth ventilation. He was not successful, and collecting his equipment from the house, intubated the boy making adequate ventilation possible. The patient very slowly began to show signs of recovery. In hospital, he was shown to have severe aspiration pneumonia but survived the ordeal without mechanical ventilation which was not available in those days.[15]

Dr Bullough

At Chislehurst, Kent in November 1963, Dr Bullough, then a consultant anaesthetist at the Dartford Group of Hospitals, was in a car when he witnessed an accident in which a young woman, Miss Sylvia Berwick, aged 19, was the casualty. He rushed over to assist her and found that she had no signs of life. He commenced external cardiac massage and mouth-to-mouth expired air ventilation (the kiss-of-life) which is now part of basic life support. People at the scene begged him to leave her alone. After approximately five minutes her cardiac output returned followed by spontaneous respiration. After a further five minutes she became conscious and asked 'What happened?' She had no recollection of the accident. She subsequently made a full recovery with no untoward sequelae. At that time it was described as the first occasion that a person had been 'brought back from death' after a road traffic accident, and was avidly reported in the press of the day. It may have been the first successful resuscitation after a road traffic accident in the United Kingdom, but it was not the first case of successful resuscitation in the community based on the account given.

Dr Bullough's Legacy

In 1966, the American National Academy of Science-National Research Council (NAS-NRC) recommended training of medical and allied health care workers in external cardiac massage according to the standards of the American Heart Association. In 1974 training in cardio-pulmonary resuscitation (CPR) was extended to the public. This was after recommendations

at a Standards Meeting in 1973.[16] Since then the guidelines and standards have been regularly updated. Advanced Cardiac Life Support courses were subsequently developed and instituted all over the United States, the first being in 1975.[17]

In 1982 the Resuscitation Council in the UK first published their guidelines for basic life support. Advanced Cardiac Life Support followed in 1984. Collaboration with Continental Europe has resulted in European Resuscitation Guidelines in 1992 with further updates, the last being published in June 1998.[18] There will be amendments to the guidelines from a meeting recently held in Copenhagen.

Dr Bullough did see his recommendations actually come to pass. In our present time resuscitation has become accepted throughout the NHS. With Advanced Life Support (ALS) courses, everyone in the health service now conducts basic life support to the guidelines of the UK Resuscitation Council. Most trusts have made it mandatory that new medical staff must be 'passed' by the Resuscitation Training Officer as to their competence in basic life support. Ambulances now have technicians and paramedics who can apply basic and advanced life support techniques as required at the roadside, and basic life support is known of by all and sundry even if they cannot actually perform it correctly.

Dr Bullough was a proponent of resuscitation but did not originate the method. The ABCs of resuscitation techniques were present over two hundred years ago but have been refined over the years. Let us not forget them again.

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'ON THE HOUSE'
A JUNIOR DOCTOR AND RESIDENT ANAESTHETIST IN 1950

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'When does history begin? Perhaps the 50 year rule is sound'. This was the opinion of Alfred Lee, the first President of the History of Anaesthesia Society, in his introduction to a paper presented at the Second International Symposium on the History of Anaesthesia held in London in 1987.[1] It would therefore seem appropriate in this Millennium Year of 2000, and on the occasion of the second meeting of the History of Anaesthesia Society to be held in Leicester, to place on record some recollections of my life as a junior doctor in Leicester and Cambridge in 1950.

Fifty years ago in 1950, I was the only house physician at the Leicester General Hospital, (the City G as it was known to the locals), which had been the former municipal and poor law hospital for Leicester. Although the two consultant physicians for my medical firm were primarily physicians to the Leicester Royal Infirmary (LRI), the City G was regarded as the poor relation, but provided good experience in general medicine. At that time it was the common practice in many hospitals for the house physician to cover the off duty of the resident anaesthetist. This was no problem for me as we had been well taught at my clinical Medical School, the West London Hospital in Hammersmith. I had always been more interested in surgery than medicine and so took the occasional opportunity to watch the late Brian Johnson, a visiting consultant from the LRI, at work.

In April 1950 I went from Leicester to Addenbrooke's Hospital in Cambridge, initially for six months as a single-handed casualty officer. When I was unable to get the duty resident anaesthetist to come down to casualty, rather than keep patients waiting I would give the anaesthetics myself, and persuade a friendly general or orthopaedic house surgeon to open an abscess, deal with a septic finger or reduce a Colles fracture.

How I became an Anaesthetist

In September 1950 I felt that the time had come to choose a career path. I was happy in Cambridge and had enjoyed the experience in casualty. It certainly gave one the ability to make quick decisions and 'stand on one's own feet'. I had always enjoyed giving anaesthetics because of their close association with the surgical world, and so in October 1950 I commenced an appointment as one of two resident anaesthetists at Addenbrooke's Hospital. There was one non-resident registrar who was Dr Aileen Adams.

The Consultant Anaesthetists at Addenbrooke's in 1950

The Consultant Anaesthetists had all been Honorary Anaesthetists to Addenbrooke's Hospital before the introduction of the National Health Service in 1948. Because Addenbrooke's had been designated as a teaching hospital, they were all graded as consultants, although they were all still in general practice either singled-handed or in partnership. All came from practices in the University and fashionable areas of Cambridge. The other consultants on the hospital staff would naturally depend on them for private practice referrals.

There were seven Consultant Anaesthetists at that time; Drs Charles Budd, Harold Youngman, George Keates, Windsor Lewis, Joan Cooper, George Hart and Harry Richards

The Duties of a Resident Anaesthetist

The duties of the resident anaesthetists were not defined, but one of the main tasks was to relieve the consultants at around 5pm so that they could leave to conduct their evening surgeries. On my first day as a resident anaesthetist, I was called to take over a partial gastrectomy from Windsor Lewis. Emergency surgery in the 1950s was mostly for acute appendicitis, perforated peptic ulcers, fractures including fractured neck of femur, and emergency prostatectomies.

There were some regular routine duties for the resident anaesthetists. Every morning there were dental gases in the out-patient dental department, and anaesthetics for the casualty department. There were afternoon lists in the out-patient theatre (note that in 1950 we were doing a great deal of day case surgery). These lists were for varicose veins, minor orthopaedics and the casualty officer's minor operations; there were also evening lists starting at 5pm, with the visiting consultant dental surgeons for the removal of wisdom teeth etc.

The other resident anaesthetist and myself were on call on alternate nights (except on Wednesdays which was covered by the registrar) and we had no official consultant or registrar cover. We also drew up our own weekly rota of both day and on-call duties.

There was no formal teaching or career guidance, for at that time it was still expected that any qualified doctor could give an anaesthetic based on the training that they had received as medical students. Therefore, either one could have gone punting on the Cam or played tennis every afternoon, or organise one's own training (and we were mostly self-taught). When I had spare time, I attended the consultants' lists to learn as much as possible. Their skills varied and their techniques were sometimes bizarre and eccentric. I learned most from Windsor Lewis (who had been a famous rugby wing three-quarter for Wales and had served during the war in the Royal Army Medical Corps). I learned a great deal about ENT anaesthesia from Jimmy Simpson. Surgeons tolerated the situation because of their dependence on private practice referrals.

There was no hospital library, but a few journals were available in a library in the radiotherapy department, organised by Professor Joe Mitchell. Most of us received our own copies of the *British Medical Journal* or subscribed to the *Lancet*. There were two main theatres, an ENT theatre, an Eye theatre and an out-patient theatre. Except for the Eye theatre each had an anaesthetic room. It would often take more than 20 minutes to anaesthetise a patient if endotracheal intubation was required. Assistance for the anaesthetist varied. Sometimes there was an untrained assistant (the forerunner of the Operating Department Assistant) or a student nurse. Syringes were autoclaved or boiled between use and there were no disposable needles or scalpel blades. The hospital employed technicians as needle and knife sharpeners. On the anaesthetic machines the oxygen and nitrous oxide cylinders had to be manhandled into the theatre and changed by the anaesthetist. We had no special theatre clothes and merely wore a gown over our everyday clothes. This was difficult during hot summer days in theatres without air-conditioning. I kept a careful note of how many anaesthetics I had administered each week and used Nosworthy cards for major cases. By the end of a year as a resident anaesthetist I had administered over 1500 anaesthetics, many for

the most major surgery carried out at that time, which included partial gastrectomies and spinal surgery.

Conclusion

Addenbrooke's at that time was a well run and happy hospital, and I was very sad when the time came in October 1951 for me to leave; but such was my affection for Addenbrooke's that I considered myself fortunate to return from 1958 until 1960 as a Senior Registrar Anaesthetist, and again from 1970 to 1983 as a Consultant Anaesthetist specialising in anaesthesia for neurosurgery.

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DR AXHAM AND THE MEDICAL ACT

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Introduction

In 1988 Dr Alfred Lee presented to the History of Anaesthesia Society *The Sad Tale of Dr Axham*, which was included in *Essays on the History of Anaesthesia*.[1] Dr Lee also became the co-author of an *Historical Vignette*[2] in 1995, with an extended article about the association of the medical profession with an unqualified practitioner. Why this interest in Dr Axham, an obscure GP from Soho who was struck off the Medical Register in 1911? Others have been erased from the Register; why was Dr Lee so concerned with the case of this particular doctor?

Synopsis of the Story

In 1906, at the age of 65, Dr Axham agreed to give anaesthetics for Mr Herbert Barker, a famous manipulative surgeon.[3] Mr Barker, who was not medically qualified, eventually became hugely successful and the envy of the medical profession. However, in February 1911 Mr Barker was sued in the High Court for alleged negligent treatment by a Charles Thomas for the sum of £5,000. Mr Barker lost the case and the plaintiff was awarded the paltry sum of £21.[4] That same morning Dr Axham had received a letter from Dr Bateman, Secretary of the Medical Defence Union, threatening to report him to the General Medical Council if he did not dissociate himself from Mr Barker. This Dr Axham would not agree to do and he was subsequently reported to the GMC.[5] At a hearing on 24 May, and now aged 71, he was again asked if he would dissociate himself from Mr Barker. He said he had done nothing wrong and that nobody, least of all the GMC, had complained before in the five years he had been anaesthetising for Mr Barker. He *felt* he was being made to take the blame for something he had not done, and said that it would be wrong to dissociate himself as Mr Barker was providing an excellent service to needy patients.

It took the GMC only 15 minutes to find the doctor guilty of infamous professional conduct,[6] and to order his name to be erased from the Medical Register. Dr Axham, expecting that this would happen, had already handed in his notice to the workhouse in Poland Street where he had worked for 24 years, and to various friendly societies to which he was doctor. (He was Surgeon to the Foresters, Hearts of Oak, Comical Fellows, and the Universal Friendly Life Assurance Benefit Societies; also to the James Self-Supporting Dispensary). When asked at the GMC hearing why he had done this, he replied that he did not want to go through the indignity of being given his notice. The law would have required this for reasons I will go into later. However, there was nothing in the regulations to stop Dr Axham from giving anaesthetics for Mr Barker as an unregistered practitioner.[7] He continued to do so for ten more years, much to the annoyance of the medical profession. Dr Axham had to move out of his large house in central London to live in genteel poverty in Norbury. Mr Barker on the other hand was later knighted.

When Dr Axham, at the age of 80, was becoming too frail to continue giving anaesthetics. Sir Herbert had no trouble finding a Dr Frank Collie to anaesthetise for him.[8] As can be expected this caused public outrage.[9] The public wanted to know if the GMC and the medical establishment

had changed their views about a doctor giving anaesthetics for an unregistered practitioner.[10] Other anaesthetists later gave anaesthetics for Sir Herbert without any official complaint; for example, in 1936, at the Barker demonstration at St Thomas's Hospital for the British Orthopaedic Association, gas was given by Dr Z Mennell.[11] In addition, I possess a photo of Sir Herbert manipulating an arm during his spell as a consultant manipulative surgeon on the Isle of Man, where it can be clearly seen that it is being done under a general anaesthetic (Figure1).

Figure 1
Sir Herbert manipulating an elbow. The anaesthetist can be seen holding a mask.

Dr Axham and the professions

Dr Axham fell foul of his medical colleagues, the General Medical Council, the medical colleges and the law. Attitudes and the law change over the years and the attitude to unregistered practitioners has changed. Professions allied to medicine are now performing many functions previously confined to medical staff, and this is only possible with their co-operation. Could it all go wrong one day, and could there be another 'poor Axham' in the years to come? History has a habit of repeating itself.

His medical colleagues

At the time of Dr Axham's erasure from the Medical Register the medical profession, through the BMA, was campaigning against bonesetters.[12] It must have been extremely galling to see Mr Barker earning a fortune treating patients without having to go through the rigours and expense of a medical education. To add insult to injury Mr Barker used the press as a means of boosting his reputation,[13,14] and he did not hesitate to release details of his more famous patients.[15] He also bombarded the *British Medical Journal* with letters (14 and 26 November; 3, 4, and 25 December 1906 and 9 January 1907 to name but a few), naming patients whom he had successfully treated. He went further, actually challenging the medical profession[16] in an open letter to the President of the Royal College of Surgeons.[17] He later deposited £1,000 with the *Daily Express*, claiming that he could cure six cases where the medical profession had failed (Figure 2).

£1,000 CHALLENGE.

Mr. H. A. Barker, the "bloodless surgeon," of Bond-street, has written to the "Express" offering to forfeit £1,000 to any deserving cause if he fails to prove the value of his methods in twenty test cases of "flat-foot."

Mr. Barker informed an "Express" representative yesterday evening that he is willing to deposit his £1,000 with the Editor of the "Express" until the trial is concluded.

He said that he would like to have a committee of laymen, or of doctors, of whose impartiality he was satisfied, as the arbiters of the trial.

At the end of this week Mr. Barker proposes to take a short holiday, at the end of which he will be prepared to treat the twenty test cases.

Figure 2
Cutting from the *Daily Express*, ? April 1906

As you can imagine, the profession was waiting for something to go wrong, and when it did, they jumped in and suggested that the boy Thomas should sue.[18] It was the profession, using the MDU, who reported Dr Axham to the General Medical Council and who conducted the proceedings against him.[19] The MDU provided the GMC with a transcript of Dr Axham's evidence at 'The Alleged Negligence of a Bonesetter' (reported in *The Times* of 3 February 1911), admitting that he had given anaesthetics for Mr Barker on many occasions.

The General Medical Council

The General Medical Council came into being as a consequence of the Medical Act of 1858,[20] and was given the herculean task of determining the qualifications necessary for registration and the suitability of training establishments. Furthermore, it was responsible for publishing the *British Pharmacopoeia*.[21] To enable it to do this the GMC was given awesome powers, being accountable only to the Privy Council,[21] and had the right to erase from the Register the name of any medical practitioner 'convicted of any Felony or Misdemeanour, or after due enquiry be judged by the General Council to have been guilty of infamous Conduct in any professional respect'.[21] Dr Axham was struck off for enabling Mr Barker, an unregistered practitioner, to do the work of a doctor. It is of interest that the word 'operations' was used for Mr Barker's activities although he never actually used the knife. When Dr Axham agreed to give anaesthetics for Mr Barker, did he know that he might get into trouble? He admits in a letter to the Royal College of Physicians of Edinburgh,[22] and in an article to *Truth*[23] that he did. The GMC regularly posted warnings to those registered with them and frequently repeated these warnings on the front pages of the Medical Register and in the supplements of the *British Medical Journal*.

The use of unqualified assistants and 'covering'

Having received complaints that patients were being treated by unqualified assistants, and that these unqualified assistants were actually signing death certificates in the name of a doctor (one doctor did not even live in the same country), the GMC decided to act and proposed legislation that would prevent doctors from employing unqualified people to do their work for them.

A few months later the GMC gave its definition of 'covering':

> 'The Executive Committee furthermore takes this opportunity of stating, in reference to the procedure known as 'covering' that in its view a Registered Practitioner covers an unregistered person when he does, or assists in doing, or is party to, any act which enables such Unqualified person to practice as if he were duly qualified.'

In 1897 in the *British Medical Journal*[24] there is a Notice giving a detailed warning about the practice of covering. These warnings were to stand virtually unchanged for 60 years. When the MDU wrote to Dr Axham warning him to dissociate himself from Dr Barker it threatened to report him for covering using the definition below:

> 'Further in regard to the practice commonly known as 'covering' the Council gives notice that any registered practitioner who by his countenance, advice, assistance, or co-operation knowingly enables an unqualified person (whether described as an assistant or otherwise) to attend or treat any patient, to procure or issue any medical certificate or certificate of death, or otherwise to engage in medical practice as if the said person were duly qualified and registered, is liable to be judged as guilty of 'infamous conduct in a medical respect' and to have his name erased from the Medical Register under the said enactments. But the foregoing does not apply so as to restrict the proper training and instruction of *bona fide* medical students and pupils, or the legitimate employment of dressers and surgery attendants under the immediate personal supervision of registered practitioners.'

In 1912, Mr Barker successfully treated the wife of a bishop (Mrs Moule) and the sub-editor of *The Times* (J B Capper). This prestigious newspaper now became a supporter of Mr Barker's treatments and actually featured a leading article named 'What is a quack?'[25] The lesser papers started an intense campaign to get Mr Barker recognised and to get Dr Axham reinstated. Mr Barker said that he was going to appeal to the King.[26] Whether this was the catalyst one can only speculate, but in 1914 the GMC issued a *Warning Notice* two pages long concerning the conduct expected from the medical profession. It also mentions the use of unqualified assistants and covering. But this time it specifically mentions the giving of anaesthetics and the possible consequences to the anaesthetist for associating with an unregistered practitioner.[27]

In a similar Notice in 1958[28] (the centenary year of the GMC), there is a specific warning about enabling an unregistered practitioner to do the work of a doctor by the giving of anaesthetics. Even in the latest booklet from the GMC (which allows doctors to refer patients to professionals allied to medicine provided that they are accountable to a statutory regulatory body), it clearly states that it is: 'an abuse of your professional position, to enable anyone who is not registered with the GMC to carry out tasks that require the knowledge and skills of a doctor'.[29]

The Colleges

The Registrar of the GMC wrote to the Royal College of Surgeons on the 26 May 1911 advising it that the name of Frederick Axham MRCS had been erased from the Medical Register, and it was resolved that this should be referred to the Disciplinary Committee to consider and report thereon:

> 'The Committee was of the opinion that the offence, for which Dr Frederick William Axham has been removed from the Medical Register, is of such a nature as to render him unfit to remain a Member of the College, and they accordingly recommend that he be removed from being a Member of the College under Clause 2, Section XVI of the bye-laws.'

This was later proposed and seconded at the Ordinary Meeting of the Council.[30] The Council would have had to inform the GMC of Dr Axham's removal.[21] The Royal College of Physicians of Edinburgh held an Extraordinary Meeting on 7 May 1912 and resolved:

> 'That Mr Axham should be suspended *sine die* and deprived, until the said suspension is removed, of all rights and privileges which as Licentiate he does or may enjoy.'

The President of the College had taken legal opinion and written to the Privy Council to see if this was legal:

> 'Speaking without prejudice, it seems to me that the College has been unnecessarily sensitive as to the exercise of the powers it enjoys under the charter and the bye-laws incidental thereto'.

This time Dr Axham was legally represented, but to no avail. The GMC was on this occasion also duly informed, and as Axham was now without any medical qualifications it could not reinstate him even if it wished to.

The Law

It takes many years of one's life to become a doctor. For some it is easy; for others it is an uphill battle with many hurdles to overcome and many sacrifices to be made. The financial burden to the parents can also be very heavy with schooling, university, and medical school to be paid for, all undertaken in the hope that eventually the young doctor will have received sufficient medical education to be registered with the GMC. Interestingly, a person does not have to be registered with the GMC to practice medicine in the UK, but he will have 'considerable disabilities' compared to a registered medical practitioner.[31] For example, he is forbidden to use any title or description implying that he is a registered practitioner, and most importantly 'he may not hold any appointments that are open only to registered practitioners'.[31] These rights are the 'Privileges of Registration' initially given under the Medical Act of 1858,[21] and are basically concerned with income protection. These original privileges have remained virtually unchanged for a hundred and forty years.

The loss of privilege, which forced Dr Axham to resign from his public posts, was the requirement to be registered with the GMC in order to work as a physician, surgeon or as any other medical officer for any prison, ship, the Armed Forces or Friendly Society or any hospital paid for out of public funds. Although the wording of the Act has changed this privilege still stands, and is to be found in Section 47 of the 1983 Medical Act. The latter was amended by the Clinical Performance Act of 1995, but Section 47 of the 1983 Act has remained unchanged. Many hospitals employ independent nurse practitioners and consultant specialists in paediatric surgery who are not medically qualified but certainly perform tasks which were in the past done by doctors. How this fits in with the Act is hard to see. It could be argued that they are not being employed as medical officers and surgeons but as practitioners. Is it all in a name or is it the reality of the practice which matters?

Public Relations

Perhaps it is the latter because in 1914 Mr Barker performed a masterstroke in public relations. He cured five army officers, discharged from the army through ill health, who went to see him in his rooms with knee problems.[32] Not only were they free from symptoms following Barker's treatment, but also they were re-enlisted to serve the country. The papers were full of his praises following these miracles. Mr Barker then informed the press that he was giving his services free to the army. The army, however, refused his offer,[33] despite massive support, including 206 names[32] (many of famous generals) whom Barker had treated. The reason given was that it would contravene the Medical Act. This resulted in a media uproar, with articles such as: 'Why not the best for our Soldiers'[34] and 'Crippled owing to Red Tape' (Figure 3).

CRIPPLED OWING TO RED TAPE.

NEW SURGERY BARRED TO SOLDIERS.

Mr. Jeremiah MacVeagh will raise the question of manipulative surgery in the House of Commons to-day, and if he receives no more satisfactory explanation than on Tuesday he intends to move the adjournment.

In the House on Tuesday Mr. Ian Mac-Pherson, Parliamentary Under-Secretary to

Figure 3
***Daily Express*, 17 February 1917**

The War Office was bombarded with letters from grateful patients whom Barker had treated. Hodge, the then (17 stone) Minister of Labour (Barker had successfully manipulated his twisted knee) invited fifty MPs to a dinner at the House of Commons so that they could meet Barker. As a result over sixty back-benchers took up the case,[8] but did not succeed in getting the Medical Act changed. The Under-Secretary of State, H J Tennet, declined to interfere and wrote a private letter to the bone setter:

> 'It would open the doors for the admission of many others whom I am sure you would consider to be quite undesirable'.[32]

Robert Jones, Military Director of Orthopaedics, was a bit more down to earth: 'No! he is not qualified!'. Mr Barker never pretended nor wanted to be a surgeon or other medical officer (he probably did not want the drop in salary!), but the War Office certainly considered him a medical officer as far as the Medical Act was concerned. In the end, as a compromise, the army stated that soldiers could see Mr Barker if they so wished,[8] but that the army could not be held responsible for their treatment in any way, and that he could not be seen as an employee of the army. It would be interesting to see what a court of law would make of it now.

Discussion

Dr Axham knew that he had broken the rules and expected to be struck off the Medical Register, and we should not be surprised that he was. There were many charlatans and dubious institutes such as the Sandow, which advertised quite freely offering spectacular cures. The MDU was determined that the medical profession should distance itself from these practices, an attitude which gave rise to accusations of a medical monopoly. Dr Bateman wrote a letter to *Truth*[7] replying to this:

> 'If the public desires the assistance of an unqualified person he is at liberty of course to employ such; and if he is not afraid to employ the services of a bone setter he is not likely to enquire whether the accompanying anaesthetist is upon the Medical Register or not. We shall continue to secure our right to keep the Medical Register free from those who encourage unqualified practice, and I have no doubt that the public will equally take advantage of its right to be attended by persons who have studied neither medicine or surgery. The risk is theirs, not ours!'

What happened next is almost beyond belief. Despite warnings from the GMC that the rules had not changed, no action was taken by the MDU or anyone else against any other doctor who associated with Mr Barker. Many, such as Professor Whitehead, supported Mr Barker openly. Following the court case against him he did not hesitate to refer cases for a medical opinion. He even had a noted surgeon to do his locum whilst he was on holiday.[12]

The medical profession was beginning to benefit from his success, and there were just too many influential doctors associated with him for action to be taken against them. Dr Frank Collie, Sir Herbert's anaesthetist after Dr Axham, was the brother of Sir John Collie the Harley Street physician. As extra protection he was married to an influential journalist. He obviously thought

he was untouchable as he wrote a long article called *Revolt* in which he derides the establishment.[36] Furthermore, who would wish to upset the King, who had personally endorsed Mr Barker by knighting him? Despite the public uproar the GMC did not reinstate Dr Axham for the simple reason that he had not asked them to do so, and as the Registrar of the GMC put it: 'Perhaps he preferred not to be'.[37]

At the age of 85, Dr Axham wrote pleading letters to the Royal College of Surgeons and to the Royal College of Physicians of Edinburgh. The latter agreed to give him back his qualifications because he had now distanced himself from Mr Barker for more than five years. Dr Axham's name was never restored to the Medical Register, as he died before the next meeting of the GMC when his restoration to the Register would have been on the agenda.

Conclusion

The attitude of the medical profession, and the powers that be, has changed much over the years, and in these days of rapid retreat it is hard to imagine the GMC or the Colleges ignoring the wishes of the government, the public and the press. However, the regulations and the law have not substantially changed, and the very processes which caused Dr Axham to be deprived of his livelihood still exist today.

Frederick Axham was born in December 1839 in Soho of very humble origin. On his birth certificate it states that his father was a gentleman's servant. His mother was a laundress. When he, who had been a doctor for the workhouse for 24 years, associated himself with Mr Barker he became the anaesthetist for the richest and the most influential in the land. Dr Axham was struck off for 'covering', but I cannot help but feel that he was also found guilty of a more serious crime in 1911; namely, rising above one's station.

Acknowledgements

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THE USE OF PARALYSIS AND MECHANICAL VENTILATION IN THE TREATMENT OF NEONATAL TETANUS

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King Edward VIII Hospital, Durban - Neonatal tetanus: 1959

To blow or not to blow, that is the question.
Whether 'tis nobler in King Edward, to suffer
the slings and arrows of outrageous curare,
or to take arms against a sea of spasms
and, by sedating, end them?

That is the question to which we hoped to find an answer in 1959!

My story starts in October 1958 when I bumped into Desmond Laurence, then Senior Lecturer in Clinical Pharmacology at University College Hospital Medical School. Desmond had just returned from the King Edward VIII Hospital in Durban, South Africa, and had obviously found the visit very stimulating. In between his tales of shark attacks on the beaches and the drunken revels of the local Zulu population, he told me that he had been conducting trials of various sedative drug regimes in babies with severe neonatal tetanus, a disease which had a mortality rate of about 85% in Durban.[1] He described how Prof E B Adams had created a remarkable academic Medical Unit in this large non-white hospital, and he enthused about the potential for large scale clinical trials. I learnt that their most recent trial of chlorpromazine[2] had demonstrated that the drug produced good control of the seizures in mild and moderately severe cases, but no effect on mortality in the severe cases and, in jest, I said that it was time that anaesthetists were involved in their trials since there had recently been several reports of survival in adults with severe tetanus treated by total paralysis and mechanical ventilation. Desmond asked me if I would be interested in setting up such a trial and, without thinking of the consequences, I said I would. Some months later I received a letter from Prof Adams inviting me to Durban. He told me that the Wellcome Trust had agreed to provide a grant to cover the cost of equipment and my fare to South Africa and asked me to provide a list of equipment required to set up the project.

From then on things moved fast. Since my sole experience with long term respiratory care had been in the treatment of some 30 patients in tank ventilators during the 1955 poliomyelitis epidemic in Boston, USA, I went to see Alex Crampton Smith in Oxford and Jackson Rees in Liverpool. I also wrote to Prof E A Pask in Newcastle. All were extremely helpful and Pask later sent me a prototype of one of his early ventilators. I decided that my £1,000 equipment grant from the Wellcome Trust should be spent on one Smith-Clarke and two Mark 5 Radcliffe ventilators, an EIL pH meter, and both a standard and a simplified (Aimer) Haldane CO_2 gas analysis apparatus.[3] I also bought two laryngoscopes and a range of tracheal tubes. To my amazement the Council of the Postgraduate Medical School agreed to provide six months paid leave (in those days Lecturer/Consultants at the Postgraduate School were paid £2,000 per annum compared with £2,500 for an NHS Consultant), and I then had to let my house and sell my car to raise the money for the fares for my wife and two young daughters.

We packed the equipment and took it to Southampton and, in March 1959, embarked for the three week sea voyage on the old Union Castle liner, *Caernarvon Castle*.

The King Edward VIII Hospital, Durban

The King Edward VIII Hospital accommodated some 2,000 African and Asian patients who slept on, between, or under the beds in the huts scattered throughout the grounds. However, the Medical School building was modern with library, laboratories and teaching rooms, and the Medical Unit was housed in a brick built building with Nightingale-style wards and nursing, and only one patient per bed! The Professor, his First Assistant, and the Medical Registrar were white (as were most of the other senior hospital and medical school staff) but the first generation of African and Asian house staff had just taken up their appointments. All the nurses were African or Asian. Although the clinical load was enormous the Medical Unit was run at a standard, which was comparable with any other teaching hospital, and all the staff were engaged in clinical research projects.

There were usually three or four adult tetanus admissions each week, since trauma was rife and tetanus toxoid had not reached the local Zulu population. There were, however, many more admissions with neonatal tetanus, the common aetiological agent appearing to be the mixture of cow dung and Johnson's baby powder used to dress the umbilical cord! The tetanus trials were conducted in two large rooms, one of which was assigned to me when I arrived with my load of apparatus. We were also fortunate in being allocated three excellent nurses to staff the unit.

Problems: equipment, environmental, clinical

The initial aim was to gain experience by treating adult cases, but for several weeks after my arrival there were no adult tetanus admissions. So I spent my time trying to set up the pH meter and CO_2 gas analysis apparatus. This proved to be more difficult than I had anticipated for the pH meter was rendered useless by the high humidity, and I was told that it would take six months to import some mercury for the gas analysers. Fortunately, a local physiologist found a small bottle of very dirty mercury at the back of a cupboard, but since there was no concentrated nitric acid, we had to revert to the local custom of cleaning it by grinding it up with brown sugar in a pestle and mortar! After three weeks there were still no adult patients with tetanus so we decided to start treating the neonates. Since I anticipated that our relatively untrained nursing staff might have difficulties with a tracheostomy and I thought that prolonged nasal intubation might lead to necrosis of the nasal passages, I used prolonged oral intubation in the first two patients. This was a great mistake for it proved to be extremely difficult to maintain the tube in its correct position throughout the three to four weeks of treatment. In addition, the larynx and surrounding structures became oedematous and ulcerated while the trachea became dilated.[4] In subsequent cases we performed a tracheostomy under general anaesthesia and inserted a shortened latex armoured tube which was held in place by a metal clamp.[5] It soon became apparent that our practice of making a window in the trachea was creating difficulties in weaning from the tracheostomy so we changed to the use of a vertical slit through the second, third and fourth tracheal rings. The problems posed by inadvertent decannulation, which occurred frequently during the first few weeks, were overcome by tying the tracheostomy tube clamp in place with a tape around the neck and a second tape which passed across the back and up through both axillae.[6] The

Figures 1 and 2
Tracheostomy tube fixation and makeshift connections in neonate and adult

reduction in night time calls was a great relief for me, for my asthma had been greatly exacerbated by the high humidity and I had to run 300 yards from my home to the unit whenever there was an emergency! Since the local African population were pretty warlike and managed to fill the mortuary most nights I didn't particularly enjoy these night time excursions!

The two Mark 5 Radcliffe ventilators were the first models to be fitted with mechanically operated valves (in place of the pressure-operated Stott valves) and functioned well as pressure generators at the highest rate of 37 breaths per minute. However, the smallest tidal volume, which could be set on the Smith-Clarke, was 250 ml so it was necessary to divert a proportion of the inspired gas away from the patient. This was done initially by incorporating an adjustable leak in the circuit, and later by inserting a parallel compliance into the breathing system. The compliance took the form of a small reservoir bag, the compliance of which was adjusted either by changing its volume with a clip, or by surrounding it with elastic bands. Humidification was another problem because the small tidal volumes resulted in excessive cooling of the gas as it passed along the inspiratory tube. We lagged the tube and increased the temperature in the hot water humidifiers until the inspired temperature was 35-37°C but this led to the risk of heat damage to the trachea since the inspired temperature increased abruptly when delivered volumes increased during temporary disconnection for tracheal suction. Another early problem was chest infection due to contamination of the inspired air by bacteria from the floor. We tackled this problem initially by raising the air inlet and then by making bacterial filters from layers of non-absorbent cotton wool in large Horlicks tins.

We also developed a sterile suction pack which enabled the nurses to use a no-touch technique for suction. There were other problems with feeding, fluid balance, skin and eye care etc which had to be solved, but within a few months the pattern of care was reasonably standardised.[5,6]

After we had treated about four patients we decided to start a randomised trial of total paralysis with curare and mechanical ventilation against the conservative sedative regime with phenobarbitone and acetylpromazine.[2] Since we only had three ventilators we had to stop randomisation when these were occupied, and this limitation greatly slowed the rate at which we could accumulate data. There were inevitably problems with staffing because the other members of the medical unit already had very heavy clinical loads, but I received a tremendous amount of help and instruction from Professor Barry Adams, Ralph Wright (the medical registrar and subsequently Professor of Medicine at Southampton), Noel Mann (the paediatrician), and many other members of the local medical community.

In1959 there was no blood gas apparatus which could analyse micro samples so I started to investigate a modification of the Campbell and Howell rebreathing technique for determining mixed venous PCO_2.[7] This technique was particularly suitable for apnoeic patients because the operator could ensure good mixing of gas between the lungs and bag by manual control of ventilation during the rebreathing periods. The modified technique involved three periods of rebreathing into a child's balloon containing oxygen. During the initial rebreathing period of 30-40 seconds a gas mixture with a PCO_2 close to mixed venous was generated in the balloon but, since recirculation had occurred, the PCO_2 was higher than that existing before the rebreathing. The patient was therefore reconnected to the ventilator and after 2-3 minutes a 20 second period of rebreathing was performed. Analysis of this gas yielded a value for mixed venous PCO_2. Subtraction of the normal venous-arterial difference (6 mmHg) then enabled arterial PCO_2 to be estimated. A third period of rebreathing confirmed that a true equilibrium had been achieved during the second rebreathing. Since we had no rapid CO_2 analyser the pattern of CO_2 build-up within the bag had to be determined by several hundred repetitive gas analyses by the Aimer or standard Haldane apparatus.[8] The determination could be accomplished in about 10 minutes and so provided a valuable guide to the adequacy of ventilation. Pat Smythe, Professor of Paediatrics in the University of Capetown, later stated that the great improvement in their results in the early 1960s was largely attributable to the adoption of this technique.[9,10]

Home via Capetown

By the time I left Durban in late September 1959 we had treated about 20 neonates and some five adults on ventilators. In those days the ships stopped in Capetown for about 5 days on the way back to England and to my amazement Buck Jones, Director of the Groote Schuur Department, arrived at the ship and loaned me his VW bus so that I could explore the Cape with my family. Only later did I discover that he had no second car and had walked to work each day! Buck also invited me to lecture on my experiences. I knew nothing about the Capetown medical community and proudly recounted our preliminary results on the assumption that we had been the first in the field. However, I was suitably deflated when Pat Smythe and Arthur Bull came up to me after the meeting and quietly presented me with a copy of their recently published *British Medical Journal* paper describing the treatment of 10 neonates with 8 survivors![11]

When I returned to Hammersmith, in October 1959, I was charged with the development of a hospital cardiac arrest service and was then invited to join the open heart surgery anaesthetic team with John Beard and Betty Lloyd-Jones. It soon became apparent that many of these patients required postoperative mechanical ventilation, so we started to treat them on the wards and then developed an intensive care unit. Simultaneously, I tried to interest the paediatricians in the use of mechanical ventilation for the treatment of the Respiratory Distress Syndrome. Unfortunately, Peter Tizard, the Professor of Paediatrics, felt that his own staff could not cope with the extra workload and I was too busy with the open heart surgery patients to be able to devote enough time to the neonates. By this time news of my interest in tetanus had spread and we had a spate of adult and child admissions from this country and from the Channel Islands.

The work in Durban was taken over initially by Beric Jackson, and later by Richard Holloway. Both continued to refine the techniques of treatment.[12] However, I should like to record that Beric Jackson described a method of providing ventilatory assistance during weaning which antedated the description of intermittent mandatory ventilation (or IMV), by some eight years.[6] The neonatal trial in Durban was completed in 1961. The results in 50 neonates showed a reduction in mortality from 84 to 44%.[13] Later analysis of all the cases of tetanus treated in Durban from 1956-1965 (Table 1) showed an overall mortality of 36% in patients treated by intermittent positive pressure ventilation while patients treated conservatively had a mortality of 79%.[14] In 1974 Smythe, Bowie and Voss reported that the mortality in patients with severe neonatal tetanus treated in the Red Cross War Memorial Children's Hospital in Capetown had been reduced to 21% in the years 1967-72. In a further consecutive series of 97 patients the mortality was only 10%, thus confirming the value of this form of treatment.[10]

Table 1
IPPV in severe tetanus neonatorum:
Durban experience 1956-66

	Treatment	Cases	Deaths(%)
Clinical Trial	IPPV	25	44.0
(1959-61)	Conservative	25	84.0
Full series	IPPV	184	36.4
	Conservative (all)	489	78.7
	Conservative 1956-9	200	89.5
	Conservative 1959-65	289	70.9

(from Adams EB et al. *Lancet* 1966; **2**:1176-81)

Professor Adams has now retired to this country, while Professor Wright and Dr Mann are, sadly, no longer with us, but I remain profoundly grateful to them, to Desmond Laurence, to the Wellcome Trust and to the Council of the (then) Postgraduate Medical School for enabling me to enjoy a unique experience which had a major influence on my subsequent career.

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EVOLUTION OF THE COMPUTER

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Computer Terms

- A bus is a connection with several paths
- A mouse is not a mammal to be scared of but a friendly clicking or double-clicking creature
- A turtle may outpace an Olympic runner
- An Apple is no longer a gastronomic delight
- Windows were opened by Gates
- Memory can be erased as well as accessed in seconds
- Intelligence may be artificial
- A nibble is defined as half a byte
- I love you is a virus
- Cybercafes are the new generation of restaurants with access to e-mail.
- A worm is an optical disk
- A demon is a friendly internet
- The web need not remind us of eight-legged hairy creatures, but is simply amazing and amazingly simple
- Computers are now almost everywhere, and have invaded the human body in the form of pacemakers and hearing aids

Chronology

1st century BC - the Antikythera mechanism, a sophisticated instrument for its time, consisted of metal gears and pointers enclosed in a box; it was found in a shipwreck.

200 BC - the Astrolabe, of Greek origin, a foundation for nautical surveying.

5000 years ago - the Abacus, ancestor of the calculator and the computer.

1300 AD - the sliding metal disc (Al-Kashi).

1550(?)-1617 - John Napier: logarithms and multiplying machine (Napier's bones or rods).

1621 - the slide rule invented by Revd William Oughtred.

1642 - Blaise Pascal: the mechanical calculator.

1673 - Baron Gottfried von Leibnitz constructed the stepped reckoner and described the binary system.

Charles Babbage

Babbage was born in 1791 into a rich banking family. As a student he taught himself mathematics along the lines laid down by von Leibnitz. When he went up to Cambridge he found that his knowledge of the subject was wider than that of his tutor. In 1823 he received a grant from the government to create a mechanical calculator to help deal with ballistics and navigation; but it was so ambitious that engineers found it impossible to build. A decade later he conceived something even more powerful, but the government withdrew its grant, and although Babbage contributed £6000 himself the machine was never completed.

In 1828 he was awarded the Lucasian Chair of Mathematics, a post he held for 11 years without delivering a single lecture at the University.

Level Difference

This was the principle upon which Babbage was to build his machine based on values computed for the formula $y=x^2$.

x	y	1st level difference	2nd level difference
1	1	1	
2	4	3	2
3	9	5	2
4	16	7	2
5	25	9	2

Since the 2nd level difference is constant, corresponding with the second power of x in the formula $y=x^2$, y can be found by simple addition of the two level difference values and the square of (x-1). Because of the use of this principle Babbage called his device a 'Difference Engine'. The new machine was in fact the first digital computer. It used a system of 50 cogwheels and data was entered by means of punched cards. Babbage's aim was to use sets of gears that moved each other to produce columns of figures. These figures would then be printed automatically. Augusta Ada, Countess of Lovelace and daughter of the poet Byron, wrote programs for Babbage's machine and thus could be called the first programmer. Alas, Babbage never raised enough funds to build a working machine.

The 19th Century

Like today's computers, Babbage intended his machines to have two main parts:

1. The Memory, which he called the Store;

2. The Central Processing Unit, which he called the Mill, and which would actually perform the necessary mathematics.

The punch cards called Algorithms, with which the machine could be programmed were invented by a Frenchman called Joseph Marie Jacquard in 1828.

In the late 1860's Babbage began building a scaled-down version of the analytical engine which was assembled shortly before his death in 1871. It has been said that: 'if he was not the father of the computer he was certainly the grandfather'.

In 1873 Christopher Sholes from Milwaukee invented the QWERTY keyboard. It was deliberately designed to slow down the typist, as there was a danger of the type-bars jamming against each other if they were operated too fast. Similarly, the standard computer was also designed to slow down problem-solving since the early equipment could not cope with overlapping, let alone parallel operations. Sholes also craftily ensured that the word 'typewriter' used only the top row of letters, this was to help salesmen giving demonstrations.

In the 1880's Babbage's son, Henry, designed and built a simple mill that printed a table of multiples of 11.

A giant step was taken by Herman Hollerith, an American engineer and statistician, who invented a keyboard device (nicknamed a statistical piano) and an electrical tabulator to read results. This made it possible to analyse previously unimaginable masses of statistics. During the American Census of 1890 the tabulators recorded complete data from nearly 7 million people in a 24-hour period. This is considered to be the beginning of modern data-processing.

Outstanding Events

Lee de Forest (1906), an American physicist, invented the Electronic Tube which controlled the movement of electrons across a vacuum inside a hermetically sealed glass bulb.

Konrad Zuse (1931) used this to build a series of computers, two of which were employed during World War Two for studying the ballistics of rockets. All his machines were destroyed in the bombardment of Berlin.

George R. Stibitz (1939), a mathematician at the Bell Laboratories in New Jersey, made the first Binary Computer (Model I Relay Computer). He assembled it in one week-end using discarded relays, two light bulbs, and fragments of a tobacco jar.

John Vincent Atanasoff, a Professor at the Iowa State College, and Clifford Berry, one of his students (1939), built a binary machine to solve complex equations used in physics. It was the first electronic digital computer, called the Atanasoff-Berry computer or Tube computer.

The Second Generation of Computers

In 1940, with a World War in the offing, the US National Defense Research Committee used an early Mark I computer built by IBM to help in making firing tables for big guns. This was a 100-ton collection of shafts, gears, and wires which used a new invention, the relay or flip-flop. It was ingenious but clumsy, as many mechanical parts could slip out of place, and it sometimes took three days to solve a problem. Presper Eckert, an electronics engineer, and John Mauchly, a mathematician, from the Moore School in Philadelphia, suggested that flip-flops be made out of vacuum tubes as in radio. By 1942 they had landed a government contract to build the ENIAC

(an acronym for Electronic Numerical Integrator and Computer).

Size Matters

In 1943 Alan Turing, a 25-year old mathematician from Cambridge, used information from a Jewish refugee who had worked on a decoding machine in Germany before the war to create the Colossus, possibly the world's first electronic computer. Its purpose was to crack the code of the German machine Enigma, and it was formulated by Professor Max Newman and built by Professor Tommy Flowers at Bletchley Park. It contained 2000 electronic tubes and could process 5000 characters per second. In 1944, Professor Howard Aiken of Harvard, completed with IBM the Harvard Mark I. This weighed five tons and incorporated nearly 3,000 telephone relays. By 1946 the ENIAC was finally completed at the University of Pennsylvania, covering a floor space of 1500 ft. and containing 40 instrument panels, 17,000 vacuum tubes, and 6000 switches It was more than 1000 times faster than any previous computer but had very little internal memory.

In 1948 Professors Tommy Kilburn, Max Newman, and Sir Frederick Williams developed the Manchester Mark I, probably the first machine to obey a program stored electronically inside itself. It was later marketed by Ferranti Ltd as the world's first commercial computer and delivered to customers in 1951.

In 1949 the Economic Delay Storage Automatic Calculator (EDSAC) was built at Cambridge University by a team headed by Dr Maurice Wilkes. It was later marketed by the Lyons Company as the LEO (Lyons Electronic Office), and as the ACE (Automatic Computing Engine) by Alan Turing at the National Physics Laboratory.

Further Progress in Computer Technology

In 1949 Eckert discovered that, when tubes containing quartz were made to oscillate by the passage of an electric current and were linked together in a loop, the circuit remembered. There emerged the EDVAC (Electronic Discrete Variable Automatic Computer) which could store 1,000 numbers in 10 tubes. Shortly afterwards Eckert and Mauchly started work on the UNIVAC (Universal Automatic Computer). This was intended for use by government, and businesses such as insurance and market research. It was finally ready in 1951, and it was one tenth of the size, ten times as fast, and able to store one hundred times the information compared with the ENIAC. However, because of rising costs, Eckert and Mauchly were forced to sell out to the Remington Rand Company. The Company offered to predict the result of the Eisenhower/Stevenson Presidential election in 1952. Using previous voting records they predicted a landslide victory for Eisenhower with 99% accuracy.

Transistors

Computers suddenly became big business and entered the offices of every company. Those making cash registers or adding machines took the plunge with the new technology. But computers were still large, expensive and slow, and the vacuum tubes were prone to failure On Christmas Eve 1947 three physicists engaged in pure research at the Bell Laboratories in New

Jersey, Walter Brattain, John Bardeen and William Shockley discovered the principle of solid state amplification, using small fragments of germanium. The invention of the transistor led to smaller, cheaper and faster computers but each transistor had to be separately wired together. Shockley moved to Palo Alto, California close to Stanford University - an area now known as Silicon Valley. Two graduate engineering students from Stanford, William Hewlett and David Packard formed an electronic company in their garage.

Integrated Circuits

In September 1958 Jack Kilby of Texas Instruments successfully tested a primitive integrated circuit made of a half inch wafer of semiconductor, deposited on glass and crudely wired together. In January 1959 Robert Noyce came up with the idea of depositing thin strips of metal on the chip, eliminating the need for wiring. Kilby and Noyce are regarded as co-inventors of integrated circuits. The modern chip, a silicon flake less than a quarter of an inch thick, can hold millions of microscopic electronic components. Under a microscope it looks like an aerial view of a city with streets, squares and large buildings. The computers themselves can now design, display and test the maze of circuits.

Modems, Mice and Windows

Modems were introduced in 1960. They are devices that allow computers to communicate over telephone lines. A side effect was that breaking into computer systems became easier. In 1963 Douglas Englebart from the Stanford Research Institute invented the mouse, the original being shaped like one. It was a modification of the aeroplane's joystick. It was originally found only on Apple computers but was adopted by IBM in 1987. Windows are rectangular screen areas on what came to be called the desktop. Users could switch among multiple activities using the mouse. *Windows* was adapted for computer products by the Microsoft Company founded by Bill Gates.

Continuing Development

A series of computer languages, such as BASIC (Beginners All-purpose Symbolic Instruction Code) started in 1964 using code words to tell the computer what to do.
In 1965 IBM introduced the Model 360, using microchip technology, which quickly gained a commanding share of the market. The Digital Equipment Corporation from Massachusetts came out with a micro-computer in the same year. Similar models were used in missiles and spacecraft, and ensured the popularity of calculators in the early 1970's.

The terms hardware and software began to appear about this time. The hard disk is rigid and permanently housed in the computer drive with an enormous capacity (one million bytes=160,000 words). Software implied that programs could be changed to suit requirements, exemplified by IBM's floppy disk. With the number of elements in a single chip increasing to over 15,000 using large-scale-integration (LSI) another generation of computers was emerging.

Glossary

The Internet - Scientists and Science Fiction writers often try to predict the future, but not all their ideas materialise. One idea that certainly did was that everyone would be linked to everyone else via small home computers. This is the Internet or Interconnected-Network. Its origin lay in the Cold War, the US Defense Department setting a number of networks, and other government agencies and universities followed suit. Al Gore dubbed it the 'Information Superhighway'.

Apple - Apple Computers was founded on a shoestring by two computer hackers, Steven Jobs and Stephen Wozniak, and rose from a small garage to be a billion dollar corporation; the era of the PC had begun. In 1975 the first PC with a screen and keyboard was sold in kit form.

CD-Rom - This was invented by Philips in 1985. It is a laser-read compact disc similar to those used in Hi-Fi systems, but adapted for computers and containing 1000 times more data. One disadvantage is that new data can not be written on them.

Computer Programming - George Boole was a self-taught English mathematician who was born in Lincoln in 1815, the son of a shoemaker. He was the first to realise that two numbers could be used to express complex kinds of arithmetical and logical statements - hence the binary system. His ideas lay dormant for over a century, but Boolean algebra is now the basis of computer programming.

Cyberspace - This word was coined by William Gibson, a Science Fiction writer, to mean the entire electronic world in which the internet works.

E- mail - Once electronic mail could arrive in a few seconds the Post Office methods, where some letters could take days, became known as snail-mail.

Laser - In 1975 IBM introduced the first laser printer, though it was rather expensive and bulky. Hewlett Packard's laser jet of 1984 meant that the printer began to expand into the world of microcomputers.

The Microprocessor - Dr Marcian (Ted) Hoff, an engineer from Stanford was the first to develop the microprocessor chip, which led to substantial changes in the design and use of computers. Processors became of smaller size and increased capacity so that by 1993 the Pentium, a 64-bit processor, was a thin wafer of about 2 sq cm containing 3.1 million transistors, each a hundred times less than the thickness of a human hair.

Virus - Viruses are programs designed to replicate themselves and deliberately damage computer systems. A notorious recent example was the 'I love you' virus. The Michelangelo virus was launched on the painter's 517th birthday and attacked computer systems throughout the world, turning data on hard disks into nonsense. It has been claimed that the US used a virus against Iraq during the Gulf War in 1992.

Webs and Browsers - At the CERN laboratory in Switzerland, the European laboratory for particle physics, Tim Berners-Lee thought it would be convenient to link with his fellow physicists around the world, and thus set up the first web. The advent of the browser, invented by another physicist, Marc Andreesen, meant the rapid growth of the world wide web, allowing graphics and videos to be moved across telephone lines. Cybercafes were opened up for those without computer access.

Conclusion

By 1994, over 50 million PCs were in use throughout the world, and it was estimated that one in three American families had one in their home. They can of course make mistakes. In 1979 and 1980 two false warnings of nuclear attacks were given, one due to a faulty circuit, and the other due to a test tape simulating an attack being accidentally fed into the computer. Although there are some giants like the Cyber Super-Computer, with 50 miles of wiring, models are generally getting smaller, eg laptop and palmtop versions. Much money is being invested in research for the next generation of computers. Charles Babbage, who spent a lifetime in pursuit of a device, would have been envious.

RICHARD STUART ATKINSON OBE - AN APPRECIATION

Dr T B Boulton
Former President, History of Anaesthesia Society

Richard (Dick) Stuart Atkinson, Honorary Consultant Anaesthetist Southend-on-Sea Hospital, and former Vice Dean of the Faculty of Anaesthetists, died unexpectedly at his home on 3 January 2000. He was a member of the first Council of the History of Anaesthesia Society (HAS) and was its President from 1996 to 1998. He was appointed an Officer of the Order of the British Empire (OBE) for his services to medicine in 1990.

Dick Atkinson was my close friend and confidant. We were both brought up in Yorkshire from an early age and were educated at rival Yorkshire independent public schools. We shared a love of that county and its wholesome plain cooking undisguised by haute cuisine! I was two years senior to Dick, but our careers ran on remarkably parallel lines. Both of us had the good fortune early in our specialist careers to come under the influence of the legendary J Alfred Lee of Southend-on-Sea Hospital, who was later to be the first President of HAS. In 1957 I was a Senior Registrar in the Southend Department of which Lee was Chairman, and Dick joined it as a young Consultant in 1961.

Richard Atkinson was born at Doncaster on 18 July 1927. He was the eldest of the three children of Stuart Atkinson, Professor of Mining Engineering at the University of Leeds and later of the University of Sheffield. Dick had a particularly close relationship with his father who frequently took him to watch the first-class cricket matches at Headingley. Dick consequently developed a true Yorkshireman's lifelong interest in cricket, and he became a member of both the Yorkshire Cricket Club and the Marylebone Cricket Club.

He was educated at Leeds Grammar School, Trinity Hall Cambridge, and St Bartholomew's Hospital (Barts), obtaining his Cambridge medical degree in 1951. The compulsory pre-registration year had not been introduced at that time and Dick began training in his chosen specialty of anaesthesia after six months as a House Physician at the North Middlesex Hospital. He then became a House Officer Anaesthetist at Barts, and subsequently a Senior House Officer at the Prince of Wales Hospital, North London.

Dick Atkinson was called up for National Service in the Royal Army Medical Corps (RAMC) in September 1953. He served first at the Cambridge Military Hospital in Aldershot. There, by dint of hard study, he passed the very first final examination for the Fellowship of the Faculty of Anaesthetists (FFARCS) in November 1953, This was immediately after the qualification had been upgraded from the interim two-part Diploma in Anaesthetics (DA) to the status of a Fellowship. Dick was then posted to the British Military Hospital in Rinteln Germany as a Specialist. There, like others of his generation, he bore responsibility beyond what might have been expected of one of his previous experience and training, in an RAMC depleted of senior specialists in all disciplines following demobilisation after the Second World War.

Dick returned to the civilian National Health Service (NHS) in1955 for further training in the Registrar grades. His Senior Registrar rotation was based on Barts. It included one year at Chase Farm District Hospital at Enfield and a year seconded as a Fellow in Anesthesiology at

the Hospital of the University of Pennsylvania, Philadelphia. That Department of Anesthesia was headed by the renowned Professor Robert Dripps. Dick always acknowledged that he learnt a great deal during that year, particularly in the field of local and spinal anaesthesia, concerning which, also influenced by Alfred Lee, he later became an authority. Such were the differences in British and American clinical practice at that time that Dick was able to reciprocate by making several important contributions to the work of the Philadelphia department. This was particularly by promoting British techniques of using muscle relaxant drugs. He also introduced his American colleagues to the use of trichloroethylene, a useful agent favoured by British anaesthetists, and by Dick in particular, both before and after halothane was introduced in 1956, for specific indications including neurosurgery. He wrote a review article on trichloroethylene for the journal *Anesthesiology* and was one of many anaesthetists who deeply regretted the final withdrawal of trichloroethylene by the manufacturers in 1984 purely for economic reasons.

On completing his apprenticeship training Dick was appointed to Southend-on-Sea as a Consultant in 1961. Alfred Lee chaired a department and ran a school of anaesthesia at Southend in a NHS District General Hospital, which, in organisation and postgraduate training methods, as well as care for the welfare of trainees, surpassed many university hospital departments of the period. A considerable number of senior British anaesthetists, as well as many practitioners from overseas, recall with gratitude time spent at Southend during their training. Alfred taught me personally much clinical anaesthesia when I was with him in 1957, but he also went out of his way to prepare me for becoming a Consultant. Dick often told me how carefully and tactfully Alfred Lee guided him when he was first appointed at Southend, and from whom he too learnt a great deal. Dick paid tribute to Lee's skill and kindness in a paper read to the HAS in 1998. (*Proceedings of the History of Anaesthesia Society* 1998; **23**:10-15)

Dick Atkinson collaborated closely with Lee professionally and they became firm personal friends. He also joined Lee as co-author of that classic textbook A *Synopsis of Anaesthesia* from the fifth (1964) to the tenth (1987) edition, and the eleventh edition was published in1993 after Lee's death, as *Lee's Synopsis of Anaesthesia*, with Dick as the senior of the three authors. Dick also collaborated with Langton Hewer in producing the twelfth (1976) to the eighteenth (1993) editions of *Recent Advances in Anaesthesia and Analgesia*, and with Professor Sir Robert Macintosh for the fourth (1978) and the fifth (1985) editions of *Lumbar Puncture and Spinal Analgesia*. Dick was also co-author of *A Handbook of Intensive Care* (1981) and of *A Short History of Anaesthesia* (1996), and author of a monograph on James Young Simpson, the discoverer of chloroform (1973).

He and I were co-editors of *The Proceedings of the Second International Symposium on the History of Anaesthesia* (1987). We enjoyed a long and happy association with the journal Anaesthesia from 1973 to 1987, first as Editor and Senior Assistant Editor, and later as joint Advisory Editors. Dick was also an Associate Editor of the *Annals of the Royal College of Surgeons of England* from 1986 to1990.

Richard Atkinson was a Member of the Board of the Faculty of Anaesthetists from 1975 to 1988 and he was Vice Dean of the Faculty and a Member of the Council of the Royal College of Surgeons of England from 1985 to 1987. He continued as Member of Council until 1990 after the Faculty achieved collegiate status within the surgeons' College in 1988. Dick contributed a great deal during that period. He and I aspired to present the views of the staff

of ordinary NHS District General Hospitals in a Board largely composed of academic anaesthetists and consultants from university hospitals. Dick had the ability to see both sides of a problem and then, after careful analysis, to present his considered opinion quietly and politely, but nonetheless forcefully. I recollect, for example, that it was he who, not without opposition from some more senior members of the Board, initiated the concept of the need for appointing Faculty Tutors in every hospital group, and for them to meet annually in conference. He and I did not agree in the nineteen eighties about the question of whether there was a pressing need for the inauguration of a truly independent (Royal) College of Anaesthetists. I was quixotically fired with enthusiasm, but Dick took a calmer and more cautious view. This did not impair our personal friendship however!

Dick Atkinson held office in several national organisations besides the Faculty and the College of Anaesthetists. He was in his time President of the Section of Anaesthesia of the Royal Society of Medicine and Vice President of the Association of Anaesthetists of Great Britain and Ireland. He was awarded both the John Snow Medal of the Association and the College Medal, and was an Honorary Member of the Association. Both Alfred Lee and Dick Atkinson had an interest in the study of the history of anaesthesia well before they came together, and this interest was further stimulated by their collaboration. Dick gave sage advice to HAS in its early days as a Member of its first Council. He also organised two successful meetings of the Society at Southend, (one during the presidency of Alfred Lee in 1988, and the other at the end of his own term as President in 1998). Although an author rather than a speaker, he competently delivered several interesting papers to HAS over the years.

Despite his many commitments, Dick Atkinson did not neglect his duties at his base hospital at Southend. He was at various times, in addition to his clinical duties, Postgraduate Tutor, a Member of the District Health Authority and Chairman of the District Ethical Committee, as well as a member of several other committees.

Dick was outstandingly supportive of the ideals of patient care embodied in the original concept of the British National Health Service. It was therefore sad that he was deeply concerned in recent years by what he perceived as the increased bureaucracy and the deterioration of NHS hospital services that followed the various reorganisations of the last four decades, despite the dedication of the clinical medical and nursing staff. He told me on a number of occasions that he dated the decline of the hospital services from the implementation of the 1968 Salmon Report on Nurse Staffing Structure that seemed to put management and sociology above patient care in a caring profession. This was not surprising. Both Dick and I had had the privilege and advantage of marrying nurses who had qualified in their profession long before 1968. This was in an era when marriage was still a partnership not regarded as being dependent, either economically or culturally, on two incomes. In those days too, whole time care of one's own young children and the management of the home was not considered to be a secondary occupation.

Richard Atkinson was a popular and respected figure. He had a kindly and equable temperament and a special regard for the welfare of his junior staff. He was sympathetic and respectful of the views of those who held opinions contrary to his own, but he was capable of taking firm decisions, based on his own assessment, when it was necessary.

It is some consolation that he had virtually completed his life's work when he died, having handed over his professional and literary responsibilities to others. He greatly enjoyed

domestic family life in retirement, but he nonetheless continued to be a frequent attender at scientific meetings, not least those of the History of Anaesthesia Society. There is no doubt that Richard Atkinson is greatly missed wherever anaesthetists and medical historians forgather.

Dick was a lover of music and opera. He especially ejoyed visits to Glyndbourne and Bayreuth, often in the company of Alfred Lee and their respective wives. He and I shared a Christian belief although we rarely discussed it.

Dick married Veronica Filler, then a junior operating theatre sister at Bart's, in 1954 during his military service. She was thereafter his lifelong affectionate companion. Dick was a devoted family man. His wife, four children and eleven grandchildren survive him. They have our deepest sympathy for their loss, but they will be comforted by the knowledge of his outstanding contributions to his profession and to the wellbeing of all who knew him.

THE HISTORY OF THE UNIVERSITY DEPARTMENT OF ANAESTHESIA IN LEICESTER*

Professor G Smith
University of Leicester

The University of Leicester admitted its first student in 1921 and by 1984 there were approximately 4,500 full-time students including 507 in the Faculty of Medicine. The Medical School was planned in 1970, and sited in Leicester partly because of the well-established School of Biological Sciences in the University. The first clinical departments were established in 1974. In 1999 a new four year graduate intake was commenced and in 2000, a Joint Medical School was established with the University of Warwick.

Prior to the opening of the Clinical Sciences building at Leicester Royal Infirmary (LRI) in 1979, the major University Clinical Departments were sited at Leicester General Hospital (LGH) to meet the needs of the first intake of medical undergraduates in October 1975. Transfer of the Departments of Medicine and Surgery to LRI in 1979 released accommodation at LGH and permitted expansion of the Medical School. The Foundation Chair of Anaesthesia was established in 1979 supported initially by one senior lecturer, one technician and one secretary.

In 1979 the objective of the department was to establish accreditation for a three year Higher Professional Training programme, to create a joint NHS University department and to develop research programmes for both academic and NHS staff. The second objective was achieved in 1983 when some two-thirds of an enlarged department moved to join with the NHS division in the new integrated department at Leicester Royal Infirmary.

In 1985 the Department comprised:

Professor
Senior Lecturers – 3
Lecturers with Honorary Senior Registrar status – 3
Lecturers with Postfellowship Registrar status – 4
Principal Secretary
Technicians – 2 University posts
Research Sisters – 2
Technicians – 2 on permanent secondment from the Medical Physics Department

In 1991 a non-clinical lecturer in pharmacology was appointed and in 1996 a fourth senior lecturer in cardiac anaesthesia was based at Glenfield Hospital. In 1996 a second Chair of Anaesthesia and Pain Management was created, and in 1999 the non-clinical lecturer was promoted to a senior lecturer.

Current staffing in the department comprises the following:

Professors – 2
Non-clinical Senior Lecturer – 1

* *Abstract only at author's request*

Clinical Senior Lecturers – 4
Lecturer/Honorary SpRs – 3
Honorary Senior Lecturers – 2
Research Fellows – 2
Visiting Research Fellow (Japan) – 1
Research Registrars – 4
Technicians – 2
Medical Physics Technicians – 2
Research Nurses – 2
Research Students (PhD) - 2

Other major academic developments include the establishment of a Sleep Disorder Clinic in 1985 and an MSc course in Pain Management. This is a two year course leading to either a Diploma or an MSc for individuals in the healthcare professions. At the same time, in recognition of the considerable degree of both basic science and clinical work taking place in acute and chronic pain, the title of the Department was changed to Department of Anaesthesia and Pain Management.

There have been various other activities taking place within the academic department in Leicester. One of the more significant ones is that in 1987 the office of the *British Journal of Anaesthesia* was transferred from Glasgow to Leicester when Professor Smith became its editor, a post he occupied from 1987 to 1997, when the editorial arrangements for the *BJA* changed from a single editor to an Editor-in-Chief plus four section editors, two of whom remain in Leicester.

Research activities in progress in the department include studies in acute postoperative pain and in chronic pain, studies of basic pharmacology including opioid pharmacokinetics and nociceptin/cannabis receptor function, clinical studies in chronic pain, in particular the assessment of neuropathic pain, studies of the stress response to surgery and examination of the effects of anaesthetic techniques on gastrointestinal motility and areas relevant to regurgitation and aspiration during anaesthesia.

TWO THOUSAND YEARS OF MONITORING*

Professor P Hutton
President, Royal College of Anaesthetists

Monitoring, perceived by many as a modern subject, is in fact as old as the history of medicine itself. What is true, however, is that the pace of technological change has brought with it the potential for making more measurements of physiological function. These have on occasions been introduced without a full evaluation of their proper contribution or their potential for causing morbidity and even mortality. This presentation reviewed the development of concepts in monitoring from the earliest times through to the modern day with a snapshot of the situation 150 years ago when anaesthesia was introduced into clinical practice.

Hippocrates (circa 400 BC) in his *Epidemics, Prognostics and Aphorisms* records his monitoring of patients suffering from a wide variety of conditions. Because most treatments were useless, the main function of a physician, apart from comforting the sick and their relatives was, by observation, to establish the pattern of disease and to offer an opinion on the prognosis and likely outcome.

The first detailed observations of the value of the pulse were made by Praxagoras (circa 280 BC) and subsequently developed by Herophilus. The latter named certain types of pulse (eg water-hammer), and tried to time the beats by a water clock. The importance of the pulse was subsequently greatly emphasised by Galen (130 AD) who regarded 'sphygmology' as the 'most important diagnostic .... with strength, frequency, rhythm and character'. Galen also made significant contributions to the importance of temperature measurement and auscultation (of physiological sounds directly by the ear).

Then, as with many other aspects of science and technology, Europe entered the 'Dark Ages' from which it did not emerge for approximately 1,000 years, and the story begins again in the 13th and 14th centuries. A key figure of this time was Nicholas of Cusa (1450), who greatly developed the use of water clocks. He weighed the water delivered during a hundred beats of the pulse thereby producing an index which was the reciprocal of the heart rate. His work was extended by Galileo and Sanctorius (1600) but it was not until the 18th century that clocks were invented with sufficient accuracy to be of any practical use. Galileo and Sanctorius were also instrumental in developing the concept of the thermometer and Sanctorius has to be given the credit for first establishing the concept of observer error.

From 1880, progress was much more rapid, paralleling the increased work in physiology and greater understanding of disease processes. Laennec delivered his treatise on auscultation and stethoscopy in 1819, Marey developed the sphygmograph in 1860 and performed a cardiac catheterisation of a horse in 1881. Faivre measured the direct arterial pressure in man in 1856 and the Riva-Rocci method of indirect measurement was published in 1896 and introduced into anaesthetic practice in 1903. Zimmerman, an army surgeon, developed the clinical importance of temperature measurement in 1846 and Wunderlich published his observations on the temperature patterns of 28,000 patients in 1868.

* *Abstract only at author's request*

One hundred and fifty years ago when anaethesia was introduced, the situation was therefore very different from today. The pulse and respiration could be counted using reliable clocks, but there was no method available of routinely measuring the blood pressure either directly or indirectly. Thermometers were still very unreliable. Auscultation was not universally accepted as a valid technique and the flexible tube stethoscope was still being developed. There was no ECG or other type of electronic measurement available.

Since then, additional types of monitoring have been introduced into clinical practice as they became available, the first peroperative electronic recordings being from Eindhoven's 'string galvanometer' in 1901. Other important events in anaesthetics monitoring the early 20th century were Levy's work on chloroform and Guedel's staging of anaesthesia in 1920. From that time, augmented by two world wars, the progress of technology has accelerated rapidly. Blood gas monitoring, intraoperative ECGs, oximetry and capnography, all at one time the innovations of enthusiasts, are now part of everyday practice.

Further reading

Although there are very few references relating directly to the development of monitoring in anaesthesia, relevant sections may be found in the following:

Singer & Underwood. *A Short History of Monitoring.* Oxford University Press, 1962; sections II and IV.

Reiser. *Medicine and the Reign of Technology.* Cambridge University Press, 1995; Chapters 2 and 5.

Clendening. *Source Book of Medical History.* Dover, 1962; Sections VII and XXXVII.

Bynum & Porter. *Medicine and the Five Senses.* Cambridge University Press, 1993; Chapters 5, 8, 13, 14.

Dornette & Brechner. *Instrumentation in Anesthesiology.* Kimpton, 1959.

Guest Lecture - Richard Gill

BUILDINGS OF LEICESTER

The speaker, who is on the staff of the English Department at Wyggeston and Queen Elizabeth I College, is not a native of Leicester but has found much to enjoy in the city and county. The county as a whole is not greatly wooded and is predominantly (though not exclusively) agricultural, full of small villages with the church at the centre and described as 'ridiculously pretty'. There is a gentle quality about the eastern half going towards Rutland, which is mostly devoted to arable and sheep farming. By contrast, the western half, exemplified by the Iron Age fort at Breedon-on-the-Hill and Charnwood Forest, is more rocky.

Evidence from a number of periods can be found in the city. The Romans were here, and not far from where we were sitting are craggy remnants of a Roman wall. A major artery, the Fosse Way, joining Cirencester and Lincoln, passed through Leicester. Behind the Roman wall is Leicester's oldest church, on the site of the Roman exercise hall. To the north-west is evidence of a Danish settlement. A perambulation will reveal occasional sights of an older Leicester, such as the medieval church opening on to the main street (High Cross Street).

The predominantly red brick New Street is characteristic of the late 18th century. There was a Greyfriars monastery here where it is thought that Richard III is buried - Leicester is not many miles from Bosworth field. The Victorians made their mark in urban planning particularly with a large scale Town Hall and a fountain (which all good cities should have!). They were generous, too, with the provision of public parks. The Grand Union Canal and the rival Midland and Great Central railways brought distinctive architecture with numbered bridges and one or two spectacular viaducts.

Factories appeared also, but in general the wealth of Leicester derived from small scale, diverse, and relatively clean industries; this tradition is maintained by Asian immigrants. The outcome of this has been an absence of recession, plenty of work thought suitable for women and little bomb damage in World War Two.

Of the hospitals, the Royal Infirmary opened in 1770 and has expanded considerably; the NHS is now the major employer in the city. The General was associated with the workhouse, and a gatehouse survives from a pioneer hospital (possibly the first) in the practice of isolation for diseases such as cholera and smallpox.

There was a change in the character of the city with the opening of University College in 1920, and a further expansion with the upgrading of the Polytechnic to De Montfort University in the 1960's. The new Engineering building has striking tall vents. At the same time, as in other places, high rise blocks of this period are being knocked down.

The speaker's enthusiastic delivery was clearly to the liking of the audience who applauded generously. The attractive tradition of the Society that the last lecture should provide local background was well maintained.

P M E Drury

TALE OF A LOGO

At the Leicester meeting Professor Richard Bodman showed me his original drawing of a logo for a tie for the Association of Anaesthetists of Great Britain and Ireland. I pressed him for the story:

'Ronald Jarman's Presidency of the AAGBI terminated in 1962 but he remained a member of Council. He was the most successful of all Presidents in that he had an extensive private practice in London and the ability and energy to charm money from his patients at a time when the Association was hard up.

I served on the Council from 1962 to 1965 and proposed a simple logo. At this time ties were universally worn and practically all had symbols of one sort or another: a club, a regiment, a school or any exclusive occupation or hobby. It seemed to me that the Arms of the AAGBI were much too elaborate for the purpose. Many also found them absurd - the supporters asleep, a torch flaming downward, poppyheads looking like baked apples. It did not require much imagination simply to have the snake curl round the stem of a poppy, which is what I drew.

Dr Jarman immediately supported the idea and suggested a cheaper tie made in rayon and a more expensive one in silk. There was the usual mumbling scepticism from Council members; however, Langton Hewer agreed to publish the design in *Anaesthesia*. Possibly on the principle of collective responsibility he forbore to name the designer!

The original order of ties carried a good representation of the logo, but the design deteriorated with subsequent orders, finally becoming unrecognisable. Happily, I had nothing to do with the order for manufacturing at any time.'

Dr Tom Boulton has noted these events in *The Association of Anaesthetists of Great Britain and Ireland, 1932-1992* and *The Development of the Specialty of Anaesthesia*. On page 276, under the heading The Association Tie, he observes: 'When a repeat order was made, the manufacturers substituted an owl for the poppy seed box. These erroneous ties are now collectors' pieces! The Officers had the courage to authorise their sale without any comment - few members noticed!' *

AMB

* HAS members should also read Appendix B, pages 710-714 of *The Association of Anaesthetists of Great Britain and Ireland, 1932-1992*, and *The Development of the Specialty of Anaesthesia* with Dr Boulton's less critical comments on the Armorial Bearings and their associated problems.

BOOK REVIEWS

Careers in Anesthesiology - Two Posthumous Memoirs. M T Jenkins, a Biography by A H Giesecke, and F F Foldes, an Autobiography, with contributions by E S Siker. Fink BR and McGoldrick KE, eds. The Wood Library Museum of Anesthesiology, Park Ridge, Illinois 2000. ISBN 1-889595-03-01 (hard cover). Pp271.

This is another in the series initiated by the Wood Library Museum covering the second half of the 20th century. The first subject is MT Jenkins, the founder of the Department of Anesthesiology at the South Western Medical School in the University of Texas. He was the son of a physician and obtained his MD in 1940. He served in the US Navy Reserve in the South Pacific, during which time he performed an appendicectomy on board ship, starting the anaesthetic with open ether before handing over to an assistant.

His original intention was to be a surgeon but he was persuaded by his chief, the distinguished surgeon CA Moyer, to undertake a residency in anesthesiology at the Massachusetts General in Boston in 1946, the year of the Ether Centennial. By 1955 he had set up a separate Department of Anesthesiology at the Parkland Hospital, Dallas, having established a residency programme, and a recovery room (as early as 1949) where cases of tetanus were also managed. In 1950 he took responsibility for the care of poliomyelitis patients using iron lungs, rocking beds, and (in 1952) the Bennett ventilator.

He is probably best remembered in Britain for his work on balanced salt solution. Dallas had a reputation as a violent place and the hospital had plenty of experience in the management of trauma. At the time when the Division of Anesthesiology was developing it was the practice to restrict salt; intravenous therapy was with 5% dextrose and blood when required. In 1950 he was joint author of a paper published in the Annals of Surgery: *Congestive atalectasis - a complication of the intravenous infusion of fluids*. Further research led to a re-interpretation of the data on salt restriction and revolutionised the management of intravenous fluids by the generous use of crystalloid solutions. He mostly stood aside from the colloid/crystalloid controversy, concentrating on blood and Ringers lactate.

Parkland Hospital was in the public eye in November 1963 when they had to treat President Kennedy, Governor Connally, and Lee Harvey Oswald. Later, Jenkins played the part of a resuscitator in Oliver Stone's film *JFK*. His list of awards and distinctions is considerable, and includes the Presidency of the American Society of Anesthesiologists; he was also the first anesthesiologist to receive the Distinguished Service Award from the American Medical Association. His involvement was such that the author feels bound to pose the question whether medical politics takes one away from the practice of medicine and lays a burden on colleagues; but he concludes that such activities are beneficial to the standard of health care.

The second subject is FF Foldes, Professor at the University of Pittsburgh and later at the Montefiore Medical Center, New York. Like Jenkins, Foldes' original interests were not directed towards anesthesiology; in his case the ambition was a career in internal medicine. In other respects there are contrasts in their lives.

The first 31 years of Foldes' life were spent in Hungary. His father was a poorly paid elementary schoolmaster and he grew up in straightened circumstances. In addition he had to endure virulent anti-semitism, but a talent for sport and a degree of street wisdom helped him to survive. The government of the day imposed a limit of 5% for Jews entering the university and he was bright enough to be one of those. At medical school he could not afford textbooks but managed by note-taking. At the age of 10 he spent a year in England with a family in Golders Green. This stood him in good stead as he was later able to teach English, and more significantly he diagnosed amoebic arthritis in a travelling American which had been repeatedly overlooked elsewhere, having just beforehand read a case report in the *Lancet*. It was this man, Alson H Robinson, who later facilitated his entry into America in 1941 when, contemplating a future that seemed to be with either Hitler or Stalin, he decided to emigrate.

Two-thirds of the book is devoted to his life up to this point; the remaining third is divided equally between his career in America and his comments on the wider scene. His first job was a research fellowship in Beecher's Department at Harvard. From his early days he was a keen researcher and he was still publishing papers after his retirement. An interest in cholinesterase led to an early publication on suxamethonium (1951). It is salutary to be reminded that the only requirement for using the drug was to notify the Food and Drug Administration.

Beecher offered him a residency and he had a baptism of fire, having to deal with over 100 admissions following the burning down of a dance hall; as he emphasised, he learned a lot about triage and fluid balance. Once he was shown how to intubate and administer a spinal he was more or less left to his own devices. He was disappointed that Beecher would not allow the use of muscle relaxants in his department.

Later, as he became established, he was active on many fronts. He arranged an exchange with the First Assistant from Mushin's department in Cardiff; it was Rendell-Baker, who later settled in America. He attended a meeting in 1955 when the World Federation of Societies of Anesthesiologists became a reality; he actually represented Israel since the United States did not at first send a delegate. He was President in 1968 when the meeting was held in London. He admits that he was not always 'politically correct'. He was never a member of the American Board of Anesthesiology, possibly because he preferred to go his own way as an examiner and not follow a structured method. There are a number of good anecdotes, my favourite concerning an elderly anesthesiologist who carried a solid gold spinal needle in his pocket and merely gave it an alcohol wipe before use. No complications were apparently recorded.

Although there are passages in the book that are mainly of interest to the families of the subjects, any anaesthetist should enjoy reading it whether or not they are interested in history or have had experience in the USA. Both men started their careers before relaxants came into general use, and at a time when most anaesthetics were given by nurses and academic departments were few. They have been very influential during a time of unprecedented change.We look forward to further volumes in this series. The frontispiece, from a painting by Professor Vandam of the HQ building of the American Society of Anesthesiologists, is a reminder (if this is necessary) of how versatile anaesthetists/anesthesiologists can be.

PME Drury

The History of Anaesthesia through Postage Stamps. Alistair McKenzie. Edinburgh: McLean Dubois. ISBN 0-9514470/9/2. Pp148. £9.50.

This book uses postage stamps and the figures and scenes depicted thereon to record the history of anaesthesia from earliest times. It has 17 chapters, each related to aspects of anaesthesia or related subjects. The first chapter is an interesting review briefly covering the use of alkaloids and other drugs prior to the emergence of inhalational anaesthesia, which is dealt with in chapter 2. Each chapter relates aspects of people on the stamps that have been produced in various countries. Chapters 3 to 7 continue with the development of pre-medication, regional anaesthesia, the development of anaesthetic equipment, intravenous anaesthesia, and the use of muscle relaxants. All of these are concerned with practical issues of anaesthesia today. One of the interesting aspects of this book is that Dr McKenzie uses the postage stamp and its depiction to look at subjects alongside and behind the points he is making, and this is particularly so in the chapter on anaesthetic equipment. This mode continues with the chapter on monitoring and its background. This is a significant chapter, as it shows the involvement of many scientists as well as physicians in the development of monitoring within the sphere of anaesthesia.

Chapter 9 is a short chapter on induced ischaemia; chapters 10 to 13 relate to obstetric anaesthesia and analgesia, the mechanisms of anaesthesia, pain relief and resuscitation. Chapter 14 deals with intravenous fluids and blood transfusion and provides a valuable background to this interesting subject. The next two chapters, 15 and 16, deal with aspects concerning anaesthesia in coronary care and intensive care and again, although brief, is a concise review of these subjects. The final chapter is related to the Colleges and Associations of Anaesthesia, and depicts their coats of arms as well as their development. This again is useful background information.

There are three appendices. Firstly, a chronology of the history of anaesthesia which I found a very informative, simple and useful compilation; a philatelic list of names, and possible future issues continuing into the 21st century.

Overall this is a pleasant, readable handbook for medical practitioners and is, I believe, of interest to the philatelist as well. Its usefulness partly depends on it being a fairly small volume; as Dr McKenzie comments, there may be something that he has left out. It is an interesting concept to link postage stamps with medical subjects and Dr McKenzie has achieved this with great skill. There is one regret I have, that presumably on grounds of cost only a few of the stamps are illustrated in colour. I believe that this would have put the icing on the cake for this volume. This is a book for the anaesthetist interested in history as well as for the philatelist.

I McLellan