

THE HISTORY OF  
ANAESTHESIA SOCIETY  
PROCEEDINGS



Volume 14

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6th November 1993

**Proceedings of the History of Anaesthesia Society**

**Editor Dr A Marshall Barr**

**Publication Coordinator Dr F E Bennetts**

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## THE HISTORY OF ANAESTHESIA SOCIETY

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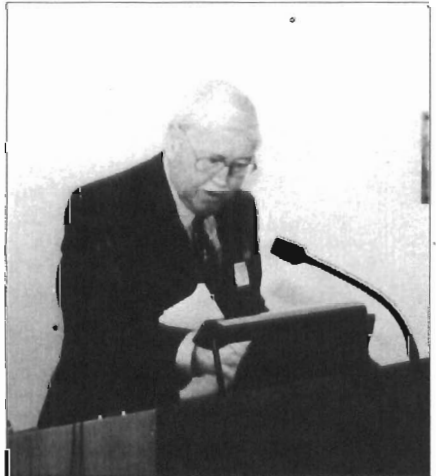
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**Dr Tom Boulton receives a birthday cake from the President**

## EDITORIAL

With this issue of the Proceedings, the editorship officially passes to my hands. I thank David Wilkinson for a most helpful handover and congratulate him on the great success of his foundation editorship. It is my confident hope that a *Best of Proceedings* will be published, to bring the many excellent contributions in the first twelve volumes to a wider readership.

It is important for members to be aware of the very major part played by Abbott Laboratories Ltd and members of their staff, in creating the Proceedings. Every edition has received direct financial support, and all have been prepared for publication by Dr Frank Bennetts, Medical Adviser, and his personal assistant, Margaret Micklewright. They transform untidy manuscripts, decipher editorial scribbles, organise illustrations and captions, design the layout and produce the whole issue on computer disc ready for duplication. They also provide diplomatic advice to a new editor on style and presentation.

I have no plans to change a very successful format. Our simple function continues to be recording the Society's proceedings in an enjoyably readable form. Relevant additional material will sometimes be included, as in this volume the retiring Hon Treasurer's history of our finances. News items, correspondence, book reviews and personal tributes will continue - space and quality contributions permitting.

The membership list is being transferred, again with major help from Abbots, to a Membership Directory. If you have not done so, please return the slip enclosed with the last issue, to make the directory up-to-date and accurate, if only to ensure delivery of your Proceedings.

**A Marshall Barr**  
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**PROCEEDINGS OF THE HISTORY OF ANAESTHESIA SOCIETY**

**Volume 14**

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6TH NOVEMBER, 1993**

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## THE LUNAR SOCIETY OF BIRMINGHAM

Dr B T Davis (Birmingham)

Senior Lecturer in Forensic Pathology, University of Birmingham  
Past President, British Society for the History of Medicine

The industrial revolution of the 18th century resulted from the invention of a reliable source of power for the working of manufactories and the pumping of water, independent of the natural forces of wind and water. This was provided by the steam engine produced by Boulton and Watt in Birmingham. With the revolution in the way of life in the western world came an intellectual ferment, and nowhere was this more active than in Birmingham.

### Three influential men

The leading English provincial physician of the time was Erasmus Darwin. He lived and practised at Lichfield, the diocesan centre for the Midlands. His was a colourful personality with many interests. He was considered to be a poet of distinction, he invented a new type of canal lock and a horizontal windmill, and he speculated on the possibility of an internal combustion engine driven by charcoal gas. He was also a notable botanist. Darwin had graduated in medicine at Cambridge in 1755 having also attended the anatomical lectures of John Hunter and the University of Edinburgh Medical School for a year. He was the youngest son of a landed gentleman in Nottinghamshire and why in 1756 he settled in Lichfield is not known. He soon had a large practice, and made the acquaintance, rapidly developing into warm friendship, of Matthew Boulton.

Boulton was a successful manufacturer of small metal goods. James Watt was to say of him later: 'Mr Boulton .... possessed in a high degree the facility of rendering any new invention of his own or others useful to the publick by organising .... the processes by which it could be carried on ... His conception of the nature of any invention was quick, and he was not less quick in perceiving the uses to which it might be applied and the profits which might accrue from it'.

Boulton's physician was William Small, who graduated at Aberdeen and became Professor of Natural Philosophy at the College of William and Mary in Virginia. His most celebrated student was Thomas Jefferson who wrote of him: 'It was my great good fortune and what probably fixed the destinies of my life that Dr William Small of Scotland was then the professor of mathematics, a man profound in most of the useful branches of science, with a happy talent of communication, correct and gentlemanly manners, and an enlarged and liberal mind'. Small became tired of living in America and decided to return to Britain to practice medicine. He consulted Benjamin Franklin as to where he might go, and was told that Birmingham was the intellectual centre of England. Armed with a letter of introduction from Franklin to Matthew Boulton, he arrived in 1765.

## The start of a Society

Darwin, Boulton and Small all had a great interest in science allied to very lively minds. They acquired the habit of meeting monthly at the time of the full moon, which enabled a safe journey home, to discuss scientific and philosophical matters. The discussion group rapidly expanded and soon became known as the Lunar Society.

Josiah Wedgwood the potter joined, as did John Whitehurst of Derby, a clock and instrument maker of outstanding ability. Richard Lovell Edgeworth was a landed gentleman with a great interest in designing carriages, recruited by Darwin and Boulton who shared the same interest. Edgeworth brought with him his Oxford friend, Thomas Day, author of *The History of Sandford and Merton* a children's storybook which went through many editions. He shared an interest in education with other Lunatics, and had ideas for training girls according to the precepts of Rousseau. He only asked his wife to marry him after she had passed an examination paper which he had set. James Keir was an Edinburgh medical student who switched to professional soldiering, then settled in Birmingham. He became a glass and chemical manufacturer, and another member of the Lunar group.

## James Watt

James Watt was born at Greenock in 1736. He became Instrument Maker to the University of Glasgow, where his interest in making steam engines was defeated by the lack of skill in Scotland to make an accurately bored cylinder with a piston to fit it. Through the good offices of John Roebuck, who had practised as a physician in Birmingham,\* Watt was persuaded to move south as partner to Boulton. Immediately he found that the Birmingham metal workers had a skill which astonished him, and enabled him to produce an efficiently working steam-engine. Watt had wide scientific interests, particularly in chemistry, metallurgy and geology.

## William Withering

Dr Small died prematurely in 1775 leaving his lunar friends desolated. Darwin wrote to William Withering, who had founded the Infirmary in Stafford: 'I am at this moment returned from a melancholy scene, the death of a friend who was most dear to me.... Mr Boulton suffers an inconceivable loss from the doctor's mechanical as well as medical abilities ... Now it occurred to me that if you should choose that situation, your philosophical taste would give you the friendship of Mr Boulton, which would operate for you what it did for Dr Small...!'

\* In Birmingham, Roebuck had invented the lead chamber process for the manufacture of sulphuric acid and thus founded the heavy chemical industry. He had gone to Scotland to found the Carron Iron Works.

Withering was a polymath. Apart from his abilities as a physician he was distinguished in chemistry, metallurgy, geology and meteorology. He was a leading botanist whose book on the British flora ran to many editions. His most celebrated work *An Account of the Foxglove and Some of its Medical Uses* was in 1785 the first scientific treatise on the assessment of a drug and marks a watershed in pharmacology.

Sadly his work on digitalis resulted in the only serious quarrel between members of the Lunar Society. He spent 10 years investigating the drug before publishing his book. Erasmus Darwin thought him too slow, and jumped the gun with his own work on foxglove based on what Withering had told him. A very public dispute followed, but their friendship was subsequently re-established.

### Joseph Priestley

The last distinguished member of the Lunar Society was the Rev Joseph Priestley, discoverer of oxygen and nitrous oxide, who came to Birmingham in 1781 as Minister to the New Meeting House. A serious riot in 1791, between factions supporting and opposing the French Revolution, resulted in Priestley's house, laboratory and papers being destroyed by fire, with Priestley driven to emigrate to America. In his memoirs he said: 'I consider my settlement at Birmingham as the happiest event in my life, being highly favourable to every object I had in view, philosophical or theological ... I had ... the society of persons eminent for their knowledge of chemistry, particularly Mr Watt, Mr Keith and Dr Withering. These with Mr Boulton and Dr Darwin ... Mr Galton and myself dined together every month, calling ourselves the Lunar Society'. Mr Galton was Samuel Galton, a wealthy gunmaker, banker and Quaker. He was grandfather to both Charles Darwin and Francis Galton. His son, Samuel Tertius Galton, also attended Lunar Society meetings.

### The nature of the Society

The Society had no fixed membership, kept no minutes, and met in each other's houses. Our knowledge of it is largely due to the copious correspondence between its members, much of which is preserved. Many distinguished men of science attended meetings, including John Baskerville the Birmingham printer, William Murdock who invented the use of coal gas for lighting, and who became superintendent of Boulton and Watt's factory, Sir Joseph Banks, the President of the Royal Society, Sir William Herschel, astronomer, John Smeaton, builder of lighthouses, Adam Afzelius, Swedish botanist, Dr Daniel Solander, Swedish physician who became librarian to the British Museum, Dr Pieter Camper, Dutch naturalist and anatomist, and Benjamin Franklin. Nine of the regular members were Fellows of the Royal Society.

A letter from Darwin to Boulton dated 5 April 1778 gives some idea of the character of the meetings: 'Dear Boulton, I am sorry the infernal divinities who visit mankind with diseases ... should have prevented my seeing all your great men today. Lord! what inventions, what wit, what rhetoric, metaphysical, mechanical and pyrotechnical, will be on the wing, banded like a

shuttlecock from one to another of your troupe of philosophers ... while poor I ... am bumped and bruised along the King's highroad to make war upon a stomach ache...!

On 3 January 1781, Watt wrote to Darwin: '..... you promised to dine with sundry men of learning at my house on Monday next ... For your encouragement, there is a new book to eat up, and it is to be determined whether or not heat is a compound of phlogiston and empyreal air, and whether a mirror can reflect the heat of the fire... If you are meek and humble, perhaps you may be told what light is made of...!'

Darwin, after the death of his wife, remarried, but his new bride would not live in Lichfield and they moved to Derby. He wrote to Boulton: 'I am here cut off from the milk of science, which flows in such redundant streams from your lunations... Pray if you think of it, make my devoirs to the learned Insane of your Society...!'

In fact, Darwin continued to attend meetings when he could, but following Priestley's departure, and with the increasing age of its members, the Society was gradually dissolving. In the early years of the 19th century the Lunar Society became extinct.

#### **Reference:**

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## THE EARLY DAYS OF ANAESTHESIA IN BIRMINGHAM

Dr E T Mathews

Consultant Anaesthetist, Birmingham 1958-1989

### The industrial background

The Cambridge meeting of our Society included a fascinating account of the East Anglian background to the early days of anaesthesia. East Anglia was rather passed over by the Industrial Revolution: Birmingham was in the centre of it. The same period of history viewed from Birmingham sources looks very different. But many of the events mentioned in Cambridge, such as the abolition of slavery, the development of the railways, the introduction of Rowland Hill's postal system and of the telegraph system, have special associations with Birmingham.

Birmingham developed from a market town making guns, buttons and metalware to be the chief manufacturing centre of the world. It was linked by canal to the Mersey, Severn, Thames, Trent and Humber. It was the centre of the waterway system. It had more miles of canal than Venice. It became the city of a thousand trades. In 1865 a Spanish visitor remarked on the prevalence of green hair in the town, at this time a sure sign of a brass worker. Some people became very wealthy. But there were also child labour, dangerous working conditions, low wages, insanitary dwellings, and an increase in violence, drunkenness and squalor. There were more violent deaths through crime than anywhere else in the country, twice as many as in Sheffield.

The view from Birmingham to Wolverhampton included 15 of England's 21 blast furnaces. At night they lit the sky for miles around, and made pictures of Dante's Inferno look insipid. When travelling from Birmingham to Wolverhampton Queen Victoria drew the blinds of her carriage.

### The battle of the gauges

Cambridge did not welcome the railway. Birmingham was at the centre of the system. Stephenson's narrow gauge (4'8½") came from Liverpool and London. Brunel's broad gauge (7') came from the south-west. They met in Birmingham. The Great Western Railway built a viaduct to link the two systems. This viaduct is 1,100 yards long and is carried on 58 blue brick arches. But neither broad nor narrow gauge lines were laid upon it. It remains today as the city's largest Victorian folly and a monument to the problems of a fragmented railway system.

### Postal and telegraph developments

Rowland Hill lived in Birmingham until he was 30 years old and when he moved to London with his bright idea he was snubbed as an interloper, and cursed as a 'fellow from Birmingham coming to teach people their business'. A Birmingham firm, Webster and Horsfalls, had

supplied the French with a telegraph cable linking Marseilles with Algeria. Despite this proven ability they did not get the contract for the first direct transatlantic cable, and the cable that was used went dead within a month. Horsfall's patent cable, made in Birmingham, was used to recover it and then to replace it.

### **The earliest anaesthetics in Birmingham**

Birmingham was busy, and the introduction of anaesthesia was not a priority. The first use of ether for surgical anaesthesia in Birmingham was reported in the *Birmingham Journal* of 16th January 1847, the operation having taken place the previous day. This was not treated as the most important news of the day, gaining only the foot of a column. The anaesthetic was given by Professor Samuel Langston Parker. He was one of the first group of 300 members elected to the Fellowship of the Royal College of Surgeons in 1843. He approached the new subject in an academic manner. Before he administered ether for surgery he carried out two experimental trials of ether on the patient. He found it 'produced complete temporary insensibility'. The patient was Mary Ann Chambers, age 22 years, for amputation of the foot. The surgeon was Professor George Beauchamp Knowles, who had also received his FRCS in 1843. Professor Parker used a modification of Robinson's apparatus. In the middle of the operation when the foot had been cut off, the patient was deliberately awakened and questioned as to whether she had felt pain. When the required information had been obtained she was anaesthetised again and the flaps of the amputation stump sutured. Was this the first professorial anaesthetic?

The following week anaesthesia was again featured in the *Birmingham Journal*, which reported that Professor Parker had given a lecture and demonstration of anaesthesia at Queen's College. His first demonstration on a young lady was uneventful. The second was on a student. This young man did not take the ether so smoothly: 'He clenched his fists and endeavoured to strike and kick everyone within his reach and was so violent in his struggles that six or eight of the students could, with difficulty, keep him down in the chair'. Nevertheless, at the close of the lecture Professor Parker was warmly applauded.

The second operation under ether reported in the *Birmingham Journal* was on a lady of 70 years with a strangulated femoral hernia, Professor Parker again giving the ether. This time he used a different approach: '...without apprising the patient of what was to be done' she was given the ether. The operation lasted 22 minutes and Parker found that four breaths of atmospheric air to two breaths from the apparatus gave adequate anaesthesia.

Professor Parker did not pursue a career in anaesthetics. His main interests were syphilis, cancer and literature. The surgeon in the second case, Mr Partridge, did not have the FRCS but was at one time an assistant surgeon in the United States Navy. In 1870 he sold his Birmingham practice to Lawson Tait.



### **The influence of Lawson Tait**

Tait arrived in November 1870. He was a protégé of Simpson. Some believe he was Simpson's natural son. His impact was dramatic. William Mayo styled him: 'the father of modern abdominal surgery'. He did more abdominal surgery than any other surgeon of his time. He also established the Medical Defence Union and he made many contributions to anaesthesia. Sir Francis Shipway gave Tait credit for the first published accounts of 'open ether' and 'warmed ether'.

### **Tait's wider role**

Tait was active in politics. He was elected a town councillor in 1876, a role in which he did much good work. He organised an educational meeting on anaesthesia in Birmingham, inviting Benjamin Ward Richardson FRS and Dr Norris to speak on their studies. The editor of the *British Medical Journal*, Dr Hart, alleged this meeting was advertising, and they became enemies for life. Unfortunately, Tait's role in the development of our specialty was marred by his attitude to anaesthetic fees and his opposition to the award of consultant status to anaesthetists. But, unlike many of his contemporaries, he did accept the right of women to practice medicine. Several of the pioneer women in medicine came to work with him at the Women's Hospital before the General Medical Council allowed them to register. They included Louisa Atkins, Edith Pechey, Ann Clark and Annie Barker. They gave anaesthetics but were not appointed as anaesthetists.

### **The early appointments in anaesthesia**

The first anaesthetists formally appointed to the Birmingham Hospitals had to have alternative sources of income; many were engaged in general practice. In 1871 a Director of Anaesthetics was appointed to the Children's Hospital and a chloroformist appointed to the Dental Hospital. In 1892 the Dental Hospital appointed six medical practitioners as Administrators of Anaesthetics. At the Women's Hospital, Dr Mary Darby Sturge was appointed Anaesthetist in 1895. Dr Sturge was at first included in the list of senior medical staff, but her name was removed following opposition by Lawson Tait and Arthur Chamberlain. At the General Hospital two Visiting Anaesthetists were appointed in 1896, but the Queen's Hospital, where the first anaesthetic in Birmingham was given, delayed its first staff appointment until 1913.

### **Drs McCardie and Featherstone**

An important event was the appointment in 1897 of William Joseph McCardie to the visiting staff of the General Hospital. Unlike the others, his professional income came solely from anaesthetic fees. McCardie's practice prospered and he also became President of the newly formed Section of Anaesthetics of the Royal Society of Medicine. But his outstanding contribution was the help he gave to younger colleagues and, in particular, to Henry Featherstone, founder of the Association of Anaesthetists. Featherstone was proud to be of

Birmingham and proud of his involvement in her industries. I believe he would have appreciated the lines written by the son of one of his colleagues about the terrible beauty of the industrial landscape of the period:

'But let me say before it has to go,  
It's the most lovely country that I know;  
Clearer than Scafell Pike, my heart has stamped on  
The view from Birmingham to Wolverhampton.'  
W H Auden. Letter to Lord Byron (II)

## THE 'GUEST CANNULA' AND ARTHUR GUEST

Dr B H Smith

Retired Consultant Anaesthetist, Birmingham  
Formerly University Clinical Lecturer,  
Featherstone Department of Anaesthetics

This is a version, enlarged to include local background, of a presentation to the 3rd International Symposium on the History of Anesthesia, Atlanta 1992.

Arthur Guest, writing from the Queen's Hospital in Birmingham, described his cannula in the *British Medical Journal* of 20 December 1941, in the section headed: 'Preparations and Appliances'. The article occupying just one column was to revolutionise transfusion techniques, to the benefit of patients and all who treated them. Most of all, it helped anaesthetists. With the war escalating, the cannula's arrival was timely.

At that time the usual transfusion technique consisted of exposing a vein through a short incision, most often the saphenous at the ankle, passing two ligatures beneath it, and tying off the lower end. A blunt Hamilton-Bailey cannula connected to the transfusion set was then introduced through a small incision in the vein wall and was tied in place with the higher ligature before the wound was closed. This procedure, carried out usually by inexperienced junior doctors, sometimes under field conditions, was time-consuming and sacrificed a large vein. Complications in the pre-antibiotic era were frequent and included thrombophlebitis, sepsis, thrombosis and embolism.

From the summer of 1940 onwards, Birmingham suffered a number of heavy air raids, and many wounded were treated at the Queen's Hospital, where Arthur Guest, qualified just three years, was a resident medical officer. His experience there led him to develop the cannula. In his article Guest illustrated his device attached to a 2 cm Record syringe, by a line drawing. The point was illustrated, and the cannula also shown disassembled.

### The cannula

The details he gave were: 'The cannula (gauge 17 swg) is fitted with a hollow needle instead of a solid stylet. This inner needle is of standard pattern, the length being such that, when fully inserted into the cannula, the bevel point protrudes just beyond the blunt end of the cannula'. He wrote: 'I have adopted the following procedure: (1) a small intracutaneous bleb of 2% procaine is introduced through a fine hypodermic needle at the chosen site; (2) after a light tourniquet has been applied the cannula, with syringe attached, is introduced and the vein is sought and just entered; (3) after confirming entry by drawing back blood, the inner needle is withdrawn about an eighth of an inch whilst the cannula is held steady; (4) the cannula now has no projecting point, and may be pushed firmly up the vein to the hilt, without danger of it piercing the wall of the vein; (5) the syringe, still attached to the inner needle, is completely withdrawn; (6) the standard adapter on the tubing from the blood reservoir is then firmly

attached to the cannula; (7) two strips of surgical tape are applied parallel to and over the wings of the cannula'. On originality, he wrote: 'It is not claimed that the instrument is entirely original in conception. A similar, but narrower type of cannula, and with a solid stylet instead of a hollow needle, has long been in use at the Children's Hospital in Birmingham. I have not seen a blunt transfusion cannula with a sharp hollow introducer to which a standard syringe can be attached'. I myself remember well the small early cannula he described.

For his cannula, Arthur Guest went to Philip Harris & Co in Edmund Street, Birmingham, and the cannula could subsequently be obtained from them. I am grateful to their present Managing Director, Mr David Linney, for the information that the cannulae were manufactured for them by Shrimpton & Fletcher, at Redditch, fifteen miles south of Birmingham and the centre of the British needle industry. The ethos of the day, in Britain at least, was that medical advances were not patented. Such a simple invention was rapidly copied and used worldwide. However, by the early sixties it had been replaced by a whole range of similar devices, mostly made of plastic materials. Philip Harris & Co would have made little from it, but they at least have prospered. Then it was a small company with a pharmacy, and a showroom next door selling medical and scientific instruments, the latter mostly for educational purposes. Today, still in the same fields, the company has a large annual turnover, including educational packages to third world countries.

### **The birthplace of the cannula**

The Queen's Hospital, the home of the cannula, was created by William Sands Cox, the founder of the Birmingham Medical School, with the specific intention of providing teaching for medical students. In 1838 he enlisted the sympathy of the Reverend Dr Warneford, the Rector of Bourton on the Water who, in the next 27 years, contributed no less than £27,000. The hospital opened in 1840 with the Warneford family Coat of Arms over the door. When the new Queen Elizabeth Hospital in Edgbaston opened in 1938, it became beyond the resources of the Board of Governors of the United Birmingham Hospitals to maintain the Queen's. Industry took over its finance in 1942 to reconstitute it as the Birmingham Accident Hospital.

Dr Warneford had written: 'I own I feel much anxiety to prevent the spirit of my intentions being perverted by posterity, if so inclined. In the present zealous supporters of the College I have the utmost confidence, but great deliberation is surely required to guard against future satanic subtlety'. His foresight was justified. After 150 years of history, its doors have been closed by the West Midlands Regional Health Authority in 1993.

### **The inventor**

Isidore Arthur Guest was born on 9 September 1911. In later life he seldom used his first name and it was, unusually, enclosed in brackets in the Medical Directory at his request. Guest won a scholarship to King Edwards School, Birmingham, founded in 1552 by Edward VIth. Former pupils include J R Tolkien, the author of the trilogy 'The Lord of the Rings' and

also Henry Featherstone, the first President of the Association of Anaesthetists of Great Britain & Ireland. Enoch Powell followed later. From King Edwards Guest went to Cambridge, completing the BA in 1934. He returned to Birmingham to enter the Medical School and completed his clinical work here, graduating MB, BChir (Cantab) in June 1937. He intended to become a consultant physician, and to this end remained in hospital residence, completing the membership examination of the Royal College of Physicians only three years after qualifying. A year later, in 1941, he described his cannula.

The war was subsequently spent in the Royal Army Medical Corps, where he reached the rank of major, and was employed on research on motion sickness, an important subject in view of the forthcoming seaborne invasions. In the postwar period, he trained as a neurologist at the National Hospital, and later publications were in this field. He received a Cambridge MD in 1950, and became a Fellow of the Royal College of Physicians in 1970.

In 1947, with the National Health Service imminent, Birmingham City Council shrewdly realised that it would not for long have to pay the salaries of new medical appointments made to the staffs of the Municipal Hospitals, and it doubled those staffs. Guest was appointed a consultant physician with a special interest in neurology to the staff of Selly Oak Hospital. He subsequently also joined the staff of the Midland Centre for Neurosurgery at Smethwick. As a Birmingham medical graduate, I knew him by reputation. My first anaesthetics appointment had sessions at Smethwick, giving opportunities to discuss his cannula with Arthur. He was a pleasant modest man who never received a penny for the cannula that bears his name. He deserves his niche in the history of our specialty, for most of us have used cannulae following its principle nearly every day of our working lives. Sadly, he died in August 1976, shortly after retirement. He is survived by his wife, who lives in Solihull, and I am grateful for her help.

'A prophet is not without honour, save in his own country, and in his own house (*Matthew* xiii.57). Though in no small measure forgotten in Britain, the name 'Guest Cannula' has lived on widely as a collective term for a whole range of generic successors using its principle. The last time I was in an operating room in the United States, in 1988, I was delighted to hear an anaesthesiologist in his twenties ask the attendant for a 'Guest Cannula'.

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## ANAESTHESIA THROUGH THE EYES OF A BIRMINGHAM MEDICAL STUDENT - 1942-45

Dr D Zuck

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I entered the Birmingham Medical School in September 1940, where our training was rather distorted by the needs of the war. Most of the younger consultants were away in the forces, so the teaching was left to those who, in the ordinary way, would probably have taken a lesser role. Also, the students were required to play some part in the 'War Effort'. This included fire-watching at the Medical School and some of the hospitals, and manning emergency casualty reception stations during air raids.

I started clinical work in April 1942. The Birmingham United Hospitals at that time consisted of the rebuilt late nineteenth century General Hospital in the centre of town, and the brand new Queen Elizabeth Hospital, opened in 1939. This must have been the most modern hospital in the country, and when one compares their design, it is difficult to believe that the Queen Elizabeth is separated from the General by only 40 years.

### **Hypoxic anaesthesia**

My first attachment was to the Casualty Department at the General Hospital for three months and there, at the age of 18½, and totally unsupervised, I spent a week giving my first anaesthetics. I was taught, for the whole of three minutes, by the classmate who had done it the week before. The apparatus I used was already antique. It consisted of two cylinders of nitrous oxide yoked together, lying on the floor and controlled by a foot key, connected to a large bag, a three-way stopcock and a mask. The cylinder assembly had been designed by Clover in 1876, and the bag by a dentist named Cattlin some ten years earlier. The only modern item was the stopcock, which appeared to date from the 1920s. It is not mentioned in any textbook published before 1930, nor does it feature in Bryn Thomas's book. It appears in their 1930 catalogue as Allen and Hanbury's improved three-way stopcock, and Rood and Webber in their 1930 textbook describe its use. The control has three positions - 'no valves', 'valves' and 'air'. With 'no valves' the system was completely closed, the patient breathing continuously into and out of the bag; with 'valves' he breathed in from the bag and out to air; and in the third position he breathed in and out to air. The instruction I was given was to fill the bag with nitrous oxide, set the control to 'no valves' and get the patient to breathe in and out of the bag, so accumulating carbon dioxide, until he was blue and starting to twitch or jactitate, at which point I should give three breaths of air, and allow the operation to start. After this, I should settle to a routine of three breaths of nitrous oxide on valves, to one of air, using the foot control to keep the bag full, and with the patient exhaling to the atmosphere. At my discretion I might vary the mixture, depending on the colour, severity of jactitation, and so on. The anaesthetics we gave were for the incision of abscesses and paronychia, which were mercifully brief. After two or three days I became quite good at it, managing to anticipate the onset of jactitations, and occasionally keeping patients unconscious for several

minutes without excessively untoward effects. Later I learned the virtuoso variation of catching the exhaled breath of air in the bag, so providing at least some oxygen in the subsequent three breaths.

While it sounds hair-raising today, this technique was quite in line with what the books were teaching during that period, not that students ever looked at anaesthetics textbooks. Rood and Webber<sup>1</sup> gives a good account of the use of this apparatus, and recommends that the anaesthetist should 'be familiar with the earliest signs of imminent asphyxial convulsions as, in his first cases at least, they form probably the safest guide as to the point at which the operation can commence'. Bellamy Gardner, in his textbook,<sup>2</sup> comments: 'This picture is not a pleasant one ...'.

### **Ethyl chloride/ether**

The first half of my time as a surgical dresser was spent largely at the Queen Elizabeth, on the firm of an orthopaedic-cum-general surgeon named Jimmy Leather. The regular anaesthetist was Dr Hassall, who was a Licentiate of the Society of Apothecaries, and who appeared to us to be a very elderly gent, but he must in fact have been only in his mid-50s. The theatre suites at the Queen Elizabeth were super-modern, with changing and scrub rooms, a reception lobby, and an anaesthetic room with a wall-mounted machine with either bobbin flow meters or rotameters, I can't now remember which, and piped gases. In keeping with the modernity of the theatres, everyone changed into theatre greens, except for Dr Hassall, who just wore a gown over his outdoor clothes. His basic technique for all ages of patients, in fact his only technique as far as I was aware, was induction with ethyl chloride, followed by open ether, with an oxygen catheter under the mask, and a finger on the temporal pulse.

Inhalational inductions, in general, were often stormy, and the students were expected to assist in the anaesthetic room, and help restrain patients during the stage of excitement. Dr Hassall had the endearing practice of collecting the students around him at the head of the table, after which he would slip his hand into his trouser pocket, take out a small bottle of chloroform, drip a few drops onto the mask in the midst of the ether from time to time, and say very conspiratorially, 'Don't tell anyone you've seen me do this'. The first death on the table that I ever saw was one of his cases. It was an elderly woman having a thyroidectomy, and when the temporal pulse suddenly became impalpable he gave the alarm. Coramine, or nikethamide, which was kept on all the anaesthetic trolleys, was injected into the heart, but with no effect. The cause of the cardiac arrest was never established, but relatives were very uncritical in those days, and the explanation that 'the patient couldn't take the anaesthetic' was readily accepted.

### **Advancing techniques**

For my second three months, my chief was a surgeon who will be instantly recognised by Birmingham graduates when I mention 'The Baron', Baron T Rose. He was a general surgeon of the broadest possible spectrum, and the deepest possible prejudice or, at least, that was how he liked to present himself. He professed the greatest scorn for the Queen Elizabeth Hospital,

for lady doctors, for public health doctors, psychiatrists, anaesthetists, and any of the surgical specialties. He was a good clinical teacher, a very speedy operator, and reckoned that a general surgeon should be able to do anything. I remember one list on which an excision of the knee joint for tuberculosis was followed by a craniotomy for suspected cerebral tumour, and the Baron didn't mess about - smoke rose from the Gigli saw. If he was a specialist at all, it was at abdomino-perineal excision of the rectum. This was not a synchronous combined operation; first, the descending colon and rectum would be mobilised, and a colostomy fashioned; then, with the patient turned into the lateral position, it was removed through the perineum. His fastest time for the complete procedure, which I actually witnessed, was one and a quarter hours. Quite often a spinal anaesthetic would be given for this operation. This was a lengthy performance in itself, and the list would be arranged so that it was put in during the elongated coffee break. The favoured agent was light nupercaine, and theory demanded that because the solution was hypobaric, the patient must lie on his tummy for twenty minutes to allow the dorsal, sensory roots, to soak in the solution. After this time, the nupercaine was regarded as fixed, and the students were mobilised to turn the now paralysed patient onto his back. The fact that the motor roots, which had been below, were also completely blocked, was never extrapolated to realisation that the face-down position was completely unnecessary for the establishment of full anaesthesia.

It was during this period that I first saw the blood pressure being taken in the operating theatre. The senior surgeon on the staff of the Queen Elizabeth, H H Sampson, was a pioneer oesophagectomist, and he actually had three patients who had survived this operation, and who were regularly produced at meetings. His method of multi-stage reconstruction was to form a skin tube down the front of the sternum, joined to the pharynx above and the stomach below, and a great feature of the clinical meetings was the demonstration of boluses of food or drink passing through this tube down the front of the chest. The students were invited to watch one of these rare operations. At the Queen Elizabeth each theatre had a viewing stand and that was where we were put, well out of the way, and quite unable to see very much so, although the operation lasted for about five hours, we slipped out after two.

The things that stick in my memory as rather unusual are that a mercury sphygmomanometer on a stand was produced. A drip was set up and the patient was intubated. Drips were by no means routine. They were almost always cut-downs, the vein, usually the saphenous at the ankle, being exposed through a skin incision, and a blunt-ended cannula tied in. They were set up by the house surgeon, not the anaesthetist. I remember the Guest cannula coming into use, but cut-downs were more general. Clotting in the cannula was always a problem, and patients could be guaranteed to develop ascending phlebitis within twenty four hours. This, as it was discovered some years later, was caused not by infection, but by chemical irritants being leached out of the rubber tubing. Apart from this one instance, I cannot remember the blood pressure being monitored, certainly not routinely. One practical reason for this, and also for the siting of intravenous infusions at the ankle, was that the wrists were rarely available to the anaesthetist. One of the students' routine tasks, immediately the patient was lifted on to the table, was to help roll him or her from side to side, extend the arms, and trap the hands under the buttocks. There were no arm or elbow retainers, and it was several years later that reports of nerve damage rendered this practice obsolete.



At this date blood was still being given through an open flask, which was usually covered with a layer of gauze to keep the flies out. As the flask emptied, more blood was poured in at the top, and since stored blood tended to contain huge clots, it was filtered through gauze as it was poured in. However, by 1943 the National Blood Transfusion Service had got fully under way, and sterile, semi-closed systems were being supplied. There was no sterile supply service. Each theatre had its autoclaves and boilers; sterile linen, gloves and certain sets came in foot-operated drums. To get things out, Cheatele's forceps were used. These were ubiquitous, and I still have a pair at home. We find them indispensable for picking teaspoons out of the waste disposer. Not everything came in ampoules; many injections were prepared by boiling a teaspoonful of water over a spirit lamp and dissolving a tabloid of drug in it.

During the thirties Birmingham had been the great centre for the correction of visceroptosis, and several surgical fortunes were made by stitching up dropped kidneys and stomachs. Inevitably, this was celebrated in the medical students' magazine, and a vestige of this practice persisted into the forties. We all did a spell as resident surgical dressers, and my main memory of this was wondering why emergencies at night were always admitted to a darkened ward where the house surgeon would have to do a cut-down by the wavering light of a torch held by a nurse who was trying to do three other things at the same time, instead of in the bright light of the receiving room.

My next encounter with anaesthetics was during the fifth year, when we spent a month giving, and getting signed up for, twenty assorted anaesthetics; these were closely supervised by a consultant, or more usually by one of the registrars. Because most of the senior male anaesthetists, or honoraries as they were then called, including Dr Featherstone, were away in the forces, the senior establishment consisted of Dr Bernard Murtagh and a number of married lady doctors who did one or two sessions a week. All, I think, had the DA, but a specialist of consultant status would be expected to have an MD. The names that come to mind are Dr Doris Wall, Mrs Scott Mason, whose husband was one of the honorary surgeons and a meticulous gastrectomist, Mrs Mills, Dr Galbraith, Dr Welsh and rather elderly Dr Crosskey. There were also two younger women, Marion Green and Helen Wood, who seemed to the students to be the only ones fully trained in modern techniques. Marion Green worked especially with neurosurgery, and Helen Wood, who had trained in the Nuffield Department at Oxford, also did sessions with the thoracic unit at Worsley.

First we received instruction about the pharmacology of anaesthetic agents. Among the doctrines that stick in my mind is that chloroform kills in five ways - by relative overdose, by absolute overdose, by vagal inhibition of the heart, by ventricular fibrillation and by poisoning the liver. Relative overdose was supposed to occur during induction when, after a spell of breath holding, a large inspiration would allow a concentrated mixture of chloroform to be inhaled, and this would travel as a bolus to the brain, and paralyse the vital centres in the medulla. But looking at the textbooks, overdose of any sort, and vagal inhibition, as irretrievable causes of death, had been dismissed by Levy in his monograph on chloroform as early as 1922. Also, there were the concepts of primary and secondary shock. Primary shock was attributed to the surgical injury, and was thought to be caused by nervous impulses

bombarding the vital centres; hence the application of Crile's idea of anoci-association. Secondary shock was caused by everything else, blood loss, heat loss, the depressant effects of the anaesthetic, and the absorption of toxins from damaged tissues. Again, examination of contemporary textbooks shows that this concept also was already outmoded when we were taught it.

Dr Murtagh, to whom we were initially attached, and who was regarded as a wizard with the Boyle's machine, often did an intravenous induction. He used thiopentone, or as it was universally called, Pentothal, which until the mid 1950s was used in a 5% solution. The standard technique, which was the one that he used, was to ask the patient to start to count, while injecting slowly. When the counting stopped, which indicated loss of consciousness, note would be taken of how much had been given, then an equal volume again would be injected. The result of this was that the patient stopped breathing. The anaesthetist would then wait for respiration to restart, while delivering a mixture of nitrous oxide, oxygen, carbon dioxide and ether. Sooner or later, the Pentothal having been redistributed, the patient would take a breath, and would immediately go into laryngeal spasm. It then became a battle between the reflexes and the carbon dioxide, and eventually the carbon dioxide always won. I remember, even at that early stage, wondering why the second dose of Pentothal was necessary. Others used Evipan as an induction agent but this, while less of a respiratory depressant, caused a lot of muscular and especially limb movements, and was less popular. The standard syringe was the Record, and needles were resterilised and used over and over again. It was common to find a needle with a fish-hooked point, or blocked by blood clot, and the experienced anaesthetist kept an arkansaw slip and a wire stylet in his waistcoat pocket, to sharpen or unblock his needle, preferably before it was sterilised.

Another common technique, which for us students was clothed in magic and mystery, was the use of Avertin (bromethanol) as a rectally administered basal narcotic. The solution had to be made up freshly in the pharmacy, and kept at body heat in a thermos flask, which had to be collected by the Registrar in person, and tested with Congo Red immediately before use, in case it had decomposed into irritating hydrobromic acid. It was administered in the ward. The patient was generally asleep within fifteen minutes, and had to be manhandled onto the theatre trolley by the students. Occasionally, usually for ENT operations, the patient had to be intubated. This was a stupendous undertaking, which the anaesthetists strove to avoid at all costs. A plain Magill tube was used, and a straight bladed Magill laryngoscope; the Macintosh blade had not yet come in, there were no cuffed tubes, and I don't remember seeing a blind intubation done. So the patient had to be deeply relaxed, and I more than once saw as much as half a pint of ether used on an open mask. There was always great relief and rejoicing when a successful intubation was achieved. When indicated, a throat pack of gauze soaked in liquid paraffin was inserted, and not always anchored outside the mouth. Nor was it always a single length of gauze, a mistake responsible for one widely publicised disaster in the Midlands some years later.

It was during this time that I first met a registrar named Eileen McShane, who I later came across in BAOR. She was an excellent anaesthetist, but she had a peculiarity all her own. She used to keep the surgeons waiting while she read the patients' notes in the anaesthetic room

before starting the induction. This irritated them like mad, from which you will gather that it was uncommon for anaesthetists to read the patients' notes; and certainly the juniors on call for emergencies didn't have a chance to see the patients before operation. Once they started their stint in theatre, they were there for the duration.

Under the supervision of the registrars I managed to scrape together the necessary twenty cases. Mainly they were entirely inhalational, but I was allowed to do intravenous inductions on the last three. Also, I was allowed to use Trilene. It was at about this time that the danger of using Trilene in association with soda lime was first recognised. There were M I E type circle absorbers on some of the machines, and cyclopropane was available, but I cannot remember ever seeing it used. Phillips airways were standard. Castor oil was routinely instilled into the eyes, which may have been a good thing, because the corneal reflex was tested frequently by some anaesthetists. All the rubber was red: masks, tubing, Clausen's harness, and bag; on some of the machines the bag was enclosed in a net, to prevent over-distension during breath holding or coughing. There were no safety devices, pin-indexing of cylinders or anything of that sort. Running repairs were carried out by the anaesthetists, or the theatre technician if there was one, with all the resulting hazards.

The visiting anaesthetists rarely saw their ordinary list patients preoperatively. The standard premed was 1/100 grain of atropine, and this was written up by the house surgeon. Because of the manpower shortage, students at most medical schools had to do unqualified house jobs for three months during their fifth year. I worked for an ENT surgeon named Stirk Adams, and had to 'phone both him and the anaesthetist about the list the evening before; I received strict instructions never to 'phone him between 7.30 and 8.0 pm on Thursday evenings while ITMA was being broadcast! My housemanship covered the period of D Day, and the release of penicillin, which was then so scarce that it was generally dripped into wounds through a tube, until it was discovered that it was inactivated by rubber.

## Reflections

When I qualified I had no intention whatever of becoming an anaesthetist. In fact, one of my abiding memories is of watching a thoroughly bored, half-asleep resident sitting at the head of the table, dripping ether on to an open mask, and wondering to myself: 'What sort of person would choose to spend the whole of his life doing this?' Certainly I didn't expect to be giving anaesthetics within days of starting my first house physician job. In the army I was given the choice of continuing in anaesthetics or switching to dermatology and VD. Occasionally since, as at three in the morning when called in for a leaking aortic aneurysm, I used to wonder whether I'd made the right choice; now, I am certain. Who's ever heard of a History of Dermatology Society?

As to why I stayed in anaesthetics, my wife, who is subject to flashes of disconcerting intuition, came up with a novel reason some years ago. Stalking out of the room as usual when one of my favourite TV programmes came on, her parting shot was that I must have become an anaesthetist because I like watching violence.

I have always been grateful to have started in anaesthetics before the great revolution in techniques of the late forties, so that I learned all the classical methods. The things I have been describing happened more than fifty years ago, something that my spirit has more of a problem accepting than does my flesh. They have been dredged from the bottom of a failing memory, so I hope I haven't been unfair to anyone. Also, it needs to be realised that there was much less uniformity in those days. Methods may have been more advanced in centres other than Birmingham.

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## SOME ANECDOTES IN THE HISTORY OF BLOOD PRESSURE MONITORING

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### Direct and indirect measurement

It is commonly accepted, and probably correct, that the first invasive measurement of blood pressure was done in a horse by the Reverend Stephen Hales in 1733. He measured the blood pressure directly by the height of blood in a tube which was introduced into the horse's carotid artery.

In man, it is usually assumed that indirect blood pressure measurement came first, followed by direct arterial pressure measurement. It may be that this assumption is incorrect. The first reference which I could find relating to the quantifying of blood pressure in man was one in which the direct blood pressure was measured using a mercury manometer by Faivre who published this in the *Gazette Medicale de Paris* in 1856.<sup>1</sup> Quoting from his article he says:

'Nothing is easier than to arrive at a knowledge of the pressure supported by the arterial blood in man. It is sufficient to make use of the amputation of an arm or a thigh and to attach to the artery of the member the manometer of Monsieur Poiseuille. The first time, using the humeral artery of a 60 year old man ... the difference between the two mercury columns was exactly 12 cm. The second experiment was done on the femoral artery of a 30 year old man of uncommon vigour, the mercury column rose past the other which had stopped at 12 cm .... The highest pressure coincided with expiration, which agrees with observations made in animals, in such a way that the eye observed an oscillation of 2 cm simultaneous with the movements of respiration perceiving at the same time additional oscillations of 2-3 mm simultaneous with the arterial pulse.'

In 1856 the blood pressure had therefore been quantified reasonably accurately and it had been noted that it varied with both respiration and the heartbeat.

In 1876, Marey developed an arm-occluding cuff for the non-invasive measurement of blood pressure. The forearm of the patient was inserted into a cuff which completely enveloped it and which could be pressurised by raising a mercury reservoir. The reservoir was initially raised to such a height that there were no pulsations recorded within the cuff. Then the mercury was gradually lowered and the pressure pulsations in the cuff which started to occur as blood flow returned to the forearm limb were recorded on a smoked drum. Examination of this envelope of oscillations<sup>2</sup> reveals an identical trace to that currently available by the Dinamap for the oscillometric measurement of blood pressure. At that time, the commonest method of measuring blood pressure was using Gaertner's Tonometer.<sup>3</sup> It was Gaertner's Tonometer which, as far as I know, produced the first data on the blood pressure changes during ether and chloroform anaesthesia.<sup>4</sup> The tonometer was, however, very poor at

recording low blood pressures and it was because of this that Cushing introduced the upper arm cuff into his operative practice in 1903.

### **The upper arm cuff**

Interestingly, the name attached to upper arm blood pressure sphygmomanometry is Riva-Rocci.<sup>5</sup> The description of his sphygmomanometer was published in December 1896. However, in January 1897, an almost identical device using an aneroid rather than a mercury manometer, was published in the *British Medical Journal* by Hill and Barnard.<sup>6</sup> Had the *British Medical Journal* been a little quicker in its publishing policy at that time, the credit for the invention of the upper arm cuff would have come to Britain rather than to Italy! As soon as the upper arm cuff was in common use, it became apparent that the width of cuff was very important. The first references I can find to experiments done on this were by Von Recklinghausen in 1901<sup>7</sup> who described making measurements with 5 cm and 12 cm cuffs on his friends after having them round for dinner! He recorded a difference of 16 - 20 mmHg between the palpatory readings from the two cuffs.

### **Arteriotomy**

In the 1940s and 50s deliberate hypotension by arteriotomy was commonly practised. Looking back at the history of this technique, the paper always quoted is that by Kholstaedt and Page.<sup>8</sup> It is quoted as a justification for returning the blood intra-arterially rather than intravenously after it had been removed from the patient. Kholstaedt and Page had in fact been doing experiments on producing haemorrhagic shock in dogs. In a trial involving 40 dogs (divided into two groups of 20 each) they found that the group which had the blood returned intra-arterially had a higher survival rate than those where the blood was returned intravenously. The article does, however, say that the blood returned intravenously was returned much more slowly because they tried to prevent rises in the CVP of over 5 cm of water. They did this because they were worried about right ventricular failure occurring. It was therefore, on the evidence of the survival rate in 40 greyhounds, that the technique of arteriotomy with arterial return was developed in man. The person normally credited with its general introduction into human anaesthesia was Gardiner.<sup>9</sup> He gives good evidence of having read the literature at the time extremely thoroughly and it is interesting that he was not actually interested in producing a low blood pressure per se, but in stimulating the production of the substance which they at that time called angiotonin to try and provide vasoconstriction. Quoting from Gardiner's article he says:

'We believed that it was chiefly peripheral vasoconstriction rather than the reduction of blood pressure which was responsible for haemostasis. It is not necessary to reduce the blood pressure to a dangerously low level in order to bring the peripheral vasoconstrictor mechanism into play.'

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## THE DEVELOPMENT OF THE CAPE WAINE VENTILATOR

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### Captain Smith-Clarke

George Thomas Smith-Clarke was born at Bewdley in December 1884. He became a man of great inventiveness with very wide scientific and engineering interests. He had remarkable energy and considerable administrative abilities - very much a man 'to get things done'. During the first world war he was responsible for liaison between the aircraft factories and the Ministry of War, holding the army rank of captain which title he retained throughout his life. He became chief engineer and director of the Alvis Motor Company in Coventry until his retirement in 1950. For 25 years until his death in 1960 he was Chairman of the Coventry and Warwickshire Hospital and then of the Coventry, Nuneaton and Rugby Hospitals Management Committee.

He was interested in astronomy, building an observatory in his garden which eventually housed an 18" reflector telescope. He became a Fellow of the Royal Astronomical Society and was involved with the design of telescopes at Herstonceux and Jodrell Bank. His equipment was donated to Professor Lovell and is now kept at Salford University. Another major interest was amateur radio; he undertook much pioneering work in the early 1920s including the development and patenting of a moving coil device for improvements for 'Loud Speaking Telephones'. This principle was later used in the manufacture of radio loudspeakers but the patent was never exploited.

In April 1931, during the blitz of Coventry, the Coventry and Warwickshire Hospital was destroyed and temporary accommodation was used until a new surgical unit could be built under the direction of Capt Smith-Clarke on the outskirts of the city at Keresley. This was a single storey building with clerestory windows. It had a flat reinforced concrete roof, 6" thick with 14" thick walls. It was finished in April 1942 and was used for several years. His nephew states that the Captain was arraigned by the local council for not obtaining planning permission! He also designed a 500-bedded hospital to replace the original hospital, but these plans were abandoned with the advent of the NHS. His connection with the hospital service stimulated his engineering as well as his management abilities. He designed several surgical instruments, but the imminent threat of a major poliomyelitis epidemic in the early 1950s turned his attention to the design and provision of 'breathing machines' with such success that the Institute of Mechanical Engineering invited him to deliver the prestigious 'James Clayton Lecture' on this topic. This he did on 7 September 1956.

In the introduction to his lecture Capt Smith-Clarke, whilst acknowledging the honour that the Institute was conferring upon him, expressed surprise that the work with which he was asked to deal had been his hobby undertaken after retirement, and he considered: 'no outstanding engineering achievement was involved in it'. He continued: 'I decided to accept the invitation



in the hope that this record of what has been done may emphasize the desirability of better understanding and closer consultation between medical men and the professional engineer whenever mechanical engineering design and construction is required'. He obviously had much discussion with, and respect for, Dr J F Galpine, the Medical Superintendent at Whitley Hospital, Coventry (then the fever or isolation hospital), and they jointly published a description of the Smith-Clarke Respirator in the *Lancet* of 25 June 1955.

### **A need recognised**

In April 1952 he had been invited to sit on a committee of the Birmingham Regional Board to consider the provision of breathing machines. Investigation showed that, in the whole of the British Isles at that time, there were some 40 Bragg-Paul pulsators and some 700 Both breathing machines donated by Lord Nuffield in 1939. These latter were of poor construction and deficient in design, durability and comfort for the patient. Many had suffered unavoidable neglect during the war years. The cost of providing the minimum number of new machines required would be in excess of one million pounds, even if the manufacturers could produce them. Such a sum of money was unlikely to be found given the financial state of the country at that time. A national committee had therefore been considering for some time modernising the Both machines 'but nothing very practical had resulted'. Smith-Clarke, together with a medical member of the Birmingham Committee, visited a hospital in London where they talked to patients on breathing machines and to the medical and nursing staff involved. He wrote: 'I was able to learn from that visit, and returned quite convinced that the time for discussion and reports was long past, and that it was up to me to get something done without further delay'. He acquired £500 from 'Free Monies Account' to modify the five Both machines held in the Coventry group. The first machine was completed by August 1952.

During the summer and autumn of 1953 all five machines were put to an arduous proving test both clinical and mechanical in the severe polio outbreak in Coventry. Two were in use continuously for many months. There were no failures. The modifications included the addition of six more hand ports, one large enough to take bed pan. A large rectangular observation window replaced the small circular window which was moved to the foot end of the cabinet. The tilting mechanism was improved, the stand was braced and strengthened and wheels were added to make it easy to move about. New control valves were designed; interior strip lights fitted and an alarm system installed; the pump was upgraded; the rubber bellows were replaced by the more durable leather; the range of breathing rates was increased; the positive pressure was made adjustable with a screw valve and the hand pumping system modified to give an increased mechanical advantage of 2.5 to 1. Later modifications included a split-head end and a positive pressure attachment for direct inflation from the pump whilst the cabinet was opened.

### **A new respirator**

Recognising the inherent disadvantages of the Both design even in its modified form, and advised by frequent informal conferences with medical and nursing staff, he built by August

1952 a one-quarter scale model of an entirely new cabinet breathing machine. Charitable monies were sought to build the prototype. The Coventry Iron Lung Fund was inaugurated, which raised £500 in a short time. This was supplemented by a donation of £800 from the Coventry Carnival Committee. The Cape Engineering Co Ltd of Warwick agreed to produce the prototype machine. This was completed by March 1954 and was known as the 'Coventry Mechanical Respirator'. Its most distinctive feature was a hinged top section counterpoised by springs and opening like the jaws of an alligator. It incorporated many of the improvements of the modified Both machine. It was constructed of aluminium alloy and stainless steel; a much improved neck seal was incorporated utilising a wrap-over collar, and the pump unit was extensively modified to provide an inspiratory/expiratory ratio of 1/1.5 and to reduce noise.

During 1952 and 1953 Smith-Clarke also developed other apparatus to assist with breathing. These included a Baby Respirator, a Junior Respirator, a Cuirass Pump and a Rocking Bed.

### **A positive pressure ventilator**

Artificial respiration by intermittent positive pressure was not used to any appreciable extent until 1952. In that year hand ventilation by teams of medical students during the Danish poliomyelitis epidemic stimulated interest in the development of intermittent positive pressure machines. Capt Smith-Clarke, appreciating that a critical requirement for this system was a reliable valve, designed and constructed over twelve such valves before he found one which would meet the conditions he considered essential. A large number of these were produced but he had reservations about their suitability for long term use. In particular, such a pressure valve could not perform with intermittent positive/negative pressure systems. Accordingly, towards the end of 1952 he built a prototype machine incorporating an inspiratory/expiratory valve, cam-operated by means of a Bowden-type cable. It had five breathing rates, 13, 16, 19, 22 and 25 per minute. Tidal volume was varied by changing the stroke of the pump.

This machine, only one of which was built, was used for some thousands of hours both on research and on patients and directly led to the design of the Smith-Clarke Mechanical Respirator introduced into practice in 1954 and published in the *Lancet* in June 1955. It was superbly engineered and contained several unique design features. There was an infinitely variable stroke volume between 200 ml and 1500 ml produced by a sliding fulcrum on the transverse lever to the bellows; a variable speed gearbox allowed stepless speed variations to give breathing rates between 1-40 per minute; the inspiratory and expiratory valves were opened by cams and closed by springs in the same way as valves in internal combustion engines, and the valve cams were designed to give a breathing pattern of inspiration 1, expiration 2. The resulting build up of pressure within the bellows prior to the opening of the inspiratory valve produced a characteristic surge on inflation. There was a variable sub-atmospheric pressure phase available up to 20 cm of water: such a facility was considered to be important at that time. The machine incorporated a hot water tank humidifier, a negative pressure vessel, expiration water trap and dry spirometer; and there was a crank handle for emergency manual operation.

## The Cape Waine Anaesthetic Ventilator

Early in 1958, Dr T E Waine approached Cape Engineering Co Ltd of Warwick with a request to convert a Smith-Clarke Respirator for use as a low flow volume controlled anaesthetic ventilator. Mr Douglas Fox, Chief Engineer to the company, undertook a feasibility study. In depth discussions took place with Dr Waine and a machine was modified with a closed circuit system with absorber. Experiments with artificial lungs were encouraging and further modifications were made enabling clinical trials to be carried out at Gulson Road, Coventry and elsewhere. These trials soon showed the limitations of the Smith-Clarke in its modified form and further modifications were considered to be counter-productive. Accordingly the machine was completely redesigned, incorporating many new features although retaining the mechanical concepts of the Smith-Clarke. It had two separate circuits, one mechanical and the other manual or spontaneous controlled by one switch, an ingeniously designed interlocking control, both circuits using the same soda lime absorber. Sub-atmospheric pressure could be used in both high flow open or in low flow closed circuit. The new design incorporated several innovative safety features which are now written into British and international standards. Cyclopropane was at that time widely used and a flameproof motor and switching was fitted, similar to the type used in filling station petrol pumps. The machine carried six cylinders including carbon dioxide and cyclopropane. An extended back bar incorporating the four bank flowmeter had provision for a number of vaporisers.

Following successful trials with the new prototype in several centres, the first production model was built by mid 1959. Five production machines had been built by 1960 and it was shown for the first time at the AAGBI meeting in Dublin. A description of the ventilator was published by Dr T E Waine and Mr Fox in the *British Journal of Anaesthesia* in 1962. Mark 11 and Mark 111 versions were developed before production finally ceased in the early 1980s.

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## THE CREATOR OF 'CLOUD NINE'

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### A note on sculptor Jonah Jones

*The correspondence quoted is mainly dated between 1984 and 1986 when Dr Donald Moir was President of the Obstetric Anaesthetists Association and Dr Tom Boulton was President of the Association of Anaesthetists.*

'The block of marble was roughly 1 foot cube, it is carved as just the head of mother and child, as though resting on a cloud or emerging from it. I never quite know what 'Cloud Nine' means, but as I carve away at it that is the title that comes to me - probably you think it facetious, but I know that the two heads have something of the feeling conveyed in photographs of both my grandsons and their mothers shortly after their birth. The marble (which is pure white) by the way will rest on a 1 inch roundel of black slate. There is still a lot of work to be done on the heads, tiny nuances of expression and musculature etc. and I need to reduce the size of the hand, if indeed it is needed at all, what do you think?'

This is how Jonah Jones in correspondence with me, described his sculpture, which was presented by the Obstetric Anaesthetists Association to the Association of Anaesthetists for 9 Bedford Square. The inscription which he carved on the roundel was:

'This Sculpture representing motherhood and the table on which it sits, were donated by the Obstetric Anaesthetists Association'.

In further correspondence he notes:

'In my own modest way, the sculpture is very nice to live with even in its unfinished state. You can call Sunday afternoon to see it. Let me know which Sunday ....., then I will be in. Otherwise I would be walking in the hills with the whippet and my sketch-book.'

He told me that he was appearing in a chat show on Harlech Television. The producer had seen 'Cloud Nine' when he visited his home and asked if it could be shown, so it had a preview in Wales. As he said: 'In an otherwise silly half hour it represents a moment of sanity'. A photograph by Robert Greetham of 'Cloud Nine' was shown in an exhibition of Jonah Jones' work called 'Romance in the Stone' at the Mostyn Gallery, Llandudno in 1990 and afterwards at Aberystwyth and Cardiff. He was delighted with the way the photographer had highlighted the sculpture in one of the photographs included in the exhibition catalogue.



### Early restlessness

Jonah Jones was partly Welsh. His paternal grandfather, John Jones, was a Gwent man who was a shaft sinker for pits and therefore itinerant. His first move to Somerset resulted in his marriage to Elizabeth Somers. They eventually settled in Washington, County Durham and had no connection to take them back to Wales. Jonah remembers the last thing his grandfather acknowledged was his Welshness, which he found sad. His father Norman was their sixteenth child and was thoroughly Anglicised - Welsh being regarded as an impediment to getting on in life. His mother Florence was the daughter of a seagoing engineer. Jonah was born on 17 February 1919, the eldest of their four children. His father was on the dole in a colliery village and introduced him to camping and walking in the Pennines, and a life-long interest in hill walking. He went to Jarrow Secondary School where the artroom was his only solace. Although he won the Will Jackson Memorial Prize for Art at the age of 16, enabling entry to the local art school (now Newcastle University) lack of money prevented his admission. He was a pacifist and felt rootless. When he visited Somerset and looked across the Bristol Channel at Wales, he resolved to get there and 'root down'. He knew he wanted to be an artist but that was almost a dirty word in the unemployment areas which nurtured him.

### Field Ambulance Service

During World War II he served in the Royal Army Medical Corps as a paramedic, wearing a Red Cross armband. When he went to the training depot in Buxton he had pushed a copy of Buckhardt's *Civilisation of the Renaissance* into his bag along with an unread copy of a story by Dylan Thomas from that week's *Listener*. That night when he read the story he saw an illustration by John Petts, a name unknown to him. Next day he discovered that Petts had left the depot the previous week for parachute training. He immediately decided to do the same. When he got to Ringway Parachute School, Petts had left but a month later he followed him to Salisbury Plain and worked with him in 224 Parachute Field Ambulance. It was through Petts' influence that he became an artist. Towards the end of the war he and Petts printed a book with a press they had acquired, on some poor paper scrounged in Jerusalem. This was *Over the Rhine, a Parachute Field Ambulance in Germany* written and produced by members of 224 Parachute Field Ambulance, published by the Canopy Press in 1946. It describes airborne landings near Wesel on 24 March 1945 and the 45 hours work carried out before they moved on. Only 300 copies were printed and I found one in the Imperial War Museum. Though Jones is not mentioned by name, an incident he described in a letter to me is found in the book:

'Much of it is concerned with casualties being brought in - never an easy thing in battles. In my own case, I brought a whole pile in one go by 'liberating' a farm cart ready yoked with a pair of horses - the poor farmer had obviously just yoked them ready for work in the field when lo and behold a great Armada of parachutists start descending on his field. I have always wondered if he ever recovered them - I had to unyoke one when it got a bullet in the hind quarters and we struggled on with only one horse to the Main Dressing Station. Then I just turned round and got some more poor blokes in.'

### Field anaesthesia and surgery

The book comments that a meagre cross set on a khaki armband was of little use to stretcher bearers, as they were otherwise camouflaged up to the eyes like fighting men. When they jumped from the aircraft they held a pack in their arms of plasma and giving sets inside a special light-weight folded stretcher, all wrapped in a blanket and tied with rope which was attached to their waists. After jumping they released the pack which glided down to earth attached to them. This provided enough to last until the land forces brought up more supplies. He was involved with blood transfusion, having had a month's course in Bristol University. Whole blood was not at first available and the amount taken from donors on the spot was limited. The anaesthetist, Captain Chaundy, was killed on landing and the surgeons called any medical officer to help with anaesthesia. Pentothal intravenously was mainly used: '... a difficult task when the patient is badly shocked and the veins have collapsed. Cases who needed complete relaxation were given a mixture of ether and chloroform'. Chloroform left by the Germans was used to soak a pad of lint and 'jammed down on the man's face whose back had broken and was too painful to move'. It worked and he was carried away. Surgeons and their two personal assistants carried between them an important innovation - ready

sterilised instruments, enough to perform a major operation at the shortest notice. There is a report on the surgery carried out on 28 theatre cases; 15 had multiple wounds, 6 penetrated abdomens, 2 penetrated chests and numerous fractures and flesh wounds. Stocks of Pentothal, ether and chloroform carried by the surgical personnel and the glider party, were ample. All cases had penicillin by intramuscular injection and some wounds were also irrigated with penicillin. Instruments and jaconet towels were all boiled in a camp kettle and a plain steriliser by means by two Primus stoves.

### **Pulmonary tuberculosis**

On demobilisation Petts was the catalyst providing Jones with work at Caseg Press in Llanystumdwy and the opportunity of going home to Wales to 'root down'. Unfortunately, he got pulmonary tuberculosis and was admitted in June 1949 to the King Edward VII Memorial Hospital in Llangefni in Anglesey for a year and had bilateral artificial pneumothorax treatment for 5 years. Jones wrote:

'The only interesting thing, since it concerns the chest in my case, is the lack of use of anaesthetics. Since I endured bilateral artificial pneumothorax for five years, without anaesthetic and, even worse, when I had adhesions cut once, I remember fainting (a blessing, of course) as I sat up in a chair while the surgeon pushed a bigger than usual pea-shooter through my ribs into the void inside and started cauterising the adhesions from a second hole. No anaesthetic. Rightly so, of course, for the lung itself registers no pain, it is only the momentary push of the pea-shooter (I'm sure there's a word for it!) through the rib cage.'

He was put in an open ward and saw patients having had lobectomies and pneumonectomies develop severe postoperative shock, with many dying. He found it appalling and was later moved to a single room. He put his survival down to the fact that he was one of the first to have the new drugs. After a year he spent five months in Switzerland and there noticed there was much less postoperative shock and the patients were walking in three days.

### **Development as an artist**

Jones says he was late in maturing as an artist, and wanted to practice Fine Art from the basis of a craft among the people. He wanted a workshop not a studio - to be like the blacksmith and carpenter, a member of the community and to be accessible to them. He managed to get to work in Eric Gill's workshops where he learnt the craft of lettering in stone and was taught by Laurence Cribb. In one letter he writes:

'I am working in the House of Lords this week. No, I am not being raised to the Peerage! it is simply a presentation plaque to Lord Shinwell who will be a 100 on Thursday.'

He has been influenced by the lonely plateaux and mountains in Ardudwy and in particular Bryn Cader Faner, which he regards as the most Welsh fact he knows. At one time this was an important place where honour was paid to a Prince or Chief. Long stones pointing

outwards to the sky have been placed in the shape of a necklace on the mountain grass forming a coronet profile. To him it means that even in that early society in the Bronze Age there was room for a designer.

He married writer Judith Maro in 1945 and they had 3 children. In 1948 they settled near Penrhyndeudraeth, not far from Portmeirion, an area of glorious scenery, good climate and comparative isolation. He depended on gallery and exhibition sales for part of his income, but mainly it came from commissioned work, and in Wales he found this. He undertook many public commissions - slate inscriptions, stained glass window design, some 20 portrait busts as well as carved and cast sculptures - almost all of them commemorative. I had become aware of his work through seeing the sculptured head of Ivor Lewis - he of the right sided thoracotomy approach to carcinoma of the oesophagus and husband of Nancie Faux, first whole-time consultant anaesthetist at Rhyl - when I visited their home in St Asaph. He had also made the commemorative plaque to Henry Morton Stanley in St Asaph Cathedral. He produced watercolours, sketches of the mountains and lakes where he lived, and has written and illustrated a book on the lakes of North Wales for walkers. He has written two novels, a book of essays, the *Gallipoli Diary*, and has published *A Tree May Fall* - about the Easter uprising in Dublin - and *Zorn, the Life of a Jewish Hermit*.

He has been an external assessor of the work of many Colleges of Art and Polytechnics in the UK; has served on many Arts and Crafts Committees and has been Director of the National College of Art and Design in Dublin, Artist-in-Residence in Newcastle and Gregynog Fellow.

Jonah now lives in Cardiff. He is still working and is grateful for the benefit medical science has given him and his family. Both his daughters had epidural analgesia during childbirth, which he regarded as a great blessing. We should be grateful that his craft has given us a beautiful object which we can all see in the hall of 9 Bedford Square and also remember that his skill and courage helped to save lives during the war.



## A TALE OF TWO INQUESTS

Dr W G G Loyn

Consultant Anaesthetist, The Whittington Hospital 1956-1980

Consultant Anaesthetist, Aberystwyth 1980-1987

### Differential anaesthesia

At our last meeting Dr Riding pointed out that, for many years after 1846, anaesthesia was discretionary and was not used in all operations until at least 1870. Pernick<sup>1</sup> quoted by Dr Beinart<sup>2</sup> in the Proceedings of the 1987 International Symposium prefers the term 'differential anaesthesia'. He suggests that many doctors in the USA made differential use of anaesthesia depending on their judgement of the patient's ability to bear pain: 'For the same surgical procedures young children were more likely to receive anaesthesia than adults, women than men, educated than uneducated, white than black patients.'

According to Pernick in his book *A Calculus of Suffering*<sup>1</sup> immigrants, particularly the Irish and Germans, were considered less sensitive to pain. There is no doubt that, in the early years, anaesthesia was not used in many parts of the USA for minor surgery, the term 'minor' embracing almost all operations other than major limb amputations, reduction of major dislocations and prolonged tissue dissections. An Iowa doctor is quoted as late as 1887 saying: 'I do not use any anesthetic of any kind. I want the patient to know what is going on'. Possibly the adoption of antiseptic surgery saw the end of this attitude; the complex rituals of Lister's technique virtually demanded that all patients be immobilised by anaesthesia. In this country, Simpson felt that social class was important. He is quoted as denying, in a letter to Meigs, that he believed all parturient women should receive anaesthesia; rather he was referring to 'the class of patients in civilised life upon whom you and I attend'. Simpson described his own clients as 'ladies', the rest were 'females in the lower and harder grades of civilised society'.

### Anaesthetic death in Aberystwyth

In 1888, Aberystwyth was a flourishing market town servicing the farms and lead mines of a wide hinterland. It was a university town and a seaside resort. Its importance as a port was waning following the advent of the railway in 1864 but there were still a number of fishermen working from the harbour. The new infirmary was opened on a hill above the town in 1888. The staff consisted of a house surgeon who also acted as secretary and dispenser, a matron and three nurses.

In December of that year, an inquest<sup>3</sup> was held at the infirmary. It was into the death of Richard Rees, a boatman aged 32 years, who had developed a septic finger after being bitten by a fish. It was decided to amputate the finger and Dr Rowland, the House Surgeon, began to administer chloroform to the patient after examining him to ascertain that he was healthy enough. His heart stopped after a few breaths. Frances Akers, the matron, was the first to give evidence at the inquest. She said that the patient began to struggle very violently and

nothing was done to the finger because he collapsed after very little chloroform had been given. The doctors attempted to resuscitate him for nearly an hour - they tried the battery, artificial respiration and all other means without success and the patient died.

### **A maverick surgeon?**

The next to give evidence was the surgeon, one T D Harries FRCS. He said that he had told the patient that removal of the diseased part was the only remedy. The patient was apparently highly nervous and Harries said to him: 'Rees, let us have that finger off. You will not require chloroform or anything else. He asked how long it would take to do. I told him two minutes at most. He became extremely nervous and said he could not stand it. He took his coat and waistcoat off and jumped on the operating table having decided to take chloroform'. The surgeon went on to describe the collapse which happened before the patient had gone through the first stage of chloroform. A juror asked Harries why he had suggested that the operation should be carried out without chloroform. He replied that the operation was simple and a robust man would have undergone a more serious operation without chloroform. The house surgeon also gave evidence and the jury returned a verdict that death resulted from normal causes whilst having chloroform administered to him previous to undergoing an operation. The members of the jury rather touchingly gave their fees to the widow.

Was Mr Harries' attitude towards the pain of surgery widely held in 1888 in the United Kingdom or was it that of an opinionated maverick? He survived into the twenties of this century and a nonagenarian friend of mine remembers him as a man of very strongly held views. He was a staunch Conservative in a Liberal stronghold and there is a report of some very intemperate remarks made by him about his political enemies at a St David's Day dinner in which he expressed his willingness to hang two of them, including the local paper's editor.

### **A bungled inquest**

There may be other indications of T D Harries' character in the circumstances surrounding another inquest held in the town in 1885.<sup>4</sup> It followed the death of a young woman shot by her husband after a domestic row. Dr Davies, the Medical Officer of Health, was called to the incident and on the following morning was present at the inquest into her death. In his evidence he said that he found a small wound on the right cheek which gave the appearance of having been caused by a bullet. The Coroner remarked that this was obviously sufficient to cause death. Dr Davies said nothing nor did he demur when the Coroner said that a post-mortem examination would not be necessary. A verdict was returned that Mary Ann Price came to her death by violence caused by a pistol bullet wound and that John Price wilfully and maliciously caused such wound. However, at the Magistrate's Court that afternoon when Price was charged, Dr Davies refused to swear that the bullet in the face had caused the woman's death and insisted on the necessity of proving that the bullet was in a vital part of the brain by post-mortem examination. The court was adjourned for this to be done. It transpired that the Coroner having given a verdict was powerless to order a post-mortem, neither could the police nor the court. A telegram was sent to the Home Secretary asking him to issue a warrant to which the Treasury Solicitor replied: 'I am to say that the Secretary of

State has no authority to give an order for a post-mortem. The police must use their own discretion as to the steps to be taken'. This the police did by obtaining permission for a post-mortem from the wife's family. A careful examination was carried out by none other than the Coroner, who discovered the bullet in a vital part of the brain.

Later that month an editorial in the *Lancet*<sup>5</sup> was very critical of the whole affair. It concluded that the Coroner 'should have issued an order for a post-mortem examination before the inquest was opened or, to say the least, before it was closed. It was scarcely in keeping with the dignity of his office to personally conduct the search for evidence which should have been placed before him for judicial consideration.' This was reprinted in the local paper, *The Cambrian News*<sup>6</sup> which commented with the remarkable statement: 'Spite goes a long way and it is well known that Dr Davies has been made the victim of a grossly illegal compact, of which we understand those who entered into it are now thoroughly ashamed'.

It transpires that Dr Davies had not long been in practice in the town and that part of the medical establishment resented his presence to the extent of excluding him from the honorary staff of the infirmary. Things came to a head in November 1884 when the Town Council, being critical of their then Medical Officer advertised the appointment. In competition with the previous incumbent, Dr Davies applied for it. He was appointed, at which point T D Harries, who had been a leading light in the boycott, spoke out giving notice that the appointment was illegal and that Dr Davies' action in applying for the post was not gentlemanly or anything like it. To this *The Cambrian News* retorted:<sup>7</sup> 'We will not say anything about Dr Harries as an authority on gentlemanly conduct but venture to say that anyone who knows both Dr Harries and Dr Davies would sooner expect Dr Davies to act like a gentleman than Dr Harries to speak like one'. We therefore have a picture as late as 1888 of a British surgeon advocating surgery without anaesthesia. He was known to be difficult, erratic and opinionated. This does not, however, necessarily prove that he was alone amongst his surgical peers in holding this view. He may have represented a larger body of opinion. More research is needed to find the end-point in the United Kingdom for discretionary or differential anaesthesia.

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## THE HISTORY OF THE BRITISH NATIONAL FORMULARY

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This story begins in 1858 and it is important to bear in mind the enormous changes in our knowledge of disease and its treatment in the last 135 years. Remember also the rapid developments of the modern pharmaceutical industry, and the changes in delivery of health care with the introduction of the National Health Insurance in 1911 and the National Health Service in 1948, which upgraded first the hospital services and then primary health care. As well as these major changes, three often forgotten factors influence the prescribing of drugs. Pharmaceutical firms want the doctor to use their drug rather than the best drug for the patient, the Ministry of Health wants the doctor to prescribe economically, while the media and public unrealistically demand magic not medicine and are susceptible to the great fallacy of therapeutics - if you get better after being given a medicine, you got better because of the medicine.

### The first formularies

The General Medical Council was established in 1858 and six years later it was authorised to prepare the British Pharmacopoeia which laid down legally enforceable standards for the quality of drugs used in medicines. In those days doctors wrote elaborate and elegant prescriptions and there was a need for doctors and pharmacists to have information about the commonly used mixtures and preparations. Many formularies and pharmacopoeias were published, the most famous being *Martindales Extra Pharmacopoeia*. If a doctor did not compound and dispense medicines himself he usually had an arrangement with a local pharmacist who would be familiar with the complicated and idiosyncratic mixtures he prescribed.

In 1911 the National Health Insurance Act was passed by Asquith's government. Under this Act general practitioners were paid seven shillings each year for each patient on their Panel, one shilling of which covered the cost of medicines. The prescriptions had to be written on NHI forms and, as the patient could take the prescription to any pharmacy, some uniformity was desirable. Small formularies were produced by the Local Panel Committees, LPCs, which represented the NHI doctors in a locality. I have one of the earliest, produced by the Liverpool LPC in 1913. It lists 31 preparations; the titles are in latin; there are five gargarismata, three lotions, nineteen misturae (cough mixtures and aperients dominate) and one pulvere.

After the 1914-18 war the number of local formularies increased. Often, similar preparations had different titles in the different formularies, Mistura Alba in one formulary was Mistura Aperiens in another, and Mistura Magnesium Sulphatum in another. Conversely, the same title, such as 'Mistura pro Tussi' might have different ingredients in different formularies. To reduce confusion a number of LPCs collaborated to produce formularies to serve doctors in

large areas; thus the *Midland Conjoint Formulary* was used by 17 LPCs in the Midlands. This move to uniformity was taken a step further in 1927 when a *National Health Insurance Formulary* for the use of all NHI doctors throughout the United Kingdom was compiled by the British Medical Association and the Retail Pharmacists Association. It was a small book of 79 pages with 295 monographs.

Most of the larger hospitals had their own pharmacopoeias. I still have the copy given to me at University College Hospital, London, when I arrived as a student in 1942. This worn black book, which I carried in my white coat for the next four or five years, demonstrates how great the changes in medical practice have been in my professional life. It contains 214 monographs. Many were for rather elaborate mixtures, and if of therapeutic value, this might have been due to the suggestive effects of evil-tasting constituents such as valerian or asafoetida. All the titles were in latin and the doses in grains and minims. Only 51 of the preparations were tablets. The only chemotherapeutic remedy was *Tablettae Sulphanilamidi*. *Injectio Insulinum* and *Extractum Hepatis Liquidum* were included.

With the war, economy in prescribing was needed. Even if the drugs were available, packing and distributing made demands on manpower, materials and transport. So, in 1941, the Minister of Health appointed a small committee to prepare the *National War Formulary*, NWF. This was very similar to the University College Hospital formulary but it contained sulphonilamide, sulphathiazol and sulphapyridine. The British Medical Association and the Pharmaceutical Society of Great Britain, both of which had been closely associated with the NWF, appointed a committee after the war to produce a new formulary, the *British National Formulary*, for use in the National Health Service. The first edition was published in 1949 and new editions appeared about every three years until 1976.

### **The British National Formulary 1949-1976**

The stated purpose of the NWF and of the early BNF was to give the practitioner, whether in general practice or in the hospital service, a selection of preparations sufficient in range to meet his ordinary requirements. The operative phrase is 'a selection'. There was no attempt to list all preparations which were available. Successive editions of the early BNF show three changes by which tradition was gradually replaced with more modern ideas. The format was changed from one designed to help the pharmacist who supplied the medicaments to one that helped the prescriber. The traditional arrangement of monographs under the type of preparation, eg. Applications, Auristellae, Capsulae, Enemata etc., moved to an arrangement according to pharmacological action on bodily systems, eg. gastro-intestinal system, cardiovascular system, respiratory system, etc. Secondly, the apothecaries dosage gave way to the metric system. Finally, there was a reduction in the number of traditional tonics, cough medicines and aperients, and inclusion of effective new drugs such as antibiotics, corticosteroids and beta adrenergic blocking agents.

There were two problems of increasing difficulty for members of the Joint Formulary Committee. Because we only included a selection of the many preparations that were

available we had to admit that our selection was very arbitrary - there were, for instance, many preparations of hypnotics and antihistamines of which we would include only a few. And we had great difficulty with the increasing outpouring of new and original drugs. The policy was to only include those whose effectiveness was reasonably certain, but this was done at the expense of being out of fashion and often very late at including really valuable drugs.

It was because of these problems, and because we only published the BNF at three yearly intervals, that it became less and less used by doctors. The pharmaceutical industry could legitimately say that the BNF was out-of-date, and it published the *Monthly Index of Medical Specialties (MIMS)*, which was very widely and increasingly used by doctors in practice and in the hospital service. *MIMS* was on the desk of every general practitioner and in the pocket of every house officer. It was estimated that 80% of prescribing by doctors was done with *MIMS* and only 20% with the BNF. This meant, of course, that proprietary preparations were prescribed far more frequently than were the equivalent and much cheaper generic drugs.

### **The new British National Formulary, 1981 onwards**

In 1975 the Medicines Commission was becoming concerned that the prescribing habits of doctors were being unduly influenced by the pharmaceutical industry and it was suggested that a new type of BNF was required which would be no longer selective but give information on all medicines available in this country for prescribing by doctors, give information about the price of medicaments and be kept up-to-date. It should still be easy to use, and fit into a coat pocket.

Discussions and negotiations were opened between the Department of Health & Social Security and the British Medical Association and the Pharmaceutical Society of Great Britain in 1975 and went on for three years. I think the fate of the BNF hung in the balance. To produce a new BNF that met all those criteria would take a great deal of work and it would not be available for two or three years, by which time it might turn out to be unwanted because doctors had got used to obtaining their information from other sources. If the ethos of the 1990s had been extant at that time I think it would have died. We owe much to the then Deputy Chief Medical Officer, Ed Harris. He gave an assurance that if the two Societies would produce a new BNF, the DHSS would purchase it and distribute it to all doctors and senior medical students.

I was asked to be the chairman of a new and much smaller Joint Formulary Committee and we appointed as editor Mr Ron Brown, who had previously worked for the Pharmaceutical Society on the production of the *British Pharmacopoeia* and *Martindale's Extra Pharmacopoeia*. The task was daunting. The main part of the book was to be the monographs. There was a great deal of information available for every preparation but we needed to confine the entry to the information that a doctor actually needed to make his choice when prescribing. Here I was able to help a lot because Dr Beeley, a lecturer in my department, had been working on a project to find ways in which computers and visual display systems could help the hospital service. Part of the study had been to develop a drug

information system so that a doctor could call up the information needed about the drug he intended to use. Not only was I fully familiar with that work but Sir Michael Drury, Dr Beeley, a young pharmacist, Miss Aylesbury and I had produced a loose leaf book on drugs, *Treatment*, based on the system.

In the spring of 1979 I drafted one section of the monographs, the cardiovascular system drugs, including only the information I thought was needed to help the prescribing doctor. Mr Brown and his staff did a mock-up which showed convincingly that the information could be presented in a clear and accessible form. By October 1979 the Committee had seen a definitive version for the new BNF and it looked good. From then on, although it was very hard work and everything had to be checked and rechecked, it was straightforward. Authors were chosen to write the 'Notes for Prescribers' at the head of each section. They were told that their version would be sent to two referees and that, in the light of their comments, the Committee would decide on the final version. We had no prima-donna problems, probably because I and my colleagues knew every contributor personally. The print was set by computer so that modifications, changes, omissions and additions in future editions could be made easily and quickly. The first edition was bound and distributed in February 1981.

### Initial reception

The initial reception of the new BNF from the media and the pharmaceutical industry was remarkably hostile. Journalists, who were familiar only with commonly used proprietary cough mixtures and medicines, were amazed that most of them, if they appeared at all (proprietary medicines advertised to the public do not appear in the BNF), were in small print indicating that, in the opinion of the Committee, they were of dubious value. The Association of the British Pharmaceutical Industry and the staff of many of the pharmaceutical companies said that the BNF was inaccurate, inadequate, unbalanced and unacceptable. This harsh and ungenerous criticism was based on a misconception. The BNF did not meet the requirements laid down in the Medicines Act for pharmaceutical companies when they produce official data sheets about the products they market. These requirements are aimed at ensuring that a firm includes comprehensive information about the product which is agreed by the Licensing Authority (now the Medicines Agency). The BNF is however not marketing drugs. It does not have to meet the requirements of the Medicines Act. It is able to include in its monographs only the information that it thinks doctors require. It can list products in small print if it thinks they are not very good. It is not bound to acquiesce to the idea that because a product has a licence it is necessarily desirable for general use.

Another reason that the drug industry did not like the BNF is that in the notes for prescribers a group of preparations such as thiazide diuretics or antidepressant drugs may be discussed together. This implies, of course, that there is little difference between the various preparations, which is anathema to a company which spends money explaining to doctors that their product is different from the other and is the preparation of choice. The reception by doctors, pharmacists and even by medical students was very different. They have found it

useful. It was soon to be seen in the pockets of all housemen and much thumbed. General practitioners have used it increasingly instead of *MIMS*.

### Criticisms

We were criticised for republishing the BNF every six months. I am sure that if we had not done this the drug industry would have done its best to persuade doctors that it was not up-to-date and that they should use *MIMS*. In each new edition there are 3000-4000 changes. Many are minor but sometimes important.

We were criticised for the way we quoted the prices of preparations. We give the cost of 20 tablets. This may be misleading if you compare the price of ordinary tablets with that of slow release preparations which are needed in a dose of only one or two tablets a day. People have wanted us to give the cost of a week's treatment. But the problem is that the dose for different patients may vary greatly.

The BNF was not sent to dental surgeons. When I learnt this I pointed out that the modern dental surgeon needs to be well informed about any medicines his patient may be taking - anticoagulants, corticosteroids or immuno-suppressives for instance. The DHSS relented and a joint *BNF/Dental Practitioners Formulary* is produced every two years.

As a result of criticism there is now very comprehensive guidance on prescribing for patients with hepatic or renal impairment and for pregnant or breast feeding women. Drug interactions are listed, and information about intravenous additives is given. Guidance is also given to pharmacists on the information to be put on labels to help patients take their medicines correctly.

### Conclusion

I think the BNF has been of great value as a compact source of the information that a doctor needs when he prescribes. It has been a pleasant surprise to find how much influence the BNF has had abroad; a number of countries now produce their own rather similar formularies.

But let me sound a warning. The aim of achieving rational and effective prescribing, when the use of drugs is congruent with the need for drugs, will not be achieved easily. A BNF that gives information about the preparations available is only part of what is needed. In Northern Ireland I showed the use of oral antidiabetic drugs was low in Londonderry and high in Newry; another study demonstrated wide variation in the use of Vitamin B12 injections in Norway, Sweden and Northern Ireland. Ponder for a moment on the common occurrence of a disease we seldom seem to see in the UK - chronic low blood pressure. Prescribing is widely influenced by doctors' concepts of disease and its appropriate treatment, by the expectations of patients, by tradition and custom and, of course, by the pharmaceutical industry which produces the new drugs which we need, but may influence prescribing in ways which do not necessarily conduce to good treatment.



## A BRIEF HISTORY OF THE SOCIETY'S FINANCES

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Hon Treasurer HAS 1986-1993

The AGM at Birmingham was my last as Honorary Treasurer and having managed the finances of the Society since its inception in September 1985, I thought it would be singularly appropriate to review the accounts of the preceding years.

I started in September 1985 by entering all the founder members into a software file entitled *A Society for the Study of the History of Anaesthesia*. The first printout, a few days after the initial exploratory meeting on September 12 had a total of 71 members with their addresses and other details. By early December numbers had risen to 163. There were 230 members by the time of my first Report and Accounts at Reading in the summer of 1986 and membership has increased steadily since then to the present total of 443, of which 74 are overseas.

To cover eight years of the Society's finances I have done a little simplification and compression of the full accounts of each year.

**RECEIPTS** are grouped under four headings:

**Subscriptions**, which includes payments in advance and subtracts repayments of overpaid subscriptions (banks sometimes pay these monthly instead of yearly!). I decided early on that it would be cheaper both for the Society and overseas members, if they paid 5 or 10 years' subscriptions in advance, saving bank charges for currency exchange.

**Meetings/Sponsors**, reflects both surpluses from meetings and the generosity of the 'trade' over the years. The highpoint was nearly £4,500 from the meeting in Rotterdam organised by Joe Ruprecht in 1991.

**Interest**, is from our deposit account (was called 'Extra Interest Account', now 'Business Call Account'). Interest rates have dropped and so income received is declining.

**Regalia**, was originally ties (only) but now includes tieclips and ladies' brooches.

**PAYMENTS** are under three headings:

**Secretarial**, is a catchall for the expenses of the President, Hon Treasurer, Hon Secretary and their secretaries, and Council members. Also, the auditor's honorarium and the BSHM affiliation fee. It does **not** include bank charges, simply because we have never paid any!

**Meetings/Proceedings**, consists mainly of the cost of printing and posting the Proceedings. In 1985/86/87 and 1992/93 it also includes most of the expenses of running the meetings. The Society usually expects local organisers to open a bank account to run their meeting, often with a £100 float from HAS. At Reading, and the joint meeting at the RSM, the Society was directly involved.

**Regalia**, is the cost of ties, tieclips and brooches. As we had sold nearly all the ties and tieclips and all the silver brooches, over £1,150 was spent in 1993/94 to buy more.

1985/6/7 1987/88 1988/89 1989/90 1990/91 1991/92 1992/93 1993/94(half)

**RECEIPTS (£)**

Subscriptions	1200	1760	1610	1605	1895	2000	2140	1620
Mtgs/Sponsors	2700	1100	760	995	2215	4700	3860	2300
Interest	0	0	90	340	735	465	765	235
Regalia	0	60	20	25	105	145	245	310

**PAYMENTS (£)**

Secretarial	240	470	560	910	1140	855	1150	610
Mtgs/Proc'dgs	1650	1030	850	100	100	850	1400	3100
Regalia	0	800	0	0	60	300	105	1155

I leave the office of Treasurer with the Society having a current balance of £2,356 and with £15,481 on deposit. There is one small cloud on the horizon for my successor, Dr Jean Horton. The government has recently activated tax legislation passed in the early eighties. This allows the Inland Revenue to tax the interest received by 'clubs, societies and unincorporated bodies' such as this Society. We have always received our bank interest untaxed and our auditor states that as this was the bank's decision, it is partly their responsibility. The Inland Revenue may not tax interest received if the Society is regarded as using the money for learned and scholarly pursuits. In my opinion, if we devote some of our accumulated surpluses to publishing Barbara Duncum's book and a book of the *Best of the Proceedings*, we may satisfy the taxman in this respect. It was also suggested at the AGM that another suitable action would be to establish a prize for the best paper from a trainee anaesthetist.

I am sure that the Society will go from strength to strength and I am looking forward to the joint meeting at the RSM in December 1994.