THE HISTORY OF ANAESTHESIA SOCIETY

Volume 4

Proceedings of Leicester 1988 Meeting –

Members Attending

The History of Anaesthesia Society
1988

Text compiled and prepared for publication by

Abbott Laboratories Ltd.

Edited by Dr D.J. Wilkinson

VOLUME 4

Proceedings of the Meeting held at
The Holiday Inn, Leicester
on 17th & 18th June 1988

MEMBERS ATTENDING THE MEETING 17/18 JUNE 1988

Dr C.K. Adam
Dr A. Batchelor
Dr J.L. Bembridge
Dr M. Bembridge
Dr F. Bennetts
Dr J.A. Bennett
Dr R. Bhorat
Dr T.B. Boulton
Dr G.C. Corser
Prof J.W. Dundee
Dr R. Eastley
Dr A. Eccles
Prof W. Erdmann
Dr C.A. Fuge
Mrs S. Garner
Dr M.B. Gough
Dr P. Goulden
Dr C.L. Gwinnutt
Dr G. Hall-Davies
Dr G.W. Hamlin
Dr D.G. Heap
Dr D.D.C. Howat
Dr A.R. Hunter
Dr J. Alfred Lee
Dr Z. Lett
Dr D.G. Lewis
Dr I. McLellan
Dr E.T. Mathews
Dr A.F. Naylor
Dr E. O'Sullivan
Dr R.N. Packham
Dr W.K. Pallister
Dr F.S. Plumpton
Dr I. Power
Dr D.L. Pryer
Dr R. Ratcliffe
Dr N.M. Rose
Dr M.A. Rucklidge
Dr J. Rupreht
Dr W.D.A. Smith
Dr. K.A. Stewart
Dr A.J. Trench
Dr W.D. Turner
Dr J. Wandless
Dr C.S. Ward
Dr G.M.J. White
Dr B.R. Whittard
Dr D.J. Wilkinson

A LEICESTER DENTIST – ROBERT MARSTON

Dr I. McLellan

Robert Marston, the son of a Leicester pharmacist, was born in 1853. He became a dentist – of course unqualified prior to the Dental Act of 1878 – and had a fairly large practice. He was an inventive man, working on dental ceramics, dental baking ovens, signalling devices for railways, shoe making equipment, anything that happened to amuse him, but it was in the field of anaesthesia that he came to the attention of both the general public and the anaesthetists of the day.

Marston and anaesthesia

He developed his anaesthetic machine, basing it on what we might describe as a Clover bag, (in fact John Snow used it first) putting chloroform liquid into an iron tank and pumping in air so it vaporised under pressure. This meant that he had an enormous volume available for anaesthesia. He also used very concentrated chloroform vapour and diluted it with a variable orifice air entrainment system using the Venturi principle, thereby delivering to the patient a known concentration of chloroform. The machine was very cumbersome and stationary. The model later developed in a number of ways, one of which is to be seen in the British Dental Association museum in Wimpole Street. He developed a further portable type with bag and bellows and, later, a nitrous oxide reservoir. Marston used this apparatus for up to an hour on each patient in his dental practice, a fairly unusual event at that time. This apparatus continued in use in Leicestershire until 1939. He later turned his talents to manufacturing nitrous oxide.

Marston really was a good Victorian. He was a strong minded individual, some people would even have called him cantankerous. Several attempts were made to introduce laws in the early 20th century to restrict the administration of anaesthesia to medical practitioners only. He fought this on all possible occasions over 25 years, challenging people such as Sir Frederick Hewitt and Dr Dudley Buxton. The basis of the debate was that dentists were in fact administering many more anaesthetics than most medical practitioners. But Marston's principles actually embrace something that we hold dear today – he believed that the operator/anaesthetist was wrong. In his book, he stated that the anaesthetist should be one dentist and the operator another (I should point out that all four of his sons were dentists and worked in the practice with him). This book was a small volume produced in 1899, and included space at the back for individual case records and tables for air entrainment so that you know the dilution of chloroform vapour.

He was deeply concerned with safety, both in controlling the concentration of chloroform vapour – exemplified in his apparatus – and in the training of medical and dental practitioners in the administration of anaesthesia. He felt very strongly on this, raising a number of points that we would consider important today. He distributed his views on legislation controlling anaesthesia throughout the country at his own expense, spending enormous amounts of effort, time and money on this. He even went so far as to write to ministers of the Crown, because he believed that a great wrong was being done to the dental profession. He used the same tactics for his own Bill for coal; he thought coal was over-priced by local merchants.

Inhalation of a tooth. Negligent or not?

It was with this background that on the 11th, 12th and 13th June, 1912, an event took place in a court of law in Leicester, which was to have a profound effect on British anaesthesia. On these days an action was brought by a lady's companion, Miss Ethel May Geary aged 25, claiming damages for bronchial pneumonia following the inhalation of a tooth or abscess material during anaesthesia for dental surgery. The plaintiff claimed that she suffered from pneumonia and lost £100 in wages, a large sum. She had gone to the dentist the previous August, to be anaesthetised by the same Robert Marston. He had by now obviously antagonised local medical opinion; someone must have provided the impetus for this action. A lady's companion in 1912 was unlikely to take on a locally successful businessman and a very respected dentist. There was also local aggression between medical practitioners in Leicester. It became quite obvious at the trial that the medical administrators of anaesthesia at the Leicester Royal Infirmary testified for the plaintiff while those from what is now the Leicester General Hospital, for the defendant. Marston lost the case and bitterly resented it. Within days he rode 22 miles from Leicester to the town of Oakham to deliver a handwritten letter to apply for permission to appeal against the verdict. The appeal was held in the following year and Marston won. By this time of course, it had become a crusade for him and in winning he entailed costs of £11,000 (£403,000 today, or just under US $750,000). I should point out that the papers at this time were full of medical litigation, so perhaps things haven't changed.

The effect of losing the case on such a man who was outgoing, and believed in his own ability, was enormous. He started to transfer the practice and his various interests to his daughters and sons. He felt he was professionally stressed and in practice he was certainly financially strained although an appeal fund was started. He sold his factory which was making dental apparatus as well as nitrous oxide. He seems to have withdrawn from practice a great deal, except for occasionally writing and protecting the dentist's right to practise anaesthesia.

Archibald Daniel Marston

How has this affected us today? In 1891 a young man was born who went to Guy's Hospital in 1909 to train as a dentist. After completing this he decided he wanted to read medicine. He qualified in dentistry in 1913 and medicine in 1915. After some surgical training, including gaining his Fellowship, he wished to become an anaesthetist and was appointed as an anaesthetist to Guy's Hospital in 1919, eventually becoming head of the department. He of course became involved with the provision of qualifications in anaesthetic practice and was with the first group who started the Diploma of Anaesthesia. This man was Archibald Daniel Marston, the nephew of Robert Marston, and who was also brought up in Leicester. In discussion with the family and acquaintances I understand that there was a very unhappy situation between them. It is my opinion – from people who knew Archie Marston and his personality

– that the enormous trauma his family had undergone affected him so much that he would never allow it to happen to anybody else, and for this reason he became so involved with the setting up of qualifications and academic backup. Since originally thinking of all this, I understand from other sources that during the formation of the Health Service, Archie Marston was one of the strongest protagonists forcing the Ministry of Health of the time to make anaesthetists and surgeons of equal grading within the Health Service.

What happened to Robert Marston's family? Three became qualified dentists, one practised unqualified. The most famous is Alvin Theophilus Marston, his son who became a learned geologist and became the silent member of the Leakey team in Olduvai Gorge. His obituary for the Geological Society is almost ten times as long as his obituary in the medical journals.

Obviously Robert Marston, one way or the other, had an enormous background influence on what we are doing today.

Reference

Marston R. *The anaesthetist's pocket book compendium.* 1899 Leicester, Marston and Parr.

THE LEICESTERSHIRE LIFE OF BENJAMIN WARD RICHARDSON (1828-1896)

Mrs S.E. Garner

Benjamin Ward Richardson was born in Somerby, Leicestershire, on 31st October 1828. He was the only son of Benjamin Richardson and his wife, Mary Ward. His early training by his mother, although she died when he was only a lad, exerted a permanent influence over his future career.

At an early age Richardson was placed under the care of a neighbouring clergyman, Reverend Young Nutt, at Burrough School, Burrough-on-the-Hill. He was a man of great learning, who fostered the boy's great love of physical and natural science. Reverend Nutt entered thoroughly into the project of training young Richardson for the medical profession, and at 13 years of age Richardson's general education ceased.

In 1841 he was apprenticed to a local surgeon, Henry Hudson, in Somerby. Here also Richardson was fortunate in that his superior, Mr. Hudson, like Reverend Nutt, was a scientific enthusiast. His hobby was electrical experimentation and he was able to teach his apprentice many things which were afterwards of such good service to him as an inventor. Richardson entered Andersons's College, Glasgow, in 1845 and in addition to his regular medical studies at the college he also attended the lectures of Dr. Robert Knox the anatomist. In 1847 his studies were interrupted as he fell victim to a severe attack of famine fever whilst a pupil at St. Andrew's Laying-in Hospital, Glasgow. He was advised by his physician to return to England for the benefit of his health. This led him to become assistant to Mr. Thomas Browne of Saffron Walden, and later to be assistant to the older brother of his old master Mr. Hudson, in his native county of Leicestershire. This came about due to an invitation from his old school master the Reverend Nutt, to lecture and demonstrate in his old school in Somerby.

During this visit Richardson called upon his old master and there he obtained a letter of introduction to Edward Dudley Hudson, a surgeon who lived and practised at Narborough. It was a large and hard practice as Narborough was a poor area composed largely of stocking weavers – a local cottage industry. In was during this time at the Narborough practice that one experience occurred, well documented by Richardson himself.

Attempted resuscitation

The son of a local innkeeper was apparently lost in Australia and unexpectedly returned home. A feast was quickly arranaged and the news spread far and wide. At the feast everything was going well, plenty of food and drink, when two men were seen leaving the activities, one of them looking extremely pale. After a little while, one man hurriedly returned saying that his friend had collapsed in a paddock. There was a run to render aid, the sick man was carried into a stable and a doctor was summoned. That doctor was Richardson. The facts presented to him were that a young man, aged 35 years, and a carpenter with a good appetite, had fallen to the ground. Upon examination the poor lad was stone dead. He was extremely cold as he had no covering on him. The air outside was very cold and they were unable to light a fire in the stable. Here I shall use Richardson's own words:

> 'I therefore turned up my coat sleeves and commenced vigorously to set up artificial respiration, getting a man to help me who took my place and who, being strong, was an efficient aid. He kept this up for half an hour and some thinking that the man's feet were getting warmer and that his bloated face was more natural, he kept steadily vigorous. At last it seemed as if he choked and it was found that it was not so easy to squeeze out the air from his chest as it should be as if there was something in the way that stopped the breathing, so with my penknife I freely opened the trachea or windpipe with a quill that was at hand, cleared the windpipe, pushing up an obstruction into a space above and removing what could be removed. To my wonder, the artificial respiration began to take effect, the feet became warmer, and at last the man swung around his head and breathed of his own accord and looked as though he was struggling into life. He moved his hands and, letting him alone for a few minutes, he astonished everyone by the signs of life he manifested. Soon, however, he became choked up again from the stomach and all our efforts failed to restore breathing and in the end I had to ride home leaving a lifeless body, but duly accredited from many a long day afterwards with having raised a dead man back to life'.

During the inquest that followed there were some questions regarding the time the young man was laid in very cold circumstances prior to his breathing being restored, a question which Richardson was to research for many years following this incident.

Research

Two experiments were documented by Richardson himself; the first deals with artificial respiration, and here again I quote:

> 'By inserting a fine needle, insulated except at the point, into the larynx of an animal and the other needle into the diaphragm, and by regulating the shocks by means of a metronome, so that a given number of shocks representing the respirations of the animal are administered, the most perfect appearance of natural respiration may be sustained for so long, in some cases as much as 7 minutes; and if any philosophical instrument maker could invent a good portable electomagnetic machine with my metronome principle applied to it, so that 15-20 shocks per minute could be passed from the larynx to the diaphragm directly, the most perfect attainable artificial respiration would be secured so long as any muscular irritability remained. ...I would suggest the value of such an instrument in cases where it could be brought into operation immediately after natural respiration had ceased' I am sure he must have been talking about a mechanical ventilator.

In the second series of experiments Richardson made various attempts by physical means to restore the circulation artificially, again well documented by him in 1865.

'The little battery, of Legendre and Morin, with the addition of the metronome, so as to regulate the stroke of the instrument used and artificial respiration, was combined with the electric process. In one experiment the negative pole from the battery was passed along the inferior vena cava to the right side of the heart and the opposite pole, armed with a sponge at its extremity, was placed over the heart externally. Sufficient action was excited to produce pulmonic current by the contraction of the right ventricle. The left side of the heart also contracted on receiving blood – an arterial circuit was made, and the animal exhibited, for the moment, all signs of reanimation'. Was he here talking about a pacemaker?

Richardson experimented with mechanical methods of restoring circulation, for example, for forcing action by the veins. He fixed a tube from a syringe into the external jugular vein, filling the syringe with blood, and by a downward stroke pushed the blood in the course of the circulation. By such an action by the arteries he suggested that perhaps it could be possible to draw a coat of blood over the lungs into the aorta, oxygenating the blood as it passed by with artificial respiration. With this object in view, a syringe connected with an air pump was fixed into a large artery and the barrel of the syringe was then exhausted. When the syringe was filled with blood the motion of its own down system movement pushed the blood back into the arteries in the direction of the heart. Of course, difficulties arose with the rapid coagulation of the blood, but on one occasion the syringe filled with blood was brought over the lungs and oxygenated and driven again over the arterial circuit into the muscles. He found muscular action and, for a brief period, all external phenomena of life.

After his paper in 1865 was published, Richardson added,

> 'I have determined by direct experiment that a rhythmic stroke is of the first importance in restoring muscular contraction. By means of a machine which can be worked either by hand or by electromagnetism, I have been able, assisted by my friends, Dr's Wood and Sedgwick, to introduce blood heated to 90°F into the coronary arteries of a dog by a rhythmic shock, and at the same rate as the stroke of the heart of the animal previous to its death. The result was that one hour and five minutes after complete death of the animal, its heart, perfectly still, cold and partially rigid, relaxed and exhibited for 20 minutes, active muscular motion, both atrial and ventricular. The action which continued for a short time after rhythmic injection was withheld, was renewed several times by simply re-establishing the injection'.

From these, and other experiments mentioned, he developed his double-action bellows and it is quite obvious that Benjamin Ward Richardson was a man very much ahead of his time, and it can be said that he was a true 'Victorian revivalist'.

THE ANAESTHETIST'S TABLE

Dr K.A. Stewart

Anaesthetic rooms are a relatively recent development. There were few before the introduction of the National Health Service in 1948 and they only became a standard feature of theatre suites in the early '60s. Indeed they are not yet universal. I was recently talking to an American surgeon from the mid-West and he told me that they were in the course of building a new suite of theatres there and had omitted anaesthetic rooms. When I expressed surprise and asked why, he said it would have cost so many thousand more dollars, and 'We hadn't the money'.

Prior to their introduction, patients were transferred conscious to a trolley and anaesthetised on the operating table. The anaesthetist's table was made of tubular enamelled metal and was some three feet high and about eighteen inches square with a galleried top, and mounted on castors. There were usually two removable plate-glass shelves and occasionally a drawer beneath the bottom shelf.

How were these tables furnished? Surprisingly, anaesthetic books of the time give little indication. For example, in the 1911 edition of *Practical Anaesthetics* by H.E.G. Boyle [1] (of Boyle's apparatus fame), anaesthetic tables were not mentioned. However, our surgical colleagues were, as always, glad to instruct and in 1899 Alexander Miles[2], an Edinburgh surgeon, published a book on surgical ward work and nursing in which he issued advice on all aspects of theatre procedures and techniques. In this 280 page book, he devoted a complete chapter to the anaesthetist's table. Admittedly, the chapter was only two pages long, but it does provide interesting details of contemporary furnishings, and listed things that should appear and be readily available. Two bottles of chloroform and two bottles of ether (presumably one of each as a backup in case they ran out), alcohol for mixture with ether, a dropper bottle, a folded towel, a Schimmelbusch type mask, an ether inhaler – either a Clover or a Junker's – a small bottle of vaseline to protect the face from the effects of volatile liquids, tongue forceps, clean towel, small basin, a hypodermic syringe charged with ether (I will refer to this shortly), several more syringes and a bottle of eucalypus oil for sterilising the syringes (I will also refer to this again), two glasses – presumably for measuring, a strong solution of ammonia, equivalent to smelling salts, I presume, capsules of nitrate of amyl and very strong solutions of cocaine for local anaesthesia by injection.

For those of us who were brought up in the pre-disposable syringe era, the author's comment on hypodermic syringes – and I quote: 'There should always be several of these on the table, it is quite exceptional to find a hospital syringe fit for use' – is a poignant reminder of the difficulties of matching barrels and plungers and the constant mix-up of Record and Luer fittings that always occurred. He described two uses for the syringe: one, to inject morphine and atropine before the operation, which was supposed by some surgeons to make the rapid administration of chloroform safer by diminishing sickness; the second, to inject ether sub-cutaneously, should the patient feel pain, or the heart's action become feeble. This is something completely new to me. The sterilisation of the syringes with eucalyptus oil is also worthy of notice. Eucalyptus oil diluted with olive oil in a ratio of 1:6 was said to be a fairly reliable antiseptic and less irritating than carbolic which was presumably the other alternative.

Some 40 years later, in 1939, Harold Burrows[3] (another surgeon) writing in his book *'Surgical Instruments and Appliances used in Operations'* again described the anaesthetist's table and astonishingly little had changed. The table was exactly as before, except we now have a drawer at the top, and the addition of an earth chain. The list of items recommended to be placed on the table looks extremely familiar when compared with the previous one – Junker's inhaler, a nasotracheal inhaler (I'm not quite sure what that was), ethyl chloride appears, a bottle of anaesthetic ether, bottles of chloroform, a measuring glass, a mask for administering ACE mixture, chloroform drop bottles as before, another dropper bottle for ether, gauze and lint, special – sizes, tongues forceps, throat swabs, hypodermic syringe tested beforehand, tablets of morphine, atropine, strychnine and ergotine and ampoules of pituitrin, capsules of amyl nitrate and coramine, clean towel, receiver, Vaseline, stomach tube...

This all looks very similar to the previous list which appeared in 1899, and I can tell you that, of the 20 items that are listed, 14 were present in the original 1899 list, so we cannot say that there was a rapid advance in the items supplied to an anaesthetist; however, alcohol, chloroform and ether mixture have disappeared, and the injection of ether subcutaneously is no longer mentioned. New arrivals included ethyl chloride, tablets of strychnine, injection of coramine (which was the all-purpose analeptic); a stomach tube appears for the first time.

How could so many items be accommodated on such small tables, some three feet high, and some eighteen inches square? They must have either had a very congested surface indeed or there was an overflow of some sort; perhaps they had two tables. Two things surprise me – nowhere is there a mention of suction, and the importance of this item did not occur to anaesthetists until some ten years after the 1939 list when the Association of Anaesthetists produced the report on their first *Enquiry into deaths under anaesthesia*.

The other astounding omission, certainly from the later list – perhaps not surprisingly from the first – is lack of mention of the laryngoscope, and yet Magill's laryngoscope was well in use by then and was clearly illustrated in all the surgical instrument catalogues of that time, and some years before. So we must assume that this article was written by a surgeon and either because of amnesia or perhaps ignorance, he wasn't aware that anaesthetists required such a thing.

The next forty years saw the demise of the anaesthetic table – it was a lingering death. By 1979, 80 years since Miles's early description, the anaesthetists' table had disappeared and as their status improved, the lowly table was replaced by superior 'furnished accommodation'. The humble table which served our colleagues for over 60 years is now forgotten, and of today's anaesthetists, if I were to recall the recent biblical quotation of Mrs. Thatcher, it could be true to say: 'My table thou hast furnished, . . .and my cup overflows'.

References

1. Boyle H.E.G. *Practical anaesthetics* 1911, 2nd Ed. Hodder & Stoughton, London.
2. Miles A. *Surgical ward work and nursing* 1899, 2nd Ed. The Scientific Press, London.
3. Burrows H. *Surgical instruments and appliances used in operations* 1939, 10th Ed. Faber & Faber, London.

DR F.P. DE CAUX (UPDATED)

Dr D. J. Wilkinson

At the last History of Anaesthesia meeting I spoke of a very unusual doctor – F.P. de Caux – whom I likened to a sleeping giant. My story at that time was rather patchy and I have now filled in a few more gaps which I would like to share with you.

Francis Percival de Caux was born 26th November, 1892 in Takaka, South Island, New Zealand. His father had emigrated from Tamworth in Warwickshire and was ordained in the diocese of Nelson, near Takaka two years before Frank's birth. He was an evangelical preacher and had brought up his children in a very strict religious environment. In a letter written in January 1957 de Caux describes his childhood in what he refers to as morbidly religious surroundings. There were prayers and bible readings twice a day, church was three times on Sunday, no hot food on Sundays, and no use of the horses for riding or driving on Sundays. The theatre was forbidden at all times, and all books read by the family had to be approved by his father first.

Education, his father believed, made people godless, and Frank was only allowed to go to school on the grounds that he might enter the church in the future. The family returned to England in 1912, and his father took a parish at Billingford in Norfolk while Frank started his medical education at St. Bartholomew's Hospital. It took him nine years to qualify because of the outbreak of the first World War, when he went to France, and served as a Medicine Auxiliare in the Service de Santé. In 1914 his father changed the family name, this being at that time Cowx. This was a Huguenot name and they decided arbitrarily (or the father decided) to change the name in 1914 to de Caux, its original form, and the notification appeared in the Cornhill Magazine.

Frank qualified in February 1921, MRCS LRCP, and specialised almost immediately in anaesthesia, becoming Resident Anaesthetist and then Senior Resident Anaesthetist at Bart's. An early diary reflects the people with whom he worked and played. On 1st January 1922 he did a 'medical' on Lord Horder for life insurance, and in March of the same year he went out to dinner at 9 Torrington Place where he met Dr Bengue a French anaesthetist who developed a special cannister and valve for the easy administration of ethyl chloride.

Early ideas and inventions

He left Bart's in mid-1923 and became Honorary Anaesthetist at All Saints Hospital, Finchley Road, and soon afterwards at the Royal Dental Hospital. The first pieces of apparatus he reported in the *Lancet* were a water sight flow meter for oxygen[1] and an ether drip feed device[2], which I now learn from his diaries was built by Charles King who at that time was working for Allen & Hanburys as an instrument technician, just before he started his own shop and business. He and de Caux had a close relationship, which we shall come to again.

De Caux's paper on endotracheal gas and oxygen for dental operations which appeared in June 1924[3], highlighted his interest in this type of anaesthesia. In a letter written in January 1935 to Ralph Waters (in response to one he had received from Waters in December 1932 requesting information on de Caux's tubes for a book Waters was writing with Guedel and Rovenstein), he described the development of his various tubes. He appears to have used two tubes for insufflation anaesthesia before Magill in a slightly different way or perhaps he just borrowed the idea from Magill. De Caux's actual words in the letter were: 'First, the large one is inserted into the trachea and then a small one anterior to it. The gas and oxygen mixture enters the trachea in a continuous stream through the small one, the patient breathing in and out through the large one, with a rubber bag fitted with an expiratory valve.' He then packed off the pharynx with gauze and said that the tubes should be placed either nasally or orally depending on what operation was taking place. When he started to use the McKesson apparatus later on, he got rid of the double tube and only used a wide bore tube, but he found this kinked as it warmed in the patient's pharynx and so he developed a series of wire-reinforced rubber tubes. These, with a wire spiral inside and rubber exterior, are to be seen in an Allen & Hanburys catalogue of that era. In the letter to Waters he describes how he had recently added the air cushions which Waters had sent him. By the air cushions, he means what we would call a cuff on a tracheal tube.

Curare, an original user

I began by mentioning his appointment to the staff of the North Middlesex Hospital in 1926. He later went to America – there he met McKesson and I now know that he was the first to have and use a McKesson machine in the United Kingdom, after persuading Charles King who had just started off his business in Devonshire Street to import one. I think, though, it is his use of curare in 1928 to augment nitrous oxide oxygen anaesthesia in 8 cases, which is one of his most significant contributions to our specialty. I came across the reference to this in *Aids to Anaesthesia* by Victor Goldman – the 2nd edition[4] – where he states quite clearly that 'in 1928, Dr. F.P. de Caux at the North Middlesex Hospital, London, was using intravenous injections of the crude extract of curare to produce muscular relaxation under nitrous oxide oxygen anaesthesia'. I spoke to Goldman, who says that he actually saw de Caux's handwritten notes on each of the 8 cases and there can be no doubt in his mind that these took place and that's why he put it in his book. I have now found some additional support for this use in a letter written in 1948 by the Medical Director of West Middlesex County Hospital, when de Caux tried to get back on to the Medical Register (note the dates are slightly wrong):

> 'One particular subject, namely that of curare, I would like to talk to you about because you were without doubt the first man to use that substance as an adjuvant to anaesthesia in the year 1926. If you remember now, there is a lot of praise and shout going on dated 1944, so come and see me.'

Again, in a letter from Coleman, who was the Senior Dental Surgeon at Bart's:

> 'and later curare, which you were the first to use in 1928, although unfairly is the credit given to Dr. Griffiths for its introduction in 1942.'

Another typewritten letter, again written as a reference for him later on in life:

> 'I may incidentally state he was the first person in this country to use curare as an adjuvant in gas and oxygen anaesthesia and this was in the year 1928 when it was administered to 7 cases, but owing to difficulties in procuring physiological standard curare the experiment collapsed.'

And last, but perhaps not least, in de Caux's own diaries, typed in:

> 'When I used curare in 1928 I used a watery extract of crude curare made by the North Middlesex Hospital dispensary. It was because there was no method

then of standardisation that we d ·ρped the method because of the inconsistent results obtained. I wrote to two tirms, Hoffman la Roche and Zimmermann, I believe, who were not very helpful.'

There is no doubt that he used curare but he never wrote it up, he never published the details and so the idea was lost. The accolades must go to Griffiths and Johnson of Montreal, but at least we have the consolation that the first use, or one of the first uses in anaesthesia, was in the UK in 1928 at the North Middlesex Hospital.

De Caux went on to publish many papers in *Anaesthesia*, and *Anesthesia & Analgesia* in the early 1930s and also published in the *British Journal of Anaesthesia* on a variety of subjects, but now is the time he was starting his abortion practice. Yet still, in his personal documents, we have on interesting piece of memorabilia to the International College of Anaesthetists. What was the International College of Anaesthetists? The only similar thing I have seen is a medal issued by this same body, which is in the International College of Surgeons in Chicago.

Abortions and Russia

His abortion practice ran into trouble in 1932 when he was asked to give a second opinion on someone who had already undergone a termination and become septicaemic. He arranged for her admission to hospital, where she died almost immediately. De Caux, although only involved indirectly, was treated with hostility by the coroner; the case received widespread national press coverage, especially as the patient's mother and Russian doctor friend immediately committed suicide. De Caux's practice in anaesthesia suffered and his researches and publications started to diminish. Perhaps this is why he eagerly took the chance to go to Russia in August of 1934 on a medical mission. He kept a very detailed diary of this trip which shows how impressed he was with the Russian medical care, with their concept of birth control by termination and the openness they had on sexual matters altogether. He gave one anaesthetic demonstration in Russia during this trip at the Bodkin Hospital where Professor Solovof did a nephrectomy and ureterectomy. De Caux was disappointed that his pre-operation preparations were not adhered to and found that he was forced to give a little ether, much against his will, with the nitrous oxide and oxygen he had planned to maintain anaesthesia. He also noted that the patient did not look at all well as he left the operating theatre after the operation!!

His paper on modern methods of birth control, written on his return to the United Kingdom and published in 1935[5], once more distanced him from his professional colleagues. Yet his interest in anaesthesia remained unchanged, and his skills did not desert him. I recently had the good fortune to spend a few hours with Professor Mushin in Cardiff who told me he had met de Caux around this time at the Royal Dental Hospital in London, as Mushin was starting his career in anaesthesia. He had nothing but praise for de Caux, both for his skills and for the interest he had shown in helping him start and maintain an illustrious career. Mushin was to remain a close friend of de Caux for the rest of his life. De Caux, however, published few other scientific papers.

Rehabilitation

I previously recorded de Caux's fall from grace and his arrest in 1942 for performing abortions on premises in Green Street in Mayfair and also in his country home in Marden in Kent. He left Camphill prison on the Isle of Wight a free man again on the 18th January 1946; he had absolutely nothing. He was forced to sue his solicitor who had been appointed by the Crown to manage his affairs, for mismanagement of those affairs. Many thousands of pounds had disappeared, his wife soon divorced him, he had no job and his name had been erased from the Medical Register by the GMC. He set out to be reinstated but made what I believe to be several grave errors in judgement in doing so. He was asked to give anaesthesia by several of his dental friends and did so without being registered; this did not endear him to the General Medical Council. Although he had strong support, including letters from Lord Horder and from Dr Mushin, he appeared to make no effort to gain what might be termed respectability and despite being advised to go and talk to Marston who was then President of the Association of Anaesthetists, he seemed to have failed to have done this. At this time he started to rework the book on anaesthesia he had written in the mid-1930s, which Mushin had provisionally edited. Mushin described it to me as perhaps the finest anaesthetic textbook he had ever read, which is quite an accolade for such a bibliophile! I now have this book, still in manuscript form and never published, and it is quite a fascinating document describing personal researches into the development of anaesthesia in Europe as well as current anaesthetic practice of the 1930s.

His lack of success with the GMC, and the desire to earn money made him turn to medical reporting, and he became the official British medical reporter for the Chinese Medical Journal and the National Medical Journal of China, and it was in February and March of 1947, as an official member of the press corps, that he was on the aircraft carrier Implacable which escorted a Royal party to the equator. He tried several drug companies to get a job; he tried McKesson's and various other equipment manufacturers but jobs were few and far between in that immediate post-war era.

In August of 1948, having failed yet again to be reinstated on the Medical Register, he started a new career. He opened rooms at 7 Devonshire Street and went to Amsterdam to learn about the new Samuels method of cancer therapy. This was based on a series of hormone treatments and a form of electrical stimulation which was supposed to affect the pituitary. His practice grew very very slowly. He thought about moving to America, or back to his native New Zealand and even to South Africa where he had many friends.

Final years

In 1951 he published a book on methods of treatment – *A New Light on Cancer*[6] – and in the following year he met the lady he was subsequently to marry, a much younger woman who is still alive, living in Brighton, and to whom I owe a great debt for the production of a lot of this information and archive material. He married her in 1960 and they spent their time either in London or in Brighton. He managed to maintain a reasonable life style and continued to be innovative. He even patented and then manufactured a reclining armchair; I don't think there are many anaesthetists who have done that, and this perhaps brought him a little more financial reward.

His health however gradually deteriorated. He developed hypertension and ischaemic heart disease and was overweight when he underwent a prostatectomy at the Lambeth Hospital, South London. He died on the 24th October 1965 following a pulmonary embolism. His young wife took his body to Brighton to be cremated and the only memorial to his name is on the wall of the crematorium. She felt, as I do, that he had been unjustly done by, and so added his qualification initials to that memorial, even though his name had been erased from the Register by the GMC. His ashes were scattered in the garden of remembrance at the crematorium.

An historian looks at cold facts, listens to hearsay and reports a distillation of what he has learnt. An historian should perhaps not make judgements, but here I believe is a man who has been poorly treated by his professional colleagues and has not perhaps received the accolades that are due. This is not an evil man obsessed by money who went wrong. This is a highly innovative original thinker, a man before his time, who acted unwisely for reasons he believed in, and who was punished for breaking the laws of the time. How he would surely laugh at his own teaching hospital performing 20 terminations every Saturday morning on request by the local Community Health Council! Many men of that era who knew him confirm these views; both Mushin and Goldman speak highly of him. Sir Ivan Magill once described him as the finest exponent of nitrous oxide anaesthesia he ever saw, surely an accolade in itself. I believe that his widespread contribution to anaesthesia at this extremely formative time in its development, together with the extraordinary experiments with curare in 1928, mean that Dr Francis Percival de Caux should now have greater recognition, both for his life and his work, by his original profession.

References

1. de Caux FP. New pattern oxygen sight-feed valve. *Lancet* 1923. 2: 228
2. de Caux FP. Closed drop ether inhaler. *Lancet* 1923. 2: 789-790.
3. de Caux FP. Endotracheal gas and oxygen for dental operations. *The Ivory Cross Journal* 1924, 6: 643-645.
4. Goldman V. *Aids to anaesthesia* 1948, 2nd Ed. London. Baillière, Tindall, Cox. p.118.
5. de Caux FP. Birth control in the Soviet Union and in Great Britain. *Marriage Hygiene* 1935, 2: 170-179.
6. de Caux FP. *A new light on cancer.* 1951, London. Carroll & Nicholson.

RECENT ACQUISITIONS AT 9 BEDFORD SQUARE

Dr A. Eccles & Dr I. McLellan

The museum, library and archives of the Association of Anaesthetists at 9 Bedford Square are looked after by Audrey Eccles, who acts as curator, librarian and archivist. In this position she is aided by T.B. Boulton, Honorary Archivist, I. McLellan, Honorary Librarian and D.J. Wilkinson, Honorary Curator to the Association.

The provision of these facilities within the premises of 9 Bedford Square and the changing displays within the museum and library have encouraged a new influx of historical material to the Association, which is greatly welcomed.

The British Journal of Anaesthesia Library houses many rare books and has recently received from Professor James Payne items from his personal library and also a large number of volumes formerly in the library of A. Charles King, and later housed in the Anaesthetic Department at the Royal College of Surgeons.

There has been a large input of technical literature from drug companies and equipment manufacturers, as well as that donated by David Zuck. This material is invaluable in the assessment of apparatus and for the production of interesting displays in the museum.

The archives have received much material including the original patent for the Magill laryngoscope and the deeds of the first premises of Charles King. The Intensive Care Society has deposited its archives within those of the Association. The museum continues to receive a wide variety of much welcomed apparatus. David Zuck donated his own extensive collection recently which has contributed very significantly to present displays. Rex Marrett, Hale Enderby and Roger Manley have all contributed invaluable items, both protype and manufactured, of their own design.

The Association has developed a film archive which as an awareness develops has encouraged donations from a wide variety of sources. Ian McLellan has personally collected a large number of these films which are on video in VHS or U-matic format. A significant group is that of ICI films made at the Westminster Hospital in the 1940's. M. Essex-Lopresti has assisted us in reviewing and arranging copying. Copyright restrictions do however prevent their widespread copying but these films are available for viewing at Bedford Square.

The Association would eagerly welcome donations of any material relating to anaesthesia which would be appropriate to enhance these collections or to inspire new avenues of acquisition. Limitations of environmentally-controlled storage space do however mean that we must be selective in our collecting policies and intending donors are particularly asked to communicate first with one of the individuals named in the first paragraph.

All historical material held at the Association is available for research purposes by contacting Dr Audrey Eccles.

Editor

FILM EXTRACTS BY DR M ESSEX-LOPRESTI

By the Editor

Dr Essex-Lopresti has an extensive library of medical films dating back to 1897, including several relating to anaestheia. This library has been patiently collected over many years, a process which continues today. The Association of Anaesthetists of Great Britain and Ireland has benefited greatly from the skills of Dr Essex-Lopresti, in the transfer of much material from old film to modern video format.

The members of the History of Anaesthesia Society present at the meeting were treated to an astonishing series of film extracts including:

- Chloroform Administration (1938)
- Design and Testing of Life Jackets (1945)
  The famous Macintosh/Pask experiments
- Anaesthesia for Facial Surgery (1945)
- d-Tubocurarine (1947)
- Reduction of Surgical Haemorrhage by Controlled Hypotension (1952)

The film presentations were enhanced by the commentaries and explanations provided by Dr Essex-Lopresti.

Editor

HYPNOSIS – TALK AND DEMONSTRATION

Dr B.D. Johnson

Dr Johnson began his presentation by reviewing the long history of hypnosis and the trance state. There are reliefs on tombs in Luxor in Egypt which depict men passing their hands in front of the faces of others who then adopt the facial expression so often seen in those in a trance state. This was 3000 years ago and there can be little doubt the Egyptians used hypnosis in a curative way.

Aesculapius relieved pain by stroking his patients to produce a trance state, a practice which today would require certain chaperoning. Hippocrates made passes of his hands over his patients which was a technique adopted by the priests of Chaldea and also in the early Druid religion. This latter process resulted in a state referred to as 'Druidic Sleep'.

Perhaps the most wellknown of the 'modern' hypnotic therapists was Franz Anton Mesmer (1734-1815) – he was a colourful character who dressed in quaint robes. His patients were seated round a tub filled with salted wood shavings out of which protruded iron bars – he believed that 'animal magnetism' passed from the healer to his patients. Mesmerism became a popular practice in Paris but in 1784 Louis XVI set up a commission, which included Dr Guillotin, which discounted the concept of animal magnetism and said the effects of mesmerism were all due to imagination.

It was around this same period that the Marquis de Puysegur coined the term 'somnambulism' to describe the mesmerised state. Then in the 1830s an Edinburgh surgeon called James Braid (1795-1860) practised hypnosis which was referred to as 'Bradism', but it was he who suggested the term 'hypnosis,' deriving it from the Greek word hypnos for sleep which has, of course, nothing to do with hypnosis. This can be clearly seen by comparing the alpha waves of the EEG of patients either awake, asleep or hypnotised – all three are different.

The next practitioner of note in this historical review was James Esdale (1808-1859) who practised in Bengal whilst an Army medical officer. He described in his book the trance state as being produced by 'Odylic force'. Esdale prepared his patients for major surgery with up to six hours of hypnosis and his case reports give a fascinating account of his technique.

In America one Phineas Quinby, a friend of Mary Baker Eddy, of Christian Scientific fame, is said to have performed surgery under hypnotic anaesthesia and, around the same time, John Elliotson of UCH was practising the technique in London. Moving a hundred years forward to 1942 – one Squire Ward, amputated a leg of a patient under hypnosis.

What is hypnosis?
It would be nice to be able to define what hypnosis is – an 'induced state of hyper-suggestibility' is the best Dr Johnson could attempt. He went on to describe the phenomenology of hypnosis – what one does to produce the state and what is produced when one has achieved it.

The induction of a hypnotic state has certain common features to all methods – firstly concentration – the patient must concentrate on something, a pencil, a point on the ceiling, it does not matter which, but they must concentrate on it totally. Secondly, the patient has to relax – starting with one part of the body, say the big toe, and then gradually working up the legs, arms, chest etc until they are totally relaxed. As this process of relaxation continues one suggests that the subject is becoming drowsy, the eyelids are becoming heavy and, if one proceeds in this way talking in a monotonous tone in an authoritative manner, then 98% of the population will pass into a light hypnotic state with the eyes closed and respiration regular.

In addition to these methods of concentration, relaxation and suggestion, one can add other techniques. Distraction is particularly useful for children – while they are concentrating on staring at one particular feature they are asked to perform some form of mathematical calculation appropriate to their intellect, whilst at the same time the operator continues to suggest further relaxation and increased drowsiness to the patient so that they enter hypnosis whilst concentrating on their maths problem.

Dr Johnson also referred to the 'crash induction' technique which was suitable for those who had been placed in a hypnotic state before. One can state that they will go into trance when one reaches the count of five and then rapidly count 1, 2, 3, 4, 5 and the patient should enter hypnosis. If, however, the subject does not pass into a trance, confidence is destroyed and other attempts to produce it prove difficult, or even impossible. Alternatively, a trigger word or passage of music can be used, but these can have unfortunate sequelae if this word is used in general conversation, or on hearing the 'sleep music' from other sources. He could not recommend the technique of 'flooding' or 'confusional induction' where the patient is battered by a whole series of verbal suggestions.

An aid to deepen this hypnotic state is that of 'reinforcement' where the operator suggests, for example, that the patient's arm will become progressively lighter as he counts from one to ten and will eventually float in the air. As one then counts, one progressively decreases pressure on the patient's arm so they perceive a lightening effect and enter a deeper state.

There are various stages of hypnosis into which a patient may be placed. Light trance is the simple state referred to previously that 98% of the population will enter after a relatively short induction period. The patient is aware of themselves, of their surroundings and of the operator and they are in control of the situation. They are relaxed and are susceptible to some degree of suggestion – for example one can suggest that an arm is in an analgesic state which one can prove by subjecting it to a painful stimulus without apparent effect.

This state Dr Johnson preferred to call 'turned on tranquillity and relaxation' rather than hypnosis which often has more evocative connotations. There is a second stage of medium trance which often has an amnesic part wherein the patient is less aware of their situation and surroundings, and can have no memory of events during this session.

If one progresses into the third stage of hypnosis, known as deep trance (referred to as 'somnambulism' by Puysegur), then a very different situation is achieved. Only ten to fifteen percent of the population can be placed in this state which exhibits many interesting phenomena.

The first of these is 'regression,' ie. taking the patient back to a previous episode – the patient does not remember the episode – they are in. This latter feature is often typified by their facial expression, voice and ability to perform certain tasks, eg. drawing a cat. He highlighted the case of someone brought up as a child in France who, as an adult, could not speak or understand French yet when regressed under hypnosis was fluent in the language, and exhibited the emotional consequence of the stage to which they have been regressed.

Abreaction can be performed at this level of trance state where a patient, by constant practice themselves after initial instruction, can accustom themselves to stimuli which had previously produced major systemic upsets and thus learn to tolerate them. The presence of tobacco smoke was one example referred to. A technique based on this can be helpful in dealing with phobic states.

Post-hypnotic suggestion is also possible at this level of trance; a patient may be told to perform an act like opening a window at a specific time after they have been brought out of trance. This phenomenon is particularly interesting as the mind subsequently rationalises an explanation for this act being performed or decision being made. For this reason, evidence obtained under hypnosis is not regarded as fact in a court of law.[1] It can be used to enhance memory by asking 'what car did you see?' or 'which people?,' but corroborative evidence must be present before it is acceptable, as false information can be implanted, sometimes by accident.

The uses to which hypnosis can be put include modification of sensation so that surgery can be performed, simple dental procedures can be carried out without anaesthesia and even intractable pain patients can be helped. Childbirth is another area where this technique can help.

The motor system can be controlled in the same way – catatonia can be induced which has little practical medical use unless it is to suggest to a patient in plaster or with a cross pedicle skin graft that their position is in fact a comfortable one. It can be used to help habit spasms or stuttering, although there are other factors in this.

Hypnotism can alter psychosomatic states; pulse, respiration and saliva production can be modified, the first stage of labour can be shortened, capillary bleeding after dental extraction can be statistically diminished and false burns can be created with an unlit cigarette as evidenced by blisters on the skin.

Some skin conditions like eczema and icthyosis can be helped as can some asthmatics. Chronic bed wetting can be cured in some patients too. The majority of patients who attend a hynpotist as a medical referral do so after seeing numerous specialists, as a sort of last ditch attempt to find help. There are occasional great successes but also many complete failures in treatment.

Many conditions such as the mild phobias and compulsions can be helped – fear of flying, fear of spiders and snakes, agoraphobia, compulsive eating or smoking, fear of public speaking and examination nerves are all amenable to treatment. The patient is taught to 'turn off their tension' and to 'turn on tranquillity'. Self induction by the patient themselves is probably the treatment of choice.

There are ethical considerations – there is a principle of integrity whereby one should not interfere with the human mind or body unless there is a very good reason to do so.

Dr Johnson believed that hypnosis was not a 'party trick' and therefore would not demonstrate his techniques before a lay audience. He believed it to be a valuable therapeutic manoeuvre as outlined and continued to demonstrate his ability to induce hypnosis by demonstrations to medical audiences. He also believed very strongly that only a medically qualified person should perform hypnotism as otherwise potentially lethal pathologies can be masked by the removal of symptoms, eg. removing a chronic headache which was due to a cerebral tumour. All patients should be fully investigated by relevant specialists before hypnotherapy was tried. Hypnotism is no universal panacea.

Dr Johnson then gave the Society a demonstration of hypnosis, on a willing subject, which clearly demonstrated the major aspects of his lecture.

Reference

1. Tashworth H. Criminal Law Review 1980, p.470.

Editor

PRIESTLEY'S ELECTRICAL MACHINE

Dr W.D.A. Smith

After the Congress on the bicentenary of nitrous oxide in 1973, I had planned to repeat Priestley's nitrous gas experiments, but chemists objected as the purity of his chemicals was unkown. I did however repeat his experiments with fixed air in a brewery. Electricity was of great interest to Priestley, and it was this that really fired his scientific imagination. He repeated, described and extended previous experiments and designed his own apparatus. He made a second electrical machine with the help of his brother, Timothy, from whom the Infirmary at Leeds bought an example for £5.11s.6d. in 1767.

Replicas were made by Mr Kahl Horner from my derelict mahogany table and they symbolise the state of contemporary science and Priestley's scientific entrée.

The machine generates frictional electricity between a rotating glass globe and a leather pad underneath it. The electrical connection led to the top of the globe by suspended needles and by a chain to the pad.

> *Editor: Dr Smith then showed a short video of the electrical machine in action and various experiments being performed. It is to be noted that a copy of this video has been donated by Dr Smith to the Association of Anaesthetists where it and others in the collection may be viewed by appointment.*

The replica of this electrical machine is now with Mr Horner, the senior workshop technician at the University Department of Anaesthesia, Leeds.

Dr Smith then showed a short film of his experiments with carbon dioxide at the Theakston Brewery at Masham.

WILLIAM CLAYFIELD'S MERCURIAL AIRHOLDER

Dr W.D.A. Smith

Humphry Davy's early experiments with the measurement of uptake of nitrous oxide and of lung volumes used an apparatus called William Clayfield's Mercurial Airholder and Breathing Machine. Clayfield derived the idea having seen James Watt's gasometer, then called Hydraulic Bellows, but Clayfield's airholder was made of glass and sealed by mercury instead of water.

Full excursion of the bell turned a pulley, from which it was suspended, through one revolution. The counterpoise weight was suspended from a second spiral pulley to allow for change of upthrust with depth of immersion. The cavity at the top of the internal cylinder was intended 'to contain any liquid it may be thought proper to expose to the action of the gas'.

For respiratory experiments the subject breathed directly into the bell, allowing his head to follow. Davy emphasised that only after many experiments, breathing air, could he begin and end in the same posture.

A replica of this airholder was made in the Leeds University Department of Chemistry by Mr H.S. Butler, the non-vitreous parts by Mr Horner.

> *Editor: Dr Smith then showed a short film of the use of this apparatus. The replica is now displayed in the Wellcome Collection at the Science Museum, London.*

The portrait

Nine weeks ago tomorrow, Mr Horner, the senior workshop technician at the Leeds University Department, visited the Antique Scientific Instrument Fair in London. The following Friday he mentioned seeing there an oil painting of a young gentleman behind whom was depicted Clayfield's mercurial airholder. The subject, apparatus and artist were unidentified. The young subject might have been Davy because he alone published results obtained using this unique airholder. Mr Horner couldn't remember the name of the dealer, but over the weekend he selected the two most likely from the list of exhibitors, one in Covent Garden, the other in Duke Street. Then I went to London to search.

It wasn't the Covent Garden dealer, but there I got a third name. The Duke Street dealer didn't seem to exist, so I tried the third one, and that led to the painting. It was about 14″ × 11″, and photography was permitted. Clayfield's mercurial air holder is quite undeniable.

About the portrait, I was biased by expectations. I carried no reference material with me, and I had to wait for processing of my film, so meanwhile I had to rely upon my very fallible, visual memory. The face seemed possibly young enough for Davy at Bristol but from memory it looked older than in the Sharples likeness of Davy taken there and he looked a bit older than the Howard portrait of Davy at the Royal Institution when he was 23. The face was not convincingly Davy's, but I felt that two artists can sometimes make one subject look like two different people and that we shouldn't reject the idea.

I was perplexed by the hair. Against the young face and the heavy dark eyebrows it looked inappropriately grey and unlike the hair in Davy's portraits, it just looked odd to me. The dealer asserted that the subject must have invented the apparatus. I was unconvinced. Clayfield was vague about the use of his air holder, as if it were an invention awaiting an application, and I was biased by Cartwright who quoted Gregory Watt: 'Oh that I could hear of the reformation of that profligate Clayfield'. Cartwright added that Clayfield seemed to have been a pupil of James Watt and in general charge of the apparatus for producing gases. He described Clayfield as 'dissolute and lazy but still an eager chemist and a follower of the elder Watt'. That description doesn't seem to quite match the gentleman portrayed. Furthermore, although not visible on the photograph, heading the sheet of paper is the word 'Experiments'. I was unaware of any experiments performed by Clayfield using the air holder. I felt the presence of the air holder might point as much to the Pneumatic Institution as to Clayfield himself.

A portrait of the founder of the Medical Pneumatic Institution certainly does not match, nor would James Watt be a likely candidate; other people for consideration are surgeon John King – and that has been ruled out in Bristol after comparing with known portraits and written descriptions; Dr Kinglake had his own busy practice, I don't think he did any experiments in the Pneumatic Institution, although he was part of it; Mr Sadler, an interesting person, but I think not as likely as Clayfield; and Tobin and Cox probably very unlikely.

The Bristol art gallery solution to the grey hair was hair powder and that I accept. The black trousers were said to date the portrait about 1815 to 1820. The National Portrait Gallery has record of a portrait of W. Clayfield, Esq. by Henry Singleton, exhibited at the Royal Academy in 1805, but this has not been located, it could be the same. Scattered evidence suggests more Clayfield than assumed implications from Cartwright's meagre evidence.

Forty-eight hours ago, I received from the Wood Library Museum of Anesthesiology in Chicago, photocopies of manuscripts said to have been addressed to William Clayfield, and this is consistent with their contents. They probably were for him but for reasons unknown, his name had been erased from most of them. The writers were Beddoes, Davy, Davies Gilbert, J and J.W. Tobin and J.W. Williams. They refer to analyses of metal ores and wastes, to an iron cement, to the marriage of J.W. Tobin, to current affairs and to fishing. They include an interesting note from Dr Beddoes to Dr Darwin, most probably referring to Clayfield, which reads: 'The bearer is my particular friend, the most ingenious philosopher in this part of the world and who nothing but money getting prevents from being among the most successful explorers of nature anywhere'.

Evidence from the University of Keele

Much has been unearthed by Dr Hugh Torrens at the University of Keele. He very kindly lent me his file, which reveals what follows:

> William Henry Clayfield died in 1837 aged 65, so he was about 29 when Gregory Watt bantered about his profligacy. He was about 33 when his portrait was exhibited and perhaps between 43 and 48 when those trousers were painted. Obituaries described Clayfield as a gentleman of high philosophic and scientific attainments, having from a very early period devoted all his leisure time to the

acquisition of knowledge, chiefly in the several departments of chemistry, botany, mineralogy and geology. Davies Gilbert, later President of the Royal Society, noted in his diary that William Clayfield's father, Michael Clayfield, was 'a man of much science and knowledge, of very low origin, but he married Miss Morgan of rather high connections'. Directories recorded him as a tobacconist and distiller.

Michael had three sons, Edward, Charles and our William. Davies Gilbert noted that Edward married a Miss Ireland, and acquired with her a considerable fortune and became a great sugar broker and spirit merchant. He died in 1825, leaving several children. About William: 'wellknown as a chemist and philosopher', he ascended with Mr Sadler in a balloon and had the misfortune of descending in the Severn. He was living unmarried in 1825. James Sadler was father of the Pneumatic Institution Sadler.

Edward and William Clayfield were partners in a wine merchants' business, and they owned a colliery. Edward was on the original committee of management of the Somerset Coal Canal. Trevithick visited them in 1802 to discuss the installation of a high pressure steam engine for pumping and winding at Clayfield Colliery. In 1799, James Sowerby and Dawson Turner recorded that at Bristol they had received kind attention from Dr Dyer and Mr William Clayfield, who pointed out the more remarkable local plants.

William Clayfield, of course is associated with the Medical Pneumatic Institution circle. In November 1798 Davy wrote to Davies Giddy (who was the same as Davies Gilbert, who changed his name): 'I suppose you have not heard of the discovery of the native sulphate of strontium in England. We have it in large quantities, mistaken for sulphate of barytes till our friend Clayfield detected strontium. Clayfield has been working on it, we have persuaded him to publish his analysis.' Warner, in 1801, discussing the local occurrences of strontium sulphate, commented 'the varieties found had undergone very complete analysis by that excellent chemist, Mr W. Clayfield, he had published a paper on the subject.'

Clayfield was a close friend of James Watt junior, who took over from his father, and it was he who broke the news of Dr Beddoes' death in 1808. Friendly correspondence between Clayfield and Davy up till at least 1816, aired their common interest in fishing. When Davy published his *Elements of Chemistry* in 1812, he wrote to Clayfield: 'I have not sent you a copy of my book, for I have thought that the best mode of avoiding giving offence to some was by not making any presents at all. Had I not so determined, one of the first copies would have been sent to you.'

Clayfield and Humphry Davy

I wonder how much Davy learnt from Clayfield in the early days? Did Clayfield conceive his air holder in the context of chemical analysis? Had a breathing machine been his main object he might have produced something easier to use, and this thought of using it for respiratory purposes may have been suggested by Davy or Beddoes, for certainly Clayfield's previous lignum vitae versions of the air holder would have quite impractical for respiratory experiments.

In his *Life of Sir Humphry Davy*, (1831), John Ayrton Paris noted that 'Thomas Beddoes was occasionally assisted by Mr William Clayfield, a gentleman ardently attached to chemical pursuits and whose name is not unknown in the annals of science. Indeed, it appears that to him he was indebted to the invention of the mercurial air holder by which he was enabled to collect and measure the various gases submitted to examination'. Perhaps an historian of chemistry can help us with elaboration of the air holder's likely applications.

In 1800, Davy told Davies Giddy that Clayfield was engaged in commercial speculations. In 1803 Clayfield corresponded with James Watt Jnr about the availability, composition and cost of metallic wastes, particularly of lead. That year, Clayfield filed a patent specification entitled *'Extracting lead etc. from regulus and ores'* and in 1804 another: *'Separating potash and soda from their sulphates and sulphurets'*.

I retract my previous reservations about Clayfield. I think this portrait is most probably of him, although we would like to learn a lot more; but whoever the subject was, now that the chain of improbable circumstances has brought the painting to our notice, it would be a pity were it lost to sight. It has its own charm, and one could wish for it to land up at an institution where the association with Dr Beddoes, Sir Humphry Davy, the Medical Pneumatic Institution and nitrous oxide would be understood and appreciated.

> *Editor's note:* The portrait was subsequently purchased by the Association of Anaesthetists and can be seen at 9 Bedford Square. The portrait is still believed to be that of William Clayfield and painted probably by Singleton.

HISTORY OF ELECTRO-CONVULSIVE THERAPY

Professor Sydney Brandon

Fifty years have passed since the first electro-convulsive therapy, but there is a very long history of the use of electricity and of shock treatment in medicine and psychiatry. There is also a long history of controversy in this area despite good documentation of its efficacy and safety. The earliest reference to electricity in medical treatment probably relates to the use of the electric eel, the electrical torpedo or cramp, whose properties were known to Hippocrates. Scribonius Largus in AD 47 described the use of this fish to treat the headaches of the Roman Emperor Claudius, while Galen employed the electric fish in the cure of gout and other diseases. Paracelsus extolled the disease-ameliorating powers of the magnet, but the full flowering of electrical treatments probably occurred in the 18th century.

Early ECT

In the mid-18th century Michael Shuppach, an Emmental doctor, treated a Swiss farmer's wife possessed of the devil. She required eight shocks on consecutive days and for the eighth and final shock he reserved one of such severity for Beelzebub himself. Richard Lovett, a lay clerk at Worcester Cathedral, published in 1756: *'Subtil medium proved – its Various Uses in animal Oeconomy particularly when applied to Maladies and Disorders incidental to the human body'.* He gives methods for applying it in each particular case.

The successful treatment of mental disease with electric sparks or current so impressed John Wesley, the leader of the Methodist reformation, that he wrote: 'I doubt not that more nervous disorders would be cured in one year by this single remedy than the whole English materia medica will cure by the end of the century' and he included it in his book: *Primitive Physick or an easy and natural method of curing most diseases* first published in London in 1755 in English, because he wished to prevent the conspiracy of medical men who continued to write their recommendations in Latin. He offered various cures for melancholy and gave concoctions of agrimony, distilled vinegar and so on, but he was quite clear that if these recommendations failed to secure a cure, there was a desperate remedy and that was electricity, which he personally endorsed.

His electrical machine is now in the Wesleyan Museum, and with it he had remarkable success. He, of course, advised that there were a variety of remedies, and for less serious disorders he extolled the virtues of fresh air, thyme tea and valerian root, but he added the practical advice that: '. . .when collecting valerian root, the true valerian root has no bad smell, but if it has, cats have pissed upon it, and it should not be used'. He also adds that: 'I am firmly persuaded that there is no remedy in nature for nervous diseases of every kind comparable to the proper and constant use of the electric machine'.

The machine is very similar to one used by Benjamin Franklin in 1782 to cure a young woman with hysterical fits. Franklin, from considerable clinical experience, later observed that improvement was always evident on the fifth day of treatment, an observation that some have taken as a support of the role of suggestion but a similar delay occurs in other forms of electrical treatment. Sir John Pringle, a Fellow of the

Royal Society, wrote in his *Discourse on the Torpedo* in 1774: 'Its name alone is sufficient to ascertain the knowledge the ancients then had of its torporific qualities'. 'Before the days of Galen the torpedo fish was applied live to parts affected and particularly for the cure of an obstinate headache'. He also noted that Galen had observed that 'the touch of a living torpedo stupefied or blunted the acute sense of pain'. Subsequent authors mentioned the calming, stupefying or sleep-inducing qualities of electrical treatment.

In 1792 George Birch, a surgeon of St. Thomas' Hospital, treated a melancholic hospital porter, who had been ill for more than a year, 'with six small shocks passed through the brain in different directions on each of three successive days, following which the porter regained his spirits and went back to work where he remained perfectly well for seven years'.

The torpedo fish was superseded by the electrostatic and later, the electromagnetic machine, which was widely produced in Victorian England. By the end of the 18th century there was already anxiety about the widespread use of this incompletely understood therapy. Jean Paul Marat, better known for his part in the French revolution, wrote in his *Memoires sur l'electricité medicale* in 1783: 'It is not sufficient to know how to turn the handle of an electric machine but necessary to know the mechanism of what one is employing as well'. If one actually abided by that one would have to abandon many treatments in medicine!

19th Century developments
By 1801 Augustin had observed that patients slept better after galvanic treatment and Bischoff claimed to have cured hysterical paralysis and stupor by the application of direct continuous current. In 1804 Aldini reported the cure of two melancholics by galvanism and by 1818 Heinroth was able to report that Perfect, Birch and Wohlrab had all been successful in treating melancholia by electricity. With the magneto-electric machine, some recommended that one electrode should be placed on the head or spine and that the other electrode should be placed in the rectum, a procedure which no doubt accelerated improvement!

Stransky at the end of the 19th century described a natural experiment involving more direct application of high voltage electricity. A schizophrenic patient in a severe delusional state escaped from an asylum and, in order to avoid his imagined persecutors, climbed an electricity pylon where he received a severe shock which threw him to the ground. He sustained burns and other injuries which left him in a critical state for several weeks, throughout which time he was lucid and entirely free of psychotic symptoms. Thus, claims, Dr Hoff '. . . though his injuries proved fatal, he died cured'.

Engleskjon in 1884 described an 'electrical neurosis' which developed with the improvement of the illness under treatment but was characterised by sleeplessness, depressed mood, restless malaise and abnormal limb sensations which he attributed to a temporary side effect on normal cells and was a penalty for the benefits of the treatment of the abnormal cells. Benedikt in 1885 described cases treated for otological conditions, one of whom developed severe memory disturbances after electrostatic treatment for 'neuralgia of the legs' losing her memory for several days in succession after treatment.

Non-electrical shock treatment

In 1707 Von Helmont, having heard of a Dutch carpenter being cured of his insanity by falling into a canal, advised plunging patients into cold water. One German physician advocated a 'surprise boat' in which the attendant quietly rowed the patient into the centre of the lake and then, without warning, pitched him overboard. Johann Reil in 1780 advised 'non-injurious torture' including ducking in water, the straight jacket, the use of cowhide, firing of unexpected cannon shots and other means of inducing fear. In 1793 Fransisois Nadeau in his MD thesis entitled *An attempt to treat mental disorders* wrote: 'Shocks which are very moderate or are induced at the right time are often very useful. They may occasion certain reactions, certain changes which help to restore a person's nature and to improve his functions'. Later psychiatrists produced the 'bath of surprise' where a trap-door opened beneath the victim plunging him into a cold water tub several feet below. Benjamin Rush was not only a signatory to the American Declaration of Independence but also the designer of both the tranquiliser and the twirling gyrator.

Drug-induced convulsions

Turning to actual convulsions, hellebore, (Veractum) often used as a symbol for madness, was employed for thousands of years in the treatment of insanity and frequently caused seizures. Hippocrates prescribed hellebore for the philosopher Democratus and subsequently wrote: 'Hellebore when given to the sane pours darkness over the mind but to the insane it is very profitable' – a claim which echoes that made by many modern psychopharmacologists. The ancient writers did note that patients with melancholia or other psychoses often experienced a remission after epileptic convulsions from any cause but did not follow up the observation or attribute the effect to hellebore or camphor. Camphor was widely used by the ancients and Avicenna, towards the beginning of the second century, popularised it as a remedy for nervous diseases of all sorts. It was early recognised as a cause of convulsions if used in large doses, and Paracelsus, in the 16th century gave large doses of camphor by mouth as a cure for lunacy.

The ancient Greeks regarded epilepsy as a sacred disease, even the word is derived from the Greek word meaning seizing, as a convulsion was seen as the seizing of an individual by some demon, spirit or god, the resulting struggle being seen in a fit. Nicholas Culpepper, in his herb book, called hellebore a herb of Saturn, thus relating it to melancholia but stating the roots are effective against all known melancholia disorders. William Battie, a president of the Royal College of Physicians, in his treatise on madness recommended hellebore as specifically antimaniacal and is said to have used it on the King. Leopold von Avenbrugger claimed camphor as a specific for certain types of insanity but again he noted the severe and prolonged convulsions and speculated as to whether they were the most effective aspect of the treatment.

Dr Weickhard in *Practical Medical Handbook* published in Vienna in 1798 recommended epileptogenic doses of camphor in the treatment of Wahnsinn, roughly speaking a delusional state, and Szerkeres, a Hungarian physician, revolutionary and priest wrote that for Wahnsinn 'Paulinsky recommended camphor beginning with a dose of 10 grams and increasing the dosage 5 grams daily up to 60 grams. The patient will develop dizzy and epileptic attacks. When he awakens from the epileptic attack, his reason will return'. Burrows in 1828 similarly recommended camphor in large doses 'in a case of insanity where two scruples were exhibited it produced a fit and a perfect cure followed'.

Insulin
Following the isolation of insulin by Banting, Best and McLeod in 1922, a variety of experiments with the substance began. It was soon widely used to combat anorexia and a number of observations were made on its beneficient effect upon mood. Klemperer preceeded Sorkel in observing that 'insulin improved the general state of mental patients by producing hypoglycaemia'. Sakel was at this time treating morphine and alcohol addiction in Berlin and, believing that the withdrawal symptoms with excitation and over-activity resembled hyperthyroidism, decided to use insulin as a thyr^id and adrenal antagonist. Between 1927 and 1933 he had some success with this treatment and progressed to the use of higher doses to produce pre-coma or coma in excited or over-active patients and began to use the method with schizophrenic patients. In 1933 he was forced to leave Berlin and arrived in Vienna as a refugee.

Professor Wagner-Jauregg was awarded the Nobel prize for his discovery of malarial treatment, but he had failed to treat successfully a patient with schizophrenic illness, associated with obesity and marked hirsutism, after more than a year of intensive therapy. Hans Hoff was approached by the girl's mother with their joint suicide ultimatum and in desperation sought Sakel's advice. In secret and without protection from the law and in great fear of Professor Wagner-Jauregg they admitted the patient to a private institution and began insulin shock treatment. After the second shock, she appeared coherent and spoke to her mother for the first time in six months. After a relapse, she had a few more shocks but then made a complete and sustained recovery. After the second successful case, Hoff approached Professor Potzl, who was head of the university clinic at that time, and asked for Sakel to be given full facilities and it was here that he developed the so-called Classical Sakel Shock Treatment. In the early days he became convinced that convulsions, which initially occurred as a complication of the hypoglycaemic comas, were an inportant factor in the patient's eventual recovery. Later, however, when Meduna developed another shock treatment and rivalry developed between them, he declared that too much emphasis had been placed upon the convulsion and deplored the development of Meduna's shock treatment.

In a 1954 paper *The classical Sakel shock treatment – a reappraisal*, Sakel castigated psychiatrists for their failure to make full use of his comprehensive therapy. He also observed that the disrepute into which the routinised use of shocks had fallen was entirely deserved.

It was some years later, of course, that a British psychiatrist demonstrated that the apparent beneficial effects of insulin therapy with or without shock treatment on schizophrenia were entirely a placebo effect related to the intense care which the patients received.

Camphor
The work of von Meduna arose from a totally different set of observations and circumstances to those which had motivated Sakel. Nyiro and Jablonski in 1929 suggested that schizophrenia had a mitigating effect upon epilepsy and in May 1937, in Hungary, Nyiro attempted unsuccessfully to treat schizophrenics with the serum of epileptic patients. Mueller in 1930 reported two cases of catatonic schizophrenia which were cured when they developed epileptic convulsive crises and in 1931 Dr Glaidus cited eight cases in which an eruption of schizophrenic symptoms occurred when the epileptic ones disappeared. At that time, one must remember, in the early

thirties, a large number of patients in psychiatric hospitals had major brain damage of one kind or another, and so called 'epileptic psychosis' was extremely common. Meduna, observing the apparent interaction between epilepsy and schizophrenia, determined to attempt the induction of convulsions into schizophrenic patients. He first experimented with guinea pigs, using camphor, and after many successful experiments, decided on 23 January 1934 that he would induce the first convulsion in a human patient by the intramuscular injection of 25% camphor in olive oil. The experiment was entirely successful, the patient had a convulsion, but Meduna was so distressed by the experience that he had to be supported from the room by his nurses. He published the first results of this in 1934 as *Attempts to influence the course of schizophrenia by biological means*, reporting favourable results in ten out of twenty-six cases.

The troublesome effects of camphor led, of course, to a search for other agents and soon he began to use pentamethylenetetrazole (Cardiazol) by intravenous injection. This treatment was quite widely used, though it was not universally adopted because of the difficulties of administration and fears of adverse drug effects. Metrazol (a synthetic camphor) and Cardiazol became increasingly widely used and in this country Alexander Kennedy in the late '40s, was able to demonstrate major changes in morbidity associated with psychiatric illnesses as a result of the introduction of this treatment.

Electro-therapy

The next major development, however, was due to Ugo Cerletti ably assisted by Bini. Cerletti in Genoa had engaged in experimental work to determine whether or not the sclerotic changes in Ammons Horn were the cause or a consequence of epilepsy. To attempt the induction of lesions, he induced convulsions in dogs by shocks delivered from electrodes in the mouth and the rectum discharging 125 volts over 0.5 seconds. In 1935 he became Professor of Neuropsychiatry in Rome and continued his work with dogs but came to speculate about the possibility of using electric shocks as a convulsive agent in therapy. Many of those animals in which the electrode was placed in the mouth and the rectum suffered not only brain damage but cardiac arrest as a result of changes in the electrical activity of the heart. He learnt earlier that an electric shock to the head was used to slaughter pigs in the Rome slaughter houses and subsequent investigations demonstrated that in fact the animals were merely stunned, and in their stunned state were slaughtered. He showed that they could survive high doses of substantial duration without either brain damage or cardiac arrest. Bini had observed that deaths only occurred when the electrodes were attached to two distant points in the body and never when the passage of electricity was through the head. It was Bini who designed the apparatus for human use and they reported it as a possibility in a conference in May 1937, but despite having a very wide animal experience and suitable apparatus, it was more than a year before the ultimate human experiment was made.

The first patient

In June 1938 a schizophrenic patient was brought in by the police. He had been found wandering in the railway station in Milan without a ticket or any means of identification and, although physically healthy, he was bedraggled and alternately mute or expressing himself in an incomprehensible jibberish made up of odd neologisms. It was clear he was suffering from a severe schizophrenic disorder, possibly a chronic one, and since the Medical Defence Union had not then ruled on formal consent, they decided he was a very suitable patient for their first experiment. He was not treated in the normal treatment area but in a small technicians' room in the hospital. There are many accounts of this first treatment and one that I find most appealing, but not necessarily the most accurate, is as follows:

> The patient was brought in, but there was great apprehension among those who had gathered, and fears that the patient might be damaged. So, though higher doses had been used in animals, the shock was cautiously set at 70 volts for one tenth of a second. This low dosage predictably produced only a minor spasm, after which the patient burst into song. Cerletti suggested another shock at a higher voltage, and an excited and voluble discussion broke out among the spectators, who included Bini, Longhy, Accornero, Kalinowsky, Fleischer. At least twenty other people have claimed to have been present at different times in a room which probably only held three or four. All of the staff objected to a further shock, protesting that the patient would probably die. But Cerletti, like all professors, was familiar with committees and knew that postponement would inevitably lead to prolonged and possibly permanent procrastination, decided to proceed at 110 volts for half a second. Before he could do so the patient, who so far had not participated in the discussion, sat up and pontifically proclaimed in clear Italian with no hint of jargon 'Non una second! Mortifera' (Not again! It will kill me). Professor Cerletti hesitated but gave the order to proceed. After a successful convulsion and recovery of the patient, Cerletti asked him: 'What's been happening to you ?' 'I don't know' the man said, 'perhaps I have been asleep'. He remained jargon-free and gave a complete account of himself and was discharged recovered after eleven complete and three incomplete treatments over the course of three months.

Just before the outbreak of the Second World War similar machines were prepared for commercial manufacture and sale but in fact those produced in Italy for export did not leave trhe country until after the end of the war. However, details of the machine became available and a number were produced in the United Kingdom and the United States and so unmodified electro-convulsive treatment was rapidly introduced and, with perhaps the stimulus of war, became widely used in the treatment of acute depressive conditions. Bennett in 1941 used crude curare to achieve muscular relaxation and Boret in 1952 introduced succinyl-choline.* The recent histroy of shock treatment is even more fascinating than that which I have accounted but perhaps it is not my concern today.

For clinicians perhaps the most shocking aspect of the history has been the attempt to legislate against this treatment and to discredit a treatment which clearly is effective in the alleviation of considerable suffering. There is no doubt that recent scientific work has demonstrated that there is little in the way of side effects, very low mortality but very high success rate in the use of this treatment. It is interesting to note from the very beginning of the use of electricity, of shock and electro-convulsive therapy, there have been complaints very similar to those which we hear reported today. It is clear that medical practice must reflect the society in which it exists and that physicians are bound by the moral codes of that society, but ultimately the best physician must be guided by his conscience. History, scientfic integrity and commitment to the care of the indivdual patient are better regulators for clinical practice

* Daniel Boret reported the use of succinyl-choline in 1949 and this was used in Italy and Sweden in 1951 (Editor)!

than legal decree or public involvement in clinical decision making, and although first used fifty years ago, I suggest that electro-convulsive therapy will have a continuing history until it is displaced by more clearly successful treatment than we currently have available.

BIBLIOGRAPHY

1. Cerletti U. Old and new information about electroshock. *Am. J. Psychiatr* 1950; *107* 93-4.
2. Edgar I I. *The Origins of the Healing Art.* Philosophical Library, New York. 1978.
3. Frank L R (Ed) *The History of Shock Treatment.* San Francisco. 1978.
4. Hoff H. History of the organic treatment of schizophrenia. In: Rinkel M. Himwick H E, eds. *Insulin Treatment in Psychiatry.* Peter Owen Ltd, London, 1960.
5. Impastato D J. The story of the first electroshock treatment. *Am. J. Psychiatr.* 1960; *116* 113-14.
6. Von Meduna L. General discussion of the Cardiazol therapy. *Am. J. Psychiatr.* 1938; 94 (suppl) 46.
7. Mowbray R M. Historical aspects of electric convulsant therapy. *Scot. Med. J* 1959; *4* 375.
8. Sakel M J. The classical Sakel shock treatment; a reappraisal. *J. Clin. Exp. Psychopath.* 1954; *15* 255-317.
9. Stainbrook, E. The use of electricity in psychiatric treatment during the nineteenth century; *Q. Rev. Psychiatr, Neurol* 1948. *22* 156-177.

DEVELOPMENTS IN THERMOPLASTIC TRACHEAL TUBES

Mr C A Russell – Portex Ltd

The subject of my talk is the development of thermoplastic tracheal tubes. I could not resist a quotation of Sir Ivan Magill in this, his centenary year. Sir Ivan's presentation on endotracheal anaesthesia at the Royal Society of Medicine on the 2nd November, 1928, began with the words: 'The history of endotracheal anaesthesia is sufficiently well known to require only brief comment'. I am sure those words are more true amongst members of this Society than they were when Magill spoke to the Royal Society of Medicine.

Intubation has a recorded history back to Egyptian times. In 1543 Vesalius passed a reed or cane into the trachea of a pregnant pig. In 1871 Trendelenberg[1] was well ahead of his time using a tracheostomy tube with an inflatable cuff made from thin sheets of natural rubber. The air-line even incorporated a rubber balloon to indicate cuff inflation. A milestone was Macewen's[2] device of 1880, introducing a ⅜″ brass tube via the mouth. Franz Kuhn was outstanding amongst German workers. He devised in 1902 an endotracheal tube of metal strap coiled to form a flexible cylinder which fitted the glottis in an airtight manner. The tube allowed the passage of a small catheter, the first recorded use of the technique which is in common use today in anaesthesia for aspirating operative debris during surgery.

During the second decade of the 20th century rapid advancement was seen and in 1910 the work of Elsberg and colleagues marked the beginning of endotracheal anaesthesia by insufflation. In 1917, Rowbotham and Magill [3] used narrow gum elastic tubes to inflate the lungs with ether, one tube was used to inflate the lungs, the other to carry away the expired gases. By 1928, Magill[4] was using a single wide bore, uncuffed red rubber tube; insufflation died promptly, and his continued influence started the procedure which is still in use today. In 1928, Guedel and Waters[5] reintroduced an inflatable cuff on tracheal tubes; it was originally described by Dorrance in 1910 and in 1906 the Green's catheter was used for artificial respiration. The cuffs were slid onto the tubes prior to use.

Post-war developments – Portex Ltd

If there is one name which I wish the Society to remember it would be Dr Sydney Leader, a dental surgeon at the Dental Hospital, London who, in 1940, set up a company based in his flat in Great Portland Street, London. He hence called the company Portland Plastics Ltd and this name remained until 1967 when it became Portex Ltd, the name Portex being Portland Plastics trademark at the time. This Austrian-born entrepreneur with degrees in both dentristry and medicine was marketing artificial eyes and teeth and was desperately searching for materials to replace ceramics and glass which were naturally in very short supply during the war. Whilst plastic materials were known before the second world war, the war was the catalyst for the birth of the modern-day plastics industry, and the development of materials such as polyvinyl chloride, polyethlene, and acrylic to substitute natural materials like rubber, gutta percha and shellacs which were in very short supply. Dr Leader was therefore in the right place at the right time to experiment with these new materials for dentures and eyes and, previously, for flexible dental tubing.

In the summer of 1943, Dr Leader was visiting Major Thornton, an anaesthetist at the Royal Army Medical Corps, Basingstoke General Hospital, where there was a wartime plastic and maxillo-facial surgical unit. These new materials were discussed and PVC as a substitute for rubber tracheal tubes was born. Clinical trial results were published in 1944,[6] followed by Major Gordons's paper in *Anesthesiology* in 1945,[7] which reported the results of his initial use with the Royal Canadian Medical Corps, based also in Basingstoke. The tubing was supplied in various sizes, the 7mm – 9mm size was popular, being satisfactory for the average adult male (it seems a bit small nowadays); it was supplied in coils of 10″ diameter which, interestingly, corresponds almost exactly to our current 140mm Magill radius of curvature which companies have to manufacture tracheal tubes to, to comply with International Standards. Whilst on the subject of 'Standards', it is interesting to note that the British Standard for Magill tracheal tubes was only finally published in 1986, 60 years later almost.

At this time, Portland Plastics simply supplied through M&IE Ltd the lengths of tubing and the anaesthetist had to prepare a tube by cutting off the desired length and, with scissors, cutting a bevel, the tip being smoothed with a hot spatula and polished with a cloth soaked in chloroform – I hope no-one does that today. Major Gordon's 1945 paper states: 'The rubber Magill tube is not ideal, it kinks in the naso-pharynx and movement of the head and neck will obstruct it. It also deteriorates rapidly on sterilization. The PVC tube, however, remains patent when acutely flexed; this is more marked at body temperature since the tubing becomes softer and more malleable as the temperature rises'.

Major Thornton also observed in 1944 the characteristic of the thermoplastic PVC tracheal tubes, that the tube, after withdrawal from the patient, remained moulded to the form it had occupied in the respiratory tract. This is, of course, one of the major advantages of the PVC tube, it softens and moulds to the patient's anatomy without exerting undue pressure on the larynx.

PVC tubes

In summary, the advantages of the PVC tracheal tube are:

- thermosensitivity
- uniform expansion of the cuff in the case of cuffed tubes
- non-irritant and non-toxic properties of PVC material
- formulation versatility and processing qualities which make manufacture to high accuracy and tolerances possible
- disposability.

Thermosensitivity can be demonstrated quite nicely by placing tubes, rubber and plastic in a water bath at 37°C.

In the case of cuffed tubes, uniform expansion of the cuffs occurs rather than the irregular blowing up and herniation experienced with latex rubber. Medical Grade PVC is non-toxic and passes stringent implantation tests, unlike natural rubber tubes which release toxic and irritant substances, leading to allergic reactions of varying severity.

Long-term intubation became possible for the first time, and the work of Wally Guess[8] was important in this area. On-site formulation and processing of PVC had major advantages – in fact, Portex today still manufactures its own PVC compounds, the only endotracheal tube company doing so. PVC is the largest tonnage plastic material used in the world, consequently it is easily available and costs are low. It can be moulded and extruded to very high accuracy and tolerances, unlike rubber which swells to several times the cross sectional area of the die.

With regard to disposability, the hazards associated with cross infection from patient to patient and the cost of recycling, provide strong arguments in favour of PVC tubes. Natural rubber tubes could never be produced at low enough prices for them to be considered for single use.

Cuffs
From the early 1960s to the present day, tracheal tube development has concentrated on one of the most important components of tracheal tube design – the inflatable cuff. The first integral PVC cuff on a tube was introduced by Portex in 1964. It was essentially a copy of the rubber cuff; its thickness was quite large and when inflated it resembled a 'rubber boot'! It was deliberately enlarged in diameter and reduced in thickness to obtain a more elastomeric cuff in about 1973.

The basic design remains to this day as the 'Standard' Portex cuff in our range of 'Blue-Line' endotracheal tube products. In the late '60s, however, anaesthetists were beginning to become concerned with injury to the trachea following prolonged intubation using these cuffs, and particularly over damage to the delicate ciliated epithelium lining the trachea. Lomholt[9] introduced the concept of a high volume, low pressure cuff in 1967 and in 1969, Geffin and Pontopiddon[10] pre-stretched the standard cuff to a larger diameter in boiling water to give a 'floppy' cuff. They were successful in reducing tracheal injury and development of the high volume/low pressure cuff had begun. Products such as the Salpeka cuffed tracheotomy tube were no longer required. This had two cuffs which were inflated alternately to reduce the time pressure was applied to a single site on the trachea. The Portex 'Softseal' square shaped cuff became available in 1973.

Tracheal injury
In the 1970s, explanations were sought to explain why tracheal damage was not eliminated by these bigger cuffs. It was suggested, for instance, that because of the increased area of cuff contact, the pressure was spread over a greater area! The key was, of course, to lie in the pressure inside the cuff, and the pressure applied to the tracheal wall. Crawley and Cross[11] in 1975 found that the pressure in high pressure cuffs remained constant during the ventilation cycle, the intra-cuff pressure of 160cm water vastly exceeding the airway pressure of 20cm of water whereas with the high volume, low pressure cuff there was a cycling of the pressure in the cuff with the ventilator, the distal end of the cuff being compressed by the ventilator pressure. It is, therefore, not necessary to apply the peak airway pressure into the cuff to maintain a seal, the cuff will automatically increase the pressure when necessary to maintain a seal, with a minium low pressure seal during the cycle to prevent aspiration. This understanding led us to the view that the front part of the square shaped 'Softseal' cuff simply added to bulk, a distinct disadvantage on intubation.

A seal in the trachea depends upon the pressure at the seal point, not the length of the seal; industrial lip seals/'O' rings are a clear example of this fact. Hence a large cuff in contact with the trachea does no more sealing than one of minimum length and is bound to cause damage in proportion to the area of contact. These strong arguments resulted in the pear-shaped cuff introduced by Portex in 1976 called, 'Profile'. Originally this cuff was assembled onto the tracheal tube the other way round to that supplied today. It was turned round as the slope in front of the tube could ease intubation.

In 1977, Nordin[12] published his important findings that when the intra-cuff pressure exceeded 40cm of water in rabbits, the flow of blood in tracheal mucosal capillaries was severely restricted leading to necrosis and stenosis. This provided the critical pressure that must not be exceeded, and more recent work by Mehta[13] and Seegobin[14] has reduced this to levels of 30cm water.

The final clinical study which I believe helped explain the different mechanisms of sealing between high pressure and low pressure cuffs, was provided by Mackenzie's[15-17] work in the 1980s in the USA, measuring human trachea dimensions.

Low volume – high pressure cuffs inflate as a highly stretched spheroid. They seal by distorting the trachea to adopt the same circular shape. High volume, low pressure cuffs, however, have sufficient circumference to totally fill the trachea, without distending the trachea. The cuff seals when the pressure in the cuff is sufficient to prevent gas from the ventilator forcing its way past the contact area. Because the cuff is not stretched, the pressure within the cuff is identical to pressure exerted on the tracheal wall. Also, more importantly, the pressure can be measured and monitored.

These data allowed cuff diameters to be optimised. Excessively large diameter cuffs cause creases and folds on sealing which act as pathways for fluid aspiration and require extra intra-cuff pressure to be applied to compress the folds and achieve a seal. To prevent aspiration, Mehta[13] showed that the intra-cuff pressure should exceed the hydrostatic pressure that can be generated by a column of liquid collecting above the cuff.

Tubes in the future

I would like to end on Crawley and Chandler's 1986 paper,[18] because it is interesting to consider why anaesthetists should require such a large number of tracheal tube sizes, all varying by only one half of a millimetre. It is quite clear from what I have shown, I hope, that in an adult, the cuff diameter, and hence its circumference is the most important dimension. The ideal tracheal tube size is, of course, the best compromise between being large enough to allow adequate ventilation and small enough to prevent laryngeal damage caused by the tube pressure on the tissues as originally shown in 1975 by Lindholm[19].

It has been proposed that only two tubes are required for use in adults, a 7.5mm for females and 8.5mm for males, both with optimally dimensioned 'Profile' cuffs, being suitable for 99% of the population. So maybe in five years' time you will simply ask your ODA for either a Portex male or female tube, possibly coloured blue for male, pink for female! That, I am sure, Dr Magill and Dr Leader could never have dreamt of in 1943.

References

1. Trendelenberg F. Beitrage zuden Operationen on der Luftwegen. *Arch.Klin.Chir.* 1871; 12: 112.
2. Macewen W. Clinical observations on the introduction of tracheal tubes by the mouth instead of performing tracheostomy. *British Medical Journal* 1880; 2: 122-144, 163-165.

3. Rowbotham, Magill IW. Anaesthetics in the plastic surgery of the face and jaws. *Proceedings Royal Society of Medicine* 1921; 14: 17.
4. Magill IW. Endotracheal anaesthesia. *Proceedings Royal Society of Medicine* 1928; 22: 83-88.
5. Guedel AE, Waters RM. *Anesth.Analg. (Current Researches)* 1928; 7: 238.
6. Thornton HL. Vinyl 'Portex' tubing. *British Medical Journal* 1944; 2: 14.
7. Gordon RA, Ainslie EH. Experience with vinyl-plastic endotracheal tubes. *Anesthesiology* 6 July, 1945.
8. Guess W. Safety evaluation of medical plastics. *Clinical Toxicology* 1978; 12: 77-95.
9. Lomholt N. A new tracheostomy tube cuff with controlled pressure on the tracheal mucous membrane. *Acta Anaesthesiologica Scandinavica* 1967; 11: 311.
10. Geffin B, Pontopiddon MD. Reduction of tracheal damage by the pre-stretching of inflatable cuffs. *Anesthesiology* 1969; 31: 462.
11. Crawley BE, Cross DE. Tracheal cuffs – a review and dynamic pressure study. *British Journal of Anaesthesia* 1975; 30: 4.
12. Nordin U, Lindholm C E, Wolgas TM. Blood flow in the rabbit tracheal mucosa under normal conditions and under the influence of tracheal intubation. *Acta Anaesthesiologica Scandinavica* 1977; 21: 81.
13. Mehta S. Safe lateral wall pressure to prevent aspiration. *Annals of the Royal College of Surgeons of England* 1984; 66: 426-7.
14. Seegobin RD, Van Hussett GL. Endotracheal cuff pressure and tracheal mucosal flow; endoscopic study of effects of four large volume cuffs. *British Medical Journal* 1984; 288: 965-968.
15. Mackenzie CF, Shin B, Whitley N, Helrich M. Human tracheal circumference as an indicator of correct cuff size. *Anesthesiology* 1980; 53: ASA Abstract S414.
16. Mackenzie CF. The relationship of human tracheal size to body habitus. *Anesthesiology* 1979; 51: ASA Abstract S378
17. Mackenzie CF, Hallisey J, Clark D, Steinberg S, Helrich M. Adult tracheal and laryngeal dimensions as an indication for correct tracheal tube use. *Anesthesiology* 1982; 57: 500.
18. Chandler M, Crawley BE. Rationalization of the selection of tracheal tubes. *British Journal of Anaesthesia* 1986; 58: 111-116.

DR ROBERT JAMES MINNITT (1889-1974) FATHER OF INHALATIONAL ANALGESIA

Dr E. O'Sullivan

Dr Minnitt was born nearly a century ago, on the 25th October 1889 in Preston. He was of Irish descent. His paternal great grandfather's name was Molloy, and the latter changed his name to Molloy-Minnitt on marrying a Miss Minnitt. His grandfather and father were vicars, and he himself initially felt called to serve within the church. He was admitted to Trinity College, Cambridge, but after a year decided he could serve more fruitfully in medicine.

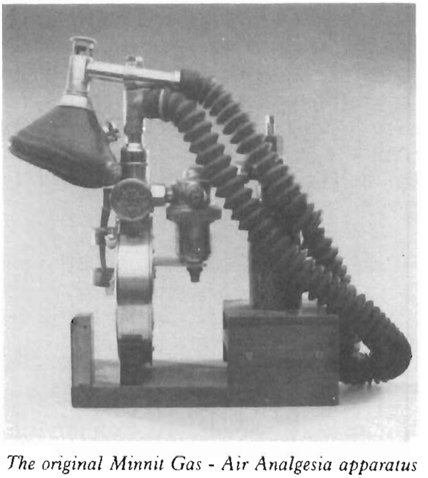
He entered the Liverpool Medical School and qualified in 1915. Thereafter he worked in the Liverpool hospitals, first as a junior doctor and then as an honorary anaesthetist. He was for many years on the staff of the David Lewis Northern Hospital, the Liverpool Royal Infirmary and Maternity Hospital.

Like most anaesthetists of his day he was also in general practice, with the surgery at his home at 73 Kremlin Drive, Liverpool, where he lived for 65 years[1,2].

Minnitt's fame rests on his life-long dedication to the relief of pain during labour. He was frequently heard to say at the beginning of his lectures on the subject: 'Let us have a great and national endeavour to secure yet another freedom, freedom from suffering for all women labouring of child, and so may the act of giving birth be but a sleep and a forgetting'. He sought a method which could be used with safety by midwives since it was they who carried out the majority of deliveries, and those mainly at home.

Pain relief in childbirth – Minnitt's apparatus

In 1933 Minnitt attended a meeting to discuss the use of nitrous oxide and oxygen for obstetric pain relief, held at the Royal Society of Medicine. The disadvantages of this combination seemed clear, and it was Dr Howard Jones who suggested that air might be considered as a substitute for oxygen. Minnitt considered the suggestion as he made his way back to Liverpool. He was soon in touch with his friend Charles King, then a well known scientific instrument maker, and he wrote: 'On July 19th, 1933, I interviewed Mr A. Charles King with regard to a means of employing nitrous oxide inhalations for the relief of labour pains and we considered the adaptation of the McKesson oxygen therapy apparatus for the purpose'. Within two months Minnitt and Charles King produced the apparatus. The Medical Board of the Liverpool Maternity Hospital appointed Dr Hilda Garry as research assistant for four months, and the first gas and air analgesia was administered at that hospital on 16th October, 1933, exactly 87 years after Morton had given the first public demonstration of diethyl ether.



The original Minnit Gas - Air Analgesia apparatus used for the first time on 16th October 1933.

The machine was essentially an adaptation of the McKesson oxygen therapy apparatus and it consisted of a reduced pressure regulator attached to a small rubber bag in a metal drum, and an automatic valve shutting off pure gas when the patient did not inhale. Below this, air was admitted through apertures to mix with the nitrous oxide. The patient hand-held her mask, so essentially this was self administration; if the patient started to lose consciousness the mask fell from her face.

During the subsequent four months, investigations of the method were conducted at two centres – at the Liverpool Maternity Hospital by Dr Hilda Garry, under Minnitt's direction and at the Wellhouse Hospital, Barnet by Dr John Elam. A paper on these two independent investigations was read at the Liverpool Medical Institution in February 1934[3]. Further work was carried out and Minnitt described in the *Lancet* in the same year, a series of cases in which electro-cardiographic studies and maternal and umbilical vein oxygen content were analysed[4]. The only variation from normal was a reduction in maternal blood oxygen content; umbilical blood gases did not show any marked variation. The average length of the second stage of labour was found to be within normal limits.

Minnitt was extremely active in the promotion of this method. He wrote several papers giving detailed instructions on the use of the apparatus. He also used gas and air analgesia as an aid to paediatric surgery. Unfortunately, the Central Midwives Board initially insisted on personal medical supervision of midwives using gas and air analgesia, and as Minnitt observed in his presidential address to the Royal Society of Medicine, 'the development of the procedure was arrested'. However, a report was published in January 1936 by the British (now Royal) College of Gynaecologists and this paved the way for acceptance by the Central Midwives Board of the administration of gas and air by unsupervised midwives using a recognised apparatus.

Teaching became a preoccupation. Minnitt lectured all over the country, prepared film strips on the use of gas and air and published a monogram on gas and air analgesia which ran to four editions, the first appearing in July, 1938.

In 1936, Standards were laid down for gas and air machines by the Central Midwives Board (C.M.B.). However, until the early 1960s, the accuracy of gas and air machines appears not be have been doubted and apparently the possible hazards of administering hypoxic mixtures to parturient women had not caused concern. A paper from Oxford on the 'Hazards of Gas and Air Analgesia' heralded the end of an era. Cole and Nainby-Luxmoore reported on the performance of 35 gas and air machines in the Oxford Region. They found almost all of these machines capable of delivering less than 10% oxygen.

It is easy now to condemn totally those hypoxic techniques. But who would wish to decry the immense benefits that accrued to womankind as a result of the introduction of the gas/air machine. In the 1970s the authorisation for the use of nitrous oxide and air was finally withdrawn. It was, for many years, virtually the only form of analgesia available to millions of British women in labour.

Minnitt's first paper in 1954 on the subject concluded with these words: 'What has been done is not a terminus, it is a thoroughfare to greater possibilities for painless labour. So may there dawn renewed hope in the hearts of women'.

Minnitt and Liverpool

Perhaps uniquely in his lifetime he was honoured by having a plaque unveiled at the Liverpool Maternity Hospital which paid tribute to his service. However, perhaps even more important, was Minnitt's influence as a teacher of safe and scientifically based anaesthesia which led to his becoming a member of that small group which laid many of the foundations of modern anaesthesia in the 1920s and 30s. He was a founder member of the Liverpool Society of Anaesthetists formed in 1930, the oldest society of its kind in the country, and was an active member of this society for over 30 years. He became the first Lecturer in Anaesthesia at the University of Liverpool in 1933 and the first anaesthetist to be a member of the Faculty of Medicine. It was in no small way due to his selfless efforts that the University Department of Anaesthesia was founded. To those who were fortunate enough to know this great man, he was an 'inspiring and generous teacher'. As a lecturer in anaesthesia at the University he attracted many future leaders to the specialty when its expansion made them most needed.

He was not only interested in obstetric analgesia. He researched into the use of insulin and glucose in the shocked state and gained his doctorate in medicine in 1925. He published widely on the problems of ether anaesthesia, examples being a paper published in the *Lancet* in 1931[5] and a presentation to the Royal Society of Medicine in 1923. He also delivered the Joseph Clover Lecture in 1951.

In 1940 Minnitt revised the *Handbook of Anaesthetics*, which had been first published in 1919 by Ross and Fairlie. This book was, in its time, one of the best expositions of this subject available, and subsequently in the 6th edition, which was published in 1944, Minnitt and Fairlie rewrote much of the original text and a considerable amount of new material was added. The resulting volume was renamed *The Textbook of Anaesthetics*. It was very widely used and was a standard work in its day.

Minnitt was honoured nationally by being elected a founder member of the Association of Anaesthetists of Great Britain and Ireland; he was an active member of the Section of the Anaesthetics at the Royal Society of Medicine, becoming its president in 1943. He received an honorary Fellowship in his own Faculty in the Royal College of Surgeons. He was the first anaesthetist to have an honorary Fellowship of the Royal College of Obstetricians and Gynaecologists conferred on him. Of the many academic honours he received, two which he especially treasured were an honorary fellowship of the Royal Society of Medicine and an MSc. honoris causa from his own university in 1967.

Minnitt selflessly devoted his life to his patients and his profession, and in particular to anaesthesia. In 1948, with the introduction of the National Health Service, he faced a personal dilemma. Believing in the traditional principles of practice, he refused to serve and resigned his post at the hospital. From then on he devoted himself to his private general practice at his home, giving personal and loyal service to his faithful patients. His contribution to research and development in general practice has not gone unnoticed; the North Wales and Merseyside Sub-Committee of the Royal College of General Practitioners sponsors the yearly 'Minnitt Prize' for research in general practice.

Minnitt was a man of outstanding integrity and completely and selflessly dedicated his life to his profession and to the service of his patients. Throughout his life he remained active in the church, and as a lay preacher was frequently asked to preach at various congregations, including that of St. Luke's Church, Formby, where his father had been a clergyman. In his latter years his life was saddened by the illnesses of his wife and daughter.

Thus as we approach the centenary of the birth of this great man we recall the words of another – Professor Cecil Gray, a good friend and an admiring colleague; he still treasures his memories and is thankful for his life of service and example. He said: 'If a man's stature in our profession is to be measured by the amount of suffering he has relieved, then Minnitt's stature is indeed great'.

References

1. Obituary – R.J. Minnitt. *The Times*; April 1974.
2. Obituary – R.J. Minnitt. *British Medical Journal*; 1974.
3. Minnitt R.J. Report to the Liverpool Medical Institute on the 'Investigation of gas and air analgesia in midwifery' February 22nd, 1934.
4. Minnitt R.J. A new technique for the self-administration of gas-air analgesia in labour. *Lancet* 1934 *i*: 1278.
5. Minnitt R.J. Ether as a cause of death after prostate operations. *Lancet* 1931; 1292.

   See also O'Sullivan, E.P. Dr Robert James Minnitt 1889-1974: A pioneer of inhalational analgesia. *J. R. Soc. Med.* 1982; 82: 221-222.

HISTORY OF ANAESTHESIA SOCIETY
MEMBERSHIP LIST JUNE 1988

Dr C.K. Adam
Dr A.K. Adams
Dr C.N. Adams
Dr J.D. Alderson
Dr J.I. Alexander
Dr E.N. Armitage
Dr L. Allan
Dr J.G. Allen
Dr G.M. Archer
Mr S. Askill
Dr R.S. Atkinson
Dr D.F. Baigent
Prof. A.B. Baker
Dr P.G. Ballance
Dr C.J. Barham
Dr A.M. Barr
Dr P.J. Baskett
Dr A.M. Batchelor
Drs. M. & J. Bembridge
Dr J.A. Bennett
Dr F.E. Bennetts
Dr N.A. Bergman
Dr P.J. Bickford-Smith
Dr R.C. Birt
Dr R.I. Bodman
Dr A.J. Booth
Dr R. Bose
Dr T.B. Boulton
Dr J.B. Bowes
Dr E.M. Bradford
Dr E.G. Bradshaw
Dr G.P. Browne
Dr K. Budd
Dr J.M. Burn
Dr J. Burton
Dr R. Calverley
Dr T.N. Calvey
Dr W. Campbell
Dr W.D. Cantrell
Dr S.J. Catling
Dr G.D. Chadd
Dr A. Chaffe
Dr J.E. Charlton
Dr C.G. Church
Dr G.S. Clark
Prof. R.S. Clarke
Dr W.B. Clarkson
Dr D. P. Coates
Dr P.A. Coe
Dr B.B. Collier
Dr I.D. Conacher
Dr M.G. Cooper
Dr I.M. Corall
Dr G.C. Corser
Dr M.J. Cowen
Mr D. Craig
Mr P.G. Cull
Dr J. Curran
Dr S.D. Dalal
Dr D.J. Daniel
Dr H.T. Davenport
Dr B.T. Davis
Dr K.E. Davis
Mr D. Dawoojee
Dr G.R. Dickson
Dr O.P. Dinnick
Dr C. Dodds
Dr B. Duncum
Prof. J.W. Dundee
Dr R.J. Eastley
Dr A. Eccles
Dr E. Ekanayake
Dr F.R. Ellis
Dr R.H. Ellis
Dr R. Emmanuel
Dr B.J. Ferguson
Dr C.N. Ferguson
Dr C.A. Foster
Dr P.M. Frost
Dr C.A. Fuge
Dr A. Gallimore
Dr M. Gamil
Mr & Mrs M. Garner
Dr A.A. Gazder
Dr L.W. Gemmell
Dr G. Gerson
Dr E.P. Gibbs
Dr E. Gilchrist
Dr D.K. Girling
Dr V.A. Goat
Dr N.H. Gordon
Dr M.B. Gough
Dr W.B. Gough
Dr P. Goulden
Prof. T.C. Gray
Dr C.L. Gwinnutt
Dr R.M. Haden
Dr G. Hall-Davies
Dr W.F. Hamilton
Dr G.W. Hamlin
Dr H. B. Hannah
Dr J. Hargreaves
Dr M. Hassan
Dr B. Hayes
Dr S.R. Headley
Prof. T.E. Healy
Dr D.G. Heap
Dr P. Helliwell
Dr A.G. Henderson
Dr J.D. Henville
Dr B.P. Hill
Mr N. Hodge
Mr C.G. Holden
Mr G.G. Holden
Dr A.J. Holland
Dr J.H. Holland
Dr J. Horton
Dr J.A. Horton
Lt.Col. I.T. Houghton
Dr B.C. Hovell
Dr D.D. Howat
Prof. A.R. Hunter
Dr M.T. Inman
Dr R.D. Jack
Dr R.H. Jago
Dr R.L. Jayaweera
Sir. Anthony Jephcott
Dr J. Jones
Dr M.J. Jones
Dr R. Jones
Dr N. S. Kaduskar
Dr L. Kaufman
Dr F.S. Keddie
Dr T. Keys
Dr J.D. Kinnell
Dr P.A. Knappett
Dr K.L. Kong
Dr R.S. Laishley
Dr, M. Leahy
Dr J.A. Lee
Dr K.G. Lee
Dr J. F. Lees
Dr J.M. Leigh
Dr A. Leslie
Dr Z. Lett
Dr I. D. Levack
Dr D.G. Lewis
Dr J.M. Lewis
Dr R.G. Lindsay
Dr A. Logan
Dr W.G. Loyn
Dr M.C. Luxton
Dr A.G. MacDonald

Sir Robert Macintosh
Dr P. Mahoney
Dr J. Mainzer
Dr R. Maltby
Dr R.E. Mansfield
Mr R.S. Mark
Dr H.R. Marrett
Dr R.H. Marsh
Dr E.T. Mathews
Dr T.E. McEwan
Dr S.W. McGowan
Dr R.K. McGregor
Dr R.P. McKinnon
Dr C.A. McLaren
Dr I. McLellan
Dr S. Mehta
Dr B.H. Meiklejohn
Dr R. Miller
Dr A.H. Mollah
Dr J. Moore
Dr J.A. Monro
Dr P. Morris
Dr J. Moyle
Dr J.T. Mulvein
Dr J.P. Murphy
Dr P.J. Murphy
Dr A.F. Naylor
Dr N.I. Newton
Mr B.W. Nicholls
Dr A.E. Nicol
Prof.J. Norman
Dr P.J. O'Connor
Dr J. Ormrod
Dr B. Owen
Dr A. Owies
Dr R.N. Packham
Dr A. Padfield
Dr W.K. Pallister
Dr B. Panning
Dr G.M. Paterson
Prof. J.P. Payne
Dr B.W. Perriss
Dr F.S. Plumpton
Dr I. Power
Dr J. Pring
Dr D.T. Protheroe
Dr D.L. Pryer
Dr R. Ratcliffe
Dr N. Redfern
Dr G.J. Rees
Brig. J. Restall
Dr L.J. Rice
Dr D.S. Robertson
Dr A-M. Rollin
Dr N.M. Rose
Dr M.A. Rucklidge
Dr J. Rupreht
Dr G.B. Rushman
Dr M.L. Rutledge
Mr R.H. Salt
Dr J.H. Sanderson
Dr D.A. Saunders
Dr D. Schiller
Dr J.L. Scholtes
Dr W. Scott
Dr J.F. Searle
Dr O. Secher
Dr J. Secker-Walker
Dr H.F. Seeley
Dr R.K. Shah
Dr R.N. Shah
Dr T.C. Shaw
Dr P.H. Simmons
Dr B.H. Smith
Dr G.B. Smith
Dr I. Smith
Dr M.R. Smith
Dr T.G. Smith
Dr W.D. Smith
Dr G.W. Snipes
Dr P.M. Spargo
Drs. J. R. & D. Spears
Prof. A.A. Spence
Dr J.B. Stetson
Dr K.A. Stewart
Dr J.G. Stock
Dr P.J.Stow
Dr B.P. Sweeney
Prof. M.K. Sykes
Mr P. Sykes
Dr P.B. Taylor
Dr T.H. Taylor
Dr T.A. Thomas
Mr J.B. Thompson
Dr P.W. Thompson
Dr B.A. Thornley
Dr J.A. Thornton
Dr M.E. Thornton
Dr S. Tirer
Dr D.C. Townsend
Dr A.J. Trench
Dr W.D. Turner
Dr D.G. Tweedie
Mr K.W. Underwood
Dr J-P. Van Besouw
Dr M. Van Ryssen
Dr R.S. Vaughan
Mr J. B. Walker
Dr D.A. Walmsley
Dr J. Wandless
Dr C.S. Ward
Dr B.M. Weaver
Dr J.R. Wedley
Dr R.W Weller
Dr D.K. Whitaker
Dr D.C. White
Dr G.M. White
Dr M.J. Whitehead
Dr B.R. Whittard
Dr J.A. Wildsmith
Dr D.J. Wilkinson
Dr S. Willatts
Dr D.P. Winder
Dr C.M. Wiseley
Dr M.J. Wolfe
Dr C.H. Woolham
Dr D. Wright
Mr P. Wright
Mr S.R. Wyndham-Crickmore
Dr E. Young
Dr T.M. Young
Dr D. Zuck