A synopsis of
ANAESTHESIA

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SEVENTH EDITION

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PREFACE TO THE SEVENTH EDITION

DURING THE FIVE YEARS which have elapsed since the sixth edition of this Synopsis was published, there have been many additions to our knowledge of the scientific basis of anaesthesia, and also changes in our outlook on some problems. These have had an influence on clinical practice and we have tried to incorporate them in this seventh edition.

In an attempt to keep the book reasonable in both size and weight we have omitted details of anatomy except where they relate to the performance of regional analgesia. Likewise structural formulae have not been included, with a few exceptions. The space occupied by graphs and diagrams has been reduced to a minimum. A number of drugs once used by anaesthetists but now almost totally discarded have lost their place unless they have special historical interest.

Many of the chapter headings have been rearranged so that interrelated topics may be considered together. We have not, in this edition, used the new International Standards or SI Units as they are not yet generally employed: a table of the new nomenclature has, however, been included in the Appendix.

We have tried, whenever possible, to give references to the first recorded use of drugs and techniques, and to place present-day concepts in their historical setting. Because the history of anaesthesia does not receive much attention in many of the larger textbooks, we have continued to devote some space to this. Once again we have attempted to keep in mind the occasional anaesthetist and those colleagues who find themselves working under substandard conditions, where equipment is not of the most modern, money is short, and skill thinly spread.

It is our hope that this new edition is reasonably up to date as we have tried to give emphasis to new work. In the natural order of things, the junior author has been largely responsible for this aspect of the book. Nevertheless, the whole of it has been very carefully revised and much dead wood has been removed. This, we venture to hope, has increased its usefulness.

January, 1973 J. A. L. R. S. A.

FROM THE PREFACE TO THE FIRST EDITION

THIS BOOK is not designed to take the place of the larger textbooks of anaesthesia and analgesia. It is a summary of current teaching and practice, and it is hoped that it will serve the student, the resident anaesthetist, the practitioner, and the candidate studying for the Diploma in Anaesthetics as a ready source of reference and a quick means of revision.

January, 1947 J. A. L.

To N. L. *and* V. A.

'*Eternal vigilance is the price of safety.*'

'*For some must watch while some must sleep.*'—*Hamlet, Act* 3, *Sc.* 2.

'*Relief from pain is purchased always at a price. The price in both morbidity and mortality does not greatly differ whatever the agent or agents used.*'—
R. M. WATERS.

'*The duty of the anaesthetist towards his patient is to take care.*'

Primum non nocere—*First of all, do no harm.*

'*The proper dose of any drug is enough.*'—
Dr. J. H. DRYSDALE.

'*It is a great mistake to suppose that Nature always stands in need of the assistance of Art . . . nor do I think it below me to acknowledge that, when no manifest indication pointed out to me what was to be done, I have consulted the safety of my patient, and my own reputation effectually by doing nothing at all.*'—THOMAS SYDENHAM (1624–1689).

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CONTENTS

Chapter I

THE HISTORY OF ANAESTHESIA

THE development of anaesthesia since its introduction in 1846 has been erratic, long periods of stagnation being occasionally broken by improvements and advances. In Britain the administration of anaesthetics has always been in the hands of doctors and gradually there has been an increase in the number of specialists in the subject. The two World Wars stimulated both surgery and anaesthesia, and following each, the number of doctors who continued their anaesthetic work, learnt under service conditions, into civilian life had a considerable influence on the development of the specialty.

In the 1920s, ether and chloroform were the main agents used, while nitrous oxide and ethyl chloride were often employed for induction. The open drop method was the most popular, and the early Boyle machines, which first appeared in 1917, made slow progress. Spinal analgesia, first described in Germany in 1898, was usually administered by the surgeon.

A Section of Anaesthetics at the annual meeting of the British Medical Association met for the first time in 1922 and in the years following definite progress was made. This was shown by, among other innovations, the popularization of endotracheal techniques by Magill and Rowbotham, the appearance of avertin (bromethol), divinyl ether, cyclopropane, and trichloroethylene, and the induction of anaesthesia by the intravenous barbiturates in the early 1930s. Controlled respiration was used with cyclopropane, so that when curare was described in 1942 by Griffith, the way to deal with hypoventilation and apnoea was well established and intermittent positive-pressure ventilation became routine practice. The Association of Anaesthetists of Great Britain and Ireland was founded in 1932.

Technical improvements were accompanied by academic recognition but not always by adequate financial rewards. The first examination for the Diploma in Anaesthetics was held in 1935 and the first chair in anaesthetics created at Oxford with R. R. Macintosh as professor two years later. The Faculty of Anaesthetists of the Royal College of Surgeons of England was established in 1947. The recognition of anaesthesia as a specialty with full equality with other medical and surgical specialties was secured in 1948 with the introduction of the National Health Service, and since then anaesthesia has not only kept pace with the rapid advances made in surgery but has in many instances enabled these advances to be made. In the past decade the scope of the anaesthetist's work has widened

and now takes in not only preoperative assessment and postoperative care, but supervision of intensive therapy units, pain clinics, and in many cases research and postgraduate education.

While anaesthesia has advanced and anaesthetists have greatly improved the quality of their work, they have still a long way to go. Morbidity and mortality associated with anaesthesia are far from satisfactory; there are difficulties in attracting young doctors into the specialty; conditions of work are in need of great betterment; the satisfaction derived from the daily round of work is not always what it could be. We must strive in the future to give an even better and safer service of pain relief and care to our patients.

Joseph Black (1728–1799): The discoverer of carbon dioxide or 'fixed air'. Born at Bordeaux, France, of Irish-Scottish parentage and educated at Belfast and at the Universities of Edinburgh and Glasgow. Became Professor of Anatomy and Lecturer in Chemistry in the University of Glasgow, and later Lecturer in Chemistry in Edinburgh, where one of his pupils was Thomas Beddoes, later of the Pneumatic Institute in Bristol. Was all this time a practising physician. In 1754 described 'fixed air', as he called carbon dioxide, and described its method of identification by lime water. He proved that the gas produced in respiration, during the fermentation of wine (this had been described by von Helmont), during combustion of charcoal in air, and that liberated from chalk by heat and acids was one and the same. He showed it to be toxic to animals and that it can be absorbed by alkalis, facts made use of by anaesthetists today.[1]

Joseph Priestley (1733–1804): Born at Fieldhead near Leeds and brought up in a strict Nonconformist Calvinistic household by an aunt. Trained as a dissenting minister and as a young man had charge of congregations at Needham Market, Nantwich, Warrington, and Leeds. Became a schoolmaster and experimenter in chemistry, physics, and electricity, and a writer on theology, languages, science, and grammar. Unlike Lavoisier, he never gave up the phlogiston theory. Next he spent seven years as librarian and companion to the second Earl of Shelburne at Bowood, and isolated or identified alkaline air (NH_3), vitriolic acid air (SO_2), dephlogisticated air (O_2), dephlogisticated nitrous air (N_2O), and nitrous acid air (NO_2). He also discovered methane and the absorption of carbon dioxide (fixed air) by green plants in the presence of sunshine with the formation of oxygen. He was elected a Fellow of the Royal Society and a Doctor of Laws of the University of Edinburgh. Received the Copley Medal of the former institution for a paper on 'The Different Kinds of Air'. In 1780 returned to Birmingham to take charge of a Unitarian

[1] *See also* Foregger, R., *Anesthesiology*, 1955, 16, 257.

congregation. Here he became a member of the famous Lunar Society, which brought him into contact with Erasmus Darwin, James Watt, and William Murdoch, the inventor of gas lighting. He was a close friend of and correspondent with Benjamin Franklin. He was an opponent of political discrimination against Dissenters and on the anniversary of the French Revolution his chapel, home, apparatus, books, and manuscripts were looted by a High Tory Royalist mob, forcing him to seek refuge in Hackney near London. His political opinions still separated him from his scientific colleagues so that in 1794 he joined his son in Northumberland in Pennsylvania. Here he added farming to his other activities and soon became a leader of his new community. He was a correspondent of Thomas Jefferson. He died of oesophageal obstruction in 1804, at the age of 70.

Humphry Davy (1778–1829):[1] Born in Cornwall, the son of a wood carver. Became apprenticed to J. B. Borlase, surgeon, of Penzance, in 1795. At the age of 17 he experimented with nitrous oxide and the effects of its inhalation. In 1798 Davy became superintendent of Thomas Beddoes's Pneumatic Institute in Clifton, Bristol, and in the following year published his book *Researches, Chemical and Philosophical; Chiefly Concerning Nitrous Oxide*. 'On the day when the inflammation was most troublesome, I breathed three large doses of nitrous oxide. The pain always diminished after the first four or five respirations.'[2] In this, Davy suggested that nitrous oxide inhalations might be used to relieve the pain of surgical operations and named it 'laughing gas'. A nitrous oxide container was made by James Watt in 1799 to assist this research.[3] In later life, Davy became famous. He invented the miner's safety lamp, was created a baronet in 1818, and was elected President of the Royal Society in 1820.

Michael Faraday (1791–1867): Said to be the first man to note the narcotic effects of ether vapour, but this is doubtful.[4] Born at Newington Butts, near London, of poor parents, he became a paper boy and later graduated to book-binding, during which occupation he made his first contact with chemical literature. Deciding to become a chemist, he obtained the post of laboratory assistant to Humphry Davy at the Royal Institution in 1813, and a little later accompanied him on an extensive tour in Europe. Wrote his first paper in 1816 on the analysis of caustic lime. Became Director of the Laboratory of Royal Institution in 1825. Following the discovery by Oersted of the deflexion of a magnetic needle by a voltaic current, he studied

[1] *See also* Cartwright, F. F., *The English Pioneers of Anaesthesia*, 1952. Bristol: Wright.
[2] Excerpts reprinted in *Survey of Anesthesiology*, 1968, 12, 92; also facsimile reproduction, 1972. London: Butterworths.
[3] Cartwright, F. F., *Proc. 4th World Cong. Anaesth.*, 1968, 203.
[4] Davison, M. H. Armstrong, *Br. J. Anaesth.*, 1957, 29, 575.

electromagnetism, and this led to the discovery of electricity and the dynamo. He invented with Whewell the terms 'electrolysis' and 'electrolyte', 'anion' and 'cation', 'anode' and 'cathode'. In 1823 he prepared liquid chlorine and showed that all gases are the vapours of liquids possessing low boiling-points. His great ability soon threatened to rival that of his master, who became jealous. Later Faraday, too, achieved world-wide fame. Fullerian Professor of Chemistry, 1833. Discovered benzene. His observations on ether were published in 1818 in *The Quarterly Journal of Science and Arts*, 4, 158. Because of ill-health he refused the presidency of the Royal Society. Received a royal pension and a residence at Hampton Court.

Henry Hill Hickman (1800–1830):[1] Medical education received in Edinburgh, but did not graduate there. He settled in practice in Ludlow. While doing a locum at Shifnal, in Shropshire, his interest in gas therapy was aroused, as the village was the birthplace of Thomas Beddoes. Familiarizing himself with the pioneer work of Davy, Priestley, and Faraday, Hickman returned to Ludlow and commenced experiments on animals. He was able to perform surgical operations painlessly on them, by causing them to inhale carbon dioxide. This was the first work on surgical anaesthesia induced by inhaling a gas. His results were published in a paper, 'A Letter on Suspended Animation' (Ironbridge, 1824),[2] but attracted no attention from scientific men in England. Even Sir Humphry Davy, who was approached by Hickman's friend, T. A. Knight, F.R.S., showed no interest. Charles X of France was appealed to in 1828, and the French Academy of Medicine agreed to investigate Hickman's results, but nothing came of the matter. Baron Larrey, one of Napoleon's surgeons, however, gave Hickman some encouragement. Hickman died prematurely, aged 29, and was buried in Bromfield churchyard, Shropshire.

Crawford Williamson Long (1815–1878): Born in Danielsville, Georgia, in the U.S., son of a successful lawyer and merchant. Educated at Franklin College and the University of Georgia from which he graduated as Master of Arts at the age of 19. He studied medicine as an apprentice of Dr. George R. Grant of Jefferson and also at the Transylvania University in Lexington, Kentucky. Later he enrolled at the University of Pennsylvania in Philadelphia, the first medical school founded in the American Colonies. After eighteen months' postgraduate study in the hospitals of New York, Long returned to his home state and set up in practice in Athens, Ga. He was well aware of 'ether frolics' as a form of social entertainment, and realized

[1] *See also* Cartwright, F. F., *The English Pioneers of Anaesthesia*, 1952. Bristol: Wright; and Smith, W. D. A., *Br. J. Anaesth.*, 1966, 38, 58, and *Ibid.*, 1970, 42, 347.
[2] Reprinted in *Survey of Anesthesiology*, 1966, 10, 92.

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that an individual under the influence of ether vapour might sustain bruises without experiencing pain. He performed his first operation under ether, the removal of a tumour from the neck of a young man, James M. Venable, who was accustomed to the effects of the vapour. This occurred on 20 March, 1842, and caused the patient no pain whatever. The account of this pioneering effort was not published until seven years later (Long, C. W., *Sth. med. J.*, 1849, N.S., **5**, 705),[1] while Morton's first use of ether vapour was reported in a letter from H. J. Bigelow to the *Boston Medical and Surgical Journal* of 11 Nov., 1846.

A statue to Long was erected in 1926 in the Statuary Hall of the U.S. Capitol, and ten years later the town where he was born also honoured his memory in a similar way.[2]

Horace Wells (1815–1848): In 1844, on 10 Dec., Gardner Q. Colton, a travelling lecturer in chemistry, gave a demonstration of the effects of inhaling nitrous oxide at Hartford, Connecticut. Horace Wells, a local dentist, was present and noticed that a young shop assistant Samuel Colley while under the influence of the gas, banged his shin and made it bleed, but stated that he experienced no pain. Wells persuaded Colton to try the gas during a dental extraction, and on the following day, 11 Dec., 1844, the experiment was carried out with Colton as anaesthetist, Riggs as dentist, and Wells as patient. It was a big success. 'A new era in tooth pulling', according to Wells. Wells learnt from Colton the method of manufacture of nitrous oxide and used it in his dental practice on 15 patients. It was administered from an animal bladder through a wooden tube into the mouth, while the nostrils were compressed. Later he went to Boston to interest a larger audience in his discovery. He demonstrated the method to the students of Harvard Medical School, but the patient complained of pain: the affair was a fiasco and Wells was hissed out of the room as a fraud. Morton was present at this operation in January, 1845. Wells returned to Hartford and continued to use the gas, but the introduction of ether gradually ousted the use of nitrous oxide. In 1847 Wells published his letter 'A History of the Discovery of the Application of Nitrous Oxide Gas, Ether, and Other Vapours to Surgical Operations' (Hartford, Conn., 1847; also *Survey of Anesthesiology*, 1958, **2**, 1). Wells gave up dentistry, became a chloroform addict, travelled round the country with a troop of performing canaries, and was incarcerated in jail after bespattering a New York prostitute with sulphuric acid. He committed suicide by cutting his femoral artery.

Colton reintroduced the use of nitrous oxide in dentistry in 1863, at New Haven.

[1] Reprinted in *Survey of Anesthesiology*, 1960, **4**, 120.
[2] *J. Am. med. Ass.*, 1965, **194**, 1008; and Taylor, F. L., *Ann. med. Hist.*, 1925, **7**, 267.

William Thomas Green Morton (1819–1868):[1] Morton deserves the chief credit for the introduction of ether as an anaesthetic agent, although W. E. Clark, of Rochester, New York, gave ether for a dental extraction in 1842, and Crawford Williamson Long (1815–1878) removed a tumour from the neck of J. M. Venable quite painlessly, in Jefferson County, Georgia, a few months after Clark's experiment. By the time (1849) that Long reported his work, Morton's fame was well established.

Morton, born at Charlton, Worcester County, Massachusetts, was a dentist who became a student, and later a partner of Wells, at Hartford. He separated from Wells and, becoming a medical student in Boston, was present when Wells failed to satisfy the audience as to the efficiency of nitrous oxide. Charles A. Jackson, one of Morton's lecturers at Harvard, suggested that ether could be used as a surface analgesic in dentistry. Morton, however, went further; he experimented on dogs to find out the effect of giving ether vapour by inhalation. Impressed with the results, he gave the vapour to Eben Frost for the removal of a tooth on 30 Sept., 1846. The operation was painless. After gaining further experience, and while still a medical student, Morton gave a demonstration at the Massachusetts General Hospital on 16 Oct., 1846, when Dr. J. C. Warren removed a tumour from the jaw of his patient, Gilbert Abbott, without producing any pain. This success gained him the support of Warren and also of Jacob Bigelow, Professor of Materia Medica. Much wrangling occurred between Morton and Jackson as to who should be given credit for the discovery. Morton three times petitioned the U.S. Congress, and even obtained an interview with the President, but he was never in his lifetime officially recognized as the pioneer of ether anaesthesia. Time later vindicated his claim. He spent his later years farming, and died of cerebral haemorrhage quite suddenly in Central Park, New York City, on 15 July, 1868;[2] a disappointed man. The inscription on his tombstone in Mount Auburn Cemetery, Boston, composed by Henry J. Bigelow reads: 'Inventor and Revealer of Inhalation Anesthesia: Before Whom, in All Time, Surgery was Agony; By Whom, Pain in Surgery was Averted and Annulled; Since Whom, Science has Control of Pain'. His agent, which he tried to patent under the name Letheon, became widely used. It was given in London and Paris in 1846. Robert Liston was the first surgeon to operate under ether in England; this was at University College Hospital on 21 Dec., 1846, using Squire's inhaler when he amputated the leg of Frederick Churchill.[3] It was, however, probably given on 19 Dec. in the Dumfries and Galloway Royal Infirmary by William Scott and William

[1] *See also* MacQuitty, B., *The Battle for Oblivion*, 1969. London: Harrap.
[2] Thomas, K. Bryn, *Anaesthesia*, 1968, 23, 676.
[3] Dawkins, R. J. Massey, *Ibid.*, 1947, 2, 51.

Fraser (Baillie, T. W., *From Boston to Dumfries*, Dumfries, 1966; and *Br. J. Anaesth.*, 1965, 37, 952). This followed a verbal report of Morton's successful use of the agent, carried by Fraser, who arrived in Liverpool from Boston on 16 Dec.

The name anaesthesia was suggested by Oliver Wendell Holmes, but had been used by Plato in 400 B.C. to denote absence of feelings in a philosophical sense and also by Dioscorides in the first century A.D. to denote absence of physical sensation (Armstrong Davison). It also appeared in Bailey's *English Dictionary* in 1751.[1]

Ether became known in England through a letter written by Henry Bigelow, Jacob's son, to his friend, Dr. Boott, who, with Mr. Robinson, gave the first ether anaesthetic, a dental case, two days before Liston's first use of it. Malgaigne was the first man to use ether in France, on 12 Jan., 1847. News spread quickly to all parts of the civilized world. The first ether anaesthetic in Australia was administered by William Ross Pugh on 7 June, 1847, at Launceston in Tasmania.[2]

John Snow (1813–1858): Born in York, the son of a farmer. After Morton, the first whole-time anaesthetist. Starting his medical studies in Newcastle, at the age of 14, as apprentice to Mr. William Hardcastle, he was one of the eight medical students who entered the Newcastle-on-Tyne Medical School at its inception in 1832. Snow worked at the Newcastle Infirmary and became interested in a cholera epidemic at Killingworth Colliery in 1831–1832. In 1833 he left Newcastle and worked for a time at Pateley Bridge in Yorkshire and in 1836 he migrated to London, travelling on foot via Liverpool, North and South Wales, and Bath, and attended lectures at the Hunterian School of Anatomy in Great Windmill Street, and also at Westminster Hospital. He became a member of the Royal College of Surgeons of England in 1838 and also passed the examination of the Apothecaries Hall; became M.D., London, in 1844, and was appointed lecturer (1844–1849) in Forensic Medicine at the Aldersgate School of Medicine. Snow took an active part in the discussions of the Westminster Medical Society (which became the Medical Society of London in 1849–1850), eventually becoming its President in 1855. In 1841 he read before it a paper on resuscitation of newborn children. He became interested in ether soon after its introduction and quickly perceived that the common method of administration was faulty. To overcome this he invented an ether inhaler. He was appointed

[1] *See* Miller, A. H., *Boston med. surg. J.*, 1927, 197, 1218; also Straton, J., *Br. med. J.* 1972, 3, 181.

[2] Wilson, G., *Proc. 4th World Cong. Anaesth.*, 1968, 174. *See also* Annotation, *Boston med. surg. J.*, 21 Oct., 1846; Bigelow, H. J., *Ibid.*, 18 Nov., 1846; Annotation, *Lond. med. Gaz.*, 18 Dec., 1846; and Annotation, *Lancet*, 26 Dec., 1846.

anaesthetist to Out-patients at St. George's Hospital, where his first anaesthetics (for dental extraction) were given, and in 1847 was promoted to the In-patient appointment. He also worked with Robert Liston at University College Hospital and with Sir William Fergusson at King's College Hospital. His health was poor and he suffered from phthisis and from nephritis, being treated for the kidney disease by Richard Bright. For many years he was a vegetarian and temperance advocate. He experimented with many substances to see if they possessed anaesthetic properties, trying many of them on himself.

Snow rapidly became the leading anaesthetist in London and wrote a book in 1847, *On the Inhalation of Ether in Surgical Operations*. He did much useful work on the physiology of anaesthesia, and described five stages or degrees of anaesthesia. He later abandoned ether for chloroform, but was familiar with the dangers of the newer drug, believing it to cause primary cardiac failure consequent on the use of too strong a vapour. To overcome this danger he invented a percentage chloroform inhaler. He gave over 4000 chloroform anaesthetics without a death. In 1853 Snow originated the method of 'chloroform *à la reine*', when he acted as anaesthetist at the birth of Queen Victoria's eighth child, Prince Leopold, at the request of Sir James Clark, and in 1857 at the birth of Princess Beatrice. These royal occasions made anaesthesia in midwifery morally respectable. He gave his royal patient 15-minim doses intermittently on a handkerchief, the administration lasting 53 minutes: it met with the Queen's warm approval—'Dr. Snow gave that blessed chloroform and the effect was soothing, quieting, and delightful beyond measure.' The birth of Leopold George Duncan Albert (1853–1884), later Duke of Albany, finally canonized 'that blessed chloroform'. Even the names of the Queen's attendants seemed to share the aura of purity which her royal participation had given to the subject: Mrs. Lilly and Mrs. Innocent the midwives, and of course Dr. Snow.[1] Snow introduced amylene as an inhalation anaesthetic in 1856. His income never exceeded £1000 per annum although during the last 10 years of his life he gave an average of 450 anaesthetics a year. His last work, *On Chloroform and Other Anaesthetics*, was published posthumously in 1858, Snow having been seized with paralysis while at work on the manuscript and dying a few days later on 17 June, 1858. In later years he proved that cholera is a water-borne disease, when he ordered the removal of the Broad Street pump handle in 1854 in London and so terminated a cholera epidemic (although this particular epidemic had commenced to wane before the actual removal of the handle!). The theory of the mode of transmission of cholera was set out in the second edition of his book (first edition 1849,

[1] Longfor E., *Victoria, R.I.*, 1964, p. 234. London: Weidenfeld and Nicolson.

following the epidemic of 1848), *On the Mode of Communication of Cholera*, 2nd ed., 1855 (London: Churchill). Near the site of the pump, in Broadwick Street, a public house has been named 'The John Snow' (although Snow was a teetotaller!). Snow's grave in Brompton Cemetery was restored in 1938 by anaesthetists from Britain and the United States. Benjamin Ward Richardson's (1828–1896) epitaph reads: 'In Brompton Cemetery there was laid to rest, at the age of forty-five, John Snow (1813–1858), exemplary citizen and useful physician. He demonstrated that cholera is communicated by contaminated water; and he made the art of anaesthesia a science.' The tombstone was destroyed by bombing in April, 1941 but was restored in 1950 and unveiled on 6 July, 1951.[1] Three of his case books with a record of his chloroform administrations 1848–1858 are in the possession of the Library of the Royal College of Physicians of London.[2]

James Young Simpson (1811–1870):[3] Born at Bathgate, near Edinburgh. Qualified 1830; M.D., 1832. Elected to Chair of Midwifery at Edinburgh, 1840, spending £500 on canvassing, etc. Started university career in atmosphere of hostility from his colleagues, but his ability as a lecturer soon attracted large classes of students. Simpson took an interest in a wide range of subjects, including leprosy, puerperal sepsis, and hospital design. He put forward the method of haemostasis by acupressure to promote better wound healing. He made many contributions to the literature of Archaeology, becoming President of the Society of Antiquaries of Scotland in 1861. He was made one of Her Majesty's Physicians in Scotland in 1847 and was created baronet in 1866. He also received many foreign honours.

He is most famous for the introduction of chloroform in 1847.[4] He had used ether in his obstetric practice in January 1847, but wanted to find a better agent. Chloroform was discovered independently by von Liebig, Soubeiran, and Guthrie in 1831. Dumas gave it its name and wrote the first full description of its physical and chemical properties. Its old name was perchloride of formyl. Chloric ether, or Dutch oil, was a solution of chloroform in alcohol. In 1847 Flourens showed that it had anaesthetic powers on animals.

Waldie (1813–1889), a Liverpool chemist, suggested that Simpson should try chloroform as an anaesthetic vapour. Simpson experimented on himself and his assistants, Matthews Duncan and George Keith, on 4 Nov., 1847. Four days later it was used clinically and a report was read to the Edinburgh Medical and Chirurgical Society

[1] *Anaesthesia*, 1952, 7, 192.
[2] Atkinson, R. S., *Proc. 4th World Cong. Anaesth.*, 1968, 197.
[3] *See also* Shepherd, J. A., *Simpson and Syme of Edinburgh*, 1969. Edinburgh and London: Livingstone; and Simpson, Myrtle, *Simpson the Obstetrician*, 1972. London: Gollancz.
[4] Simpson, J. Y., *Lond. med. Gaz.*, 1847, N.S., 5, 934; and *Lancet*, 1847, 2, 549 (reprinted in *Survey of Anesthesiology*, 1961, 5, 93).

on 10 Nov. Dumas was present at some of the first operations under chloroform. Simpson was harshly attacked on theological grounds (Gen., ch. 35, verse 16) for using pain relief for women in labour, but following the administration of chloroform to Queen Victoria during the delivery of her eighth child (Prince Leopold) in 1857 by John Snow, the seal of respectability was set on the relief of pain in childbirth by anaesthetics. Although Simpson was the first obstetrician to employ ether (January, 1847), he held that chloroform has the following advantages over ether: (1) Action more rapid, complete, and persistent. (2) Smaller quantity required. (3) Pleasanter. (4) Cheaper. Chloroform was first given in London at St. Bartholomew's Hospital on 20 Nov., 1847 (though it had in fact been used at St. Bartholomew's Hospital earlier in the year under the name of 'chloric ether' by Lawrence and Holmes Coote at the suggestion of Furnell—before Simpson).[1]

From 1845 to his death in 1870, Simpson lived at No. 52 Queen Street, Edinburgh. He was buried in the family plot in Warriston Cemetery. No. 52 Queen Street is now the headquarters of the Committee on Moral Welfare of the Church of Scotland, a centre for the care of alcoholics, drug addicts, etc. The dining room has been preserved as *The Discovery Room* and contains some of Simpson's furniture and possessions.[2] There is a memorial to Sir James Young Simpson in Westminster Abbey.

Joseph T. Clover (1825–1882): After the death of Snow, Clover became the leading scientific anaesthetic investigator and practical anaesthetist in Britain. He was born in Aylesham, Norfolk, and was educated at the Gray Friar's Priory School in Norwich and at University College Hospital in London (1844). It is unlikely[3] that Clover was present in the operating theatre at University College Hospital on 21 Dec., 1846, when Robert Liston amputated the leg of Frederick Churchill when ether was given by Peter Squire, the first major operation performed under ether anaesthesia in England. Joseph Lister was a fellow student. Became R.M.O. at University College Hospital and took F.R.C.S. in 1850. He was the pioneer of the art of completely and immediately removing from the urinary bladder the calculus fragments produced by lithotrity and invented a bladder aspirator (the forerunner of Bigelow's evacuator (1878)). He also devised 'Clover's crutch', a simple but effective piece of apparatus for maintaining a patient in the lithotomy position. Worked as general practitioner in London, later specializing in anaesthetics.

[1] Sykes, W. S., *Essays on the First Hundred Years of Anaesthesia*, 1961, Vol. II, p. 168. Edinburgh and London: Livingstone; and Coote, H., *Lancet*, 1847, 2, 571.
[2] Atkinson, R. S., *Simpson and Chloroform*, 1973. London: Priory Press.
[3] Bryn Thomas, K., *Anaesthesia*, 1972, 27, 436.

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