TIMELINE OF SOME SIGNIFICANT EVENTS IN THE EVOLUTION/HISTORY OF ANAESTHESIA

Created by History of Anaesthesia Library, Museum and Archives Committee (HALMA)

YEAR	EVENT	PERSON / PLACE INVOLVED
	Due recognition is made of the chemist and clergyman, Joseph Priestley FRS (1733-1804), for inventing, *inter alia* , the TIMELINE instrument of historiography. In order to teach history effectively at the Warrington Academy, he produced his very popular "*A Chart of Biography* " in 1765. This comprised 2000 famous names from 1200 BC to 1765 AD organized into 6 categories: statesmen & warriors; diviners & metaphysicians; mathematicians & physicians; poets & artists; orators & critics; and lastly, historians & antiquarians. He produced a second version in 1769 called "*A New Chart of History* ". (source: Professor Leslie Woodcock, Chairman of the Priestley Society)	
4500 BC	Earliest known evidence of opium poppy (*Papaver somniferum*) existence	Proven by radiocarbon dating to be from this late Neolithic period and discovered in the mid-1800s in *La Cueva de los Murcielagos* (The Cave of the Bats) near Albuñol in the south of Spain. Poppy seeds (*P. somniferum*) were found in Esparto grass (aka halfah grass) bags around the burial site of a queen. *Papaver setigerum* , one of the three subspecies of *P. somniferum* , is known to grow in the area. Opinion seems to point to the seeds being for use as food or oil rather than medicine. The findings from this site are housed in the *Museo Archeológico Nacional* in Madrid
3600 BC	First record of tracheotomy (see 2000 BC, 1546, 1620, 1625, 1909, 1955, 1972, 1985 & Melker)	Depicted on Egyptian engravings in Abydos and Sakkara. Credit is given, however, to the Persian physician, Asclepiades, for being the first "known" person to perform a tracheotomy. Dr (later Professor) Lorenz Heister, a German anatomist, surgeon and botanist, is credited with coining the term "tracheotomy" in 1718
3400 BC	Opium poppy (*Papaver somniferum*) cultivated in lower Mesopotamia by the Sumerians	Described in cuneiform script on a white clay tablet discovered in 1954 at Nippur and kept at the University of Pennsylvania Museum of Archeology and Anthropology
2000 BC	Spontaneous healing of tracheostomy mentioned (see 3600 BC, 1546, 1620, 1625, 1909, 1955 & 1985)	Recorded in the Indian Hindu Sanskrit book of Medicine - *Rig-Veda*
1543 BC	Willow extracts (containing salicin, precursor of aspirin) mentioned (see 400 BC, 1763, 1828, 1853 & 1897)	Ebers Papyrus (Egyptian medical text)
c1300 BC	First references to mouth-to-mouth (expired air) resuscitation (see 1732)	Often referred to as the "Biblical Method" due to references such as "long-standing tradition of Hebrew midwives" using the technique to resuscitate newborn babies during the Egyptian captivity period
500-400 BC	Use of cannabis noted - though not necessarily documented for medical use	Herodotus when writing in "The Histories" about the Scythians putting hemp seeds onto hot stones: "*At once it begins to smoke, giving off a vapour.....and the Scythians enjoy it so much they howl with pleasure.* "
475 BC	Early record of death following pulmonary aspiration (see 400 BC, 1848, 1853, 1946 & 1961)	The Greek poet, Anacreon, died after inhaling a grape seed
400 BC	Warnings about the danger of pulmonary aspiration (see 475 BC, 1848, 1853, 1946 & 1961)	Hippocrates: "*for drinking to provoke a slight cough or for swallowing to become forced is bad* "
400 BC	Brew made from willow leaves to relieve pain of labour (precursor of aspirin) (see 1543 BC, 1763, 1828, 1853 & 1897)	Hippocrates
c.280 BC	The importance of monitoring the pulse and its nature stressed (see 200)	Praxagoras of Alexandria. His pupil, Herophilus further developed the concept by using water clocks to monitor pulse rates. Herophilus also determined the existence of both motor and sensory nerves; Galen later explained the difference between motor and sensory nerves in his work *De Motu Musculorum*
199 BC	First known example of an instrument designed to act as a tourniquet (see 1517,1593,1718,1864,1873,1904 &1984)	The Science Museum in London has a thigh tourniquet dated 199BC - 500AD. It is made of bronze and is said to have been lined with leather for comfort and to have been used for amputations

c.30 AD	"anodyne" pills from opium poppy brewed with wine (NB: Opium is the dried latex obtained from the unripened capsules of *Papaver somniferum.* It contains more than 20 alkaloids which occur in combination with meconic and sulphuric acids)	Aulus Cornelius Celsus (Roman encyclopaedist): *De Medicina* . Celsus also used cautery to make incisions, obtain haemostasis and ablate tumours
40 - 90 AD	Wine with Mandrake (*Mandragora officinarum* plant, a member of the Solanacea plant family containing l-hyoscyamine, l-hyoscine & mandragorine) to produce what he called, in 60AD, "anaesthesia"	Pedanius Dioscorides (Dioskourides) - Greek physician, pharmacologist & botanist working in Rome & who travelled with Nero's armies as a surgeon: *De Materia Medica* (5 volume pharmacopoeia)
100	The term "diabetes" introduced (see 1889, 1909, 1921, 1926 & 1955)	Greek physician Aretaeus of Cappadocia. The word means "siphon", which reflects the increased urination associated with the disease
108 - 208	Chinese general anaesthetic agent "Mafeisan" developed	Hua-tuo, physician and anaesthetist. This was a concoction translated as "cannabis boiling powder" dissolved in wine and drunk by the patient. The actual recipe was allegedly written down by Hua-tuo for the benefit of others just prior to his execution - the execution ordered because he refused to become a particular war-lord's personal full-time physician - but, when the scroll on which it was written was rejected by a fearful gaoler, Hua-tuo burnt it and the recipe was, therefore, lost. The dates quoted are the possible dates of his birth and death
200	Emphasis on the importance of monitoring/assessing the pulse (see c.280 BC & 1863)	Galen (Aelius or Claudius Galenus) of Pergamon. A Greek physician, surgeon and philosopher who worked in Rome. He regarded "sphygmology" (sphygmos is Greek for pulse) as the "*most important diagnostic……with strength, frequency, rhythm and character* ". He also promoted the importance of body temperature and auscultation. He also noted the existence of spinal fluid (keyword: CSF)
177	Bellows used to inflate lungs of animals (see 130, 1200s, 1543, 1767, 1771)	Galen (Aelius or Claudius Galenius) of Pergamon. A Greek physician, surgeon and philospher
1020s	First known description of endotracheal intubation	Avicenna (Ibn Sīnā) - Persian physician 980-1037: *Canon of Medicine.* He recommended using cannulas of gold or silver
1020s	Inhaled anaesthesia described using a "soporific sponge" soaked in hashish, opium hyoscyamus & other herbal aromatics including some from a plant called Zoan and placed under the nose of the patient	Avicenna - he died from an accidental overdose of opium
1274	The "Doctrine (or Principle) of Double Effect" born	St Thomas Aquinas in writing his unfinished 3,500 page *Summa Theologica* . He wrote this tome from 1265 until his death in 1274. The doctrine is used to explain the legal permissibility of an action that may cause a serious harm, such as the death of a human being, as a side effect of promoting some good end - such as in the case of a doctor administering pain relief medication to a terminally ill patient where death may be the unintended consequence. This doctrine may be invoked by all physicians including anaesthetists
1275	Diethyl ether discovered (see 1525, 1540 & 1730)	Allegedly by Ramon Llull (aka Raymundus Lullius, Raymund Lull or Lully) - prolific writer, philosopher, scientist, alchemist born in Majorca. Possibly also by Jābir ibn Hāyyān - chemist, alchemist, astronomer, astrologer, engineer, geologist, philosopher, physicist, pharmacist & physician in Persia in the 8th Century
1200s	Description of bellows being used to resuscitate (see 177, 1543, 1767, 1771)	As described by Ibnu-Abi Usibi'a, a Cairo-based physician & oculist, in *Classes of Physicians* in which is described the successful resuscitation (using snuff and bellows placed in the nostril) of an Emir's (El Mou'mineen, Prince of Believers) cousin, Ibrahim Bin Saleh, who subsequently became the Governor of Egypt and Palestine. The resuscitating physician was Saleh Bin Bahla who was known to be familiar with Indian medical techniques as well

1477	Herbal components of medieval medicine first published	Napolese printer, Arnaldus de Bruxella, produced the first printed version of a Latin hexameter poem, "*De Viribus Herbarum Carmen* " ("*Concerning Powers of the Herbs - poem/formula* "). This form of poetry is thought to have provided a mnemonic for apothecaries and physicians. Although an earlier German version may have existed, this poem has been attributed to Macer Floridus, which is a pseudonym of Odo Magdunensis (aka Odo de Meung) who was a French physician living in Meung on the Loire river. At least 17 similar European medieval herbal recipes that have been found include macerated combinations of seeds administered as **soporific draughts to provide general/deep anaesthesia and post-operative analgesic poultices** for major surgery, usually amputations, from which patients awakened fully. Typical recipe consisting of: Black Henbane (Hyoscyamus niger) Opium poppy (Papaver somniferum) Hemlock (Conium maculatum) with seed counts of 372:108:94 respectively. This particular mix was found at the site of a former medieval hospital in Soutra, Scotland
1516	First known written mention of South American Indian arrow poison (later to be called "curare" by Georgius Marggravius in 1684) (see 1743)	Pietro Angherius (Peter Martyr d'Anghiera), Italian, writing in his work *De Orbe Novo* (On The New World), which was published in 1530, after his death, and which describes the first contact between Europeans and Native Americans and also happens to provide the first mention of India rubber. These writings were chronicles of others' experiences, including those of Christopher Columbus, and were not of his own adventures
1517	An atlas of trauma surgery published which described using a tourniquet for amputations (see 199BC, 1593, 1718, 1864, 1873, 1904 & 1984)	Hans von Gersdorff, the so-called founder of Prussian military medicine
1522	Laudanum mentioned	Paracelsus (Phillippus Aureolus Theophrastus Bombastus von Hohenheim) a Swiss physician, botanist, alchemist, astrologer and occultist. Although he was not the first to actually dissolve opium in alcohol, he noted it was more soluble in that than in water. He named the resultant solution, which had all the alkaloids of opium as well as crushed pearls, musk and amber
1525	Ether used on animals (see 1275, 1540 & 1730)	Paracelsus. A description of his use of ether and its effects on domestic fowls appeared in the 1603 first edition of *Operum Medico-Chimicorum Sive Paradoxorum*
1540	Diethyl ether synthesis (by distilling ethanol & sulphuric acid mixture) recorded & called *oleum dulce vitrioli* (sweet oil of vitriol) (see 1275, 1525 & 1730)	Valerius Cordus, German physician & botanist. His works (*De Artificionis Extractionibus*) were published in Strasburg in 1561 by Conrad Gesner. (It has been suggested that, as Paracelsus was a friend of Cordus, he may also have been involved)
1543	Intubation and ventilation (using bellows) of animals described (see 177, 1200s, 1767, 1771)	Andreas Vesalius - anatomist & physician (founder of modern human anatomy: *De humani corporis fabrica* (On the Fabric of the Human Body) (7 volumes))
1546	First recorded successful (patient survival) tracheostomy (see 3600 BC, 2000 BC, 1620, 1625, 1909, 1955 & 1985)	Dr Antonio Musa Brassavola in Ferrara, Italy - for patient with airway obstruction from peri-tonsillar abscess
1553	Discovery of the true function of breathing reported (key word: oxygen)	Michael Servetus (aka: Miguel Serveto Conesa; Miguel Servet; Michel de Villeneuve), Spanish theologian, physician, cartographer, polymath. He was the earliest scientist to recognize that lungs added from the air to blood something that sustained life. He noted from his animal studies that blood changed colour as it passed through the lungs and he reported this in a book he wrote that mostly challenged the then current Church doctrines for which he was burned at the stake in Geneva by the town council at the urging of John Calvin (aka: Jehan Cauvin). Calvin also burned every copy of the books with the exception of 3 that had been hidden. Hence this scientific revelation remained unknown for more than 2 centuries
1593	Description of the use of a stick to tighten a tourniquet by twisting. Such a stick has been called a "Spanish Windlass" (see 199BC, 1517, 1718, 1864, 1873, 1904 & 1984)	Wilhelm Fabry of Hilden, also called Fabricius Hildanus, who has been referred to as the father of German surgery
1603	First temperature measuring device: thermoscope (see 1611, 1868, 1953, 1956 & 1961)	Galileo Galilei (although others have also been ascribed to its invention). This device only showed changes in temperature and did not possess a scale

1611	First clinical use of a thermometer (see 1603, 1868, 1953, 1956 & 1961)	Santorio Sanctorius who created a scale for the thermoscope which converted it to a thermometer - called thus by a Jesuit priest, Father Laurechon, in 1624. David Gabriel Fahrenheit was the first to use mercury in thermometers and developed the measurement scale that bears his name. Anders Celsius introduced his now eponymous scale (originally called centigrade) in 1743. Normal adult body temperature of 98.6 degrees Fahrenheit was scientifically documented in the 1830s by Bequerel & Breschet
1615	First time blood transfusion recommended or suggested (see 1665, 1667 & 1818)	Andreas Libavius, a German polymath, although he never attempted to perform it
1620	First record of a paediatric tracheostomy (see 3600 BC, 2000 BC, 1546, 1625, 1909, 1955 & 1985)	Dr Nicholas Habicot (French surgeon). Performed on a 14 year old boy who swallowed a bag containing 9 gold coins to prevent a highwayman from stealing it. The bag was manipulated and eventually passed rectally
1625	Tracheostomy using trocar & (single) cannula first described (see **1877** & 3600 BC, 2000 BC, 1546, 1620, 1909, 1955 & 1985)	Santorio Sanctorius, Professor of Medicine in Padua, Italy in his publication titled "*Commentaria* ". He was also responsible for originating the study of human metabolism, for the notion of insensible perspiration and for introducing the clinical thermometer (see 1611)
1628	Publication of *Exercitatio Anatomica de Motu Cordis et Sanguinis in Animalibus* (On the Motion of the Heart & Blood of Animals) - the first description of systemic circulation derived from experimentation	Dr William Harvey - "The Father of Cardiovascular Medicine" - English physician at St Bartholomew's Hospital, London
1656	First description of intravenous drug injection (wine, opium and Crocus metallorum (an emetic) into animals using an animal bladder and goose quill)	(later Sir) Christopher Wren (best known for architectural accomplishments but also noted for many other varied scientific achievements)
1660s	First intravenous opium into humans	JD Major (Kiel) & JS Elsholtz (Berlin)
1665	First animal-to-animal blood transfusion (see 1615, 1667x2 & 1818)	Richard Lower, English physician, while demonstrating for the Royal Society. Having bled one dog, he connected the carotid artery of another dog to neck veins of the first animal using a quill and successfully resuscitated the dog he had bled
1666	The ability of intermittent positive pressure ventilation (IPPV) to sustain life demonstrated	Robert Hooke (aka "England's Leonardo"), Curator of Experiments for the Royal Society, architect, philosopher and polymath, who showed that a dog could be kept alive indefinitely if ventilated with bellows inserted via a tracheostomy
1667	The term "apnoea" coined	Rosenthal for demonstrations of ventilation with bellows in front of the Royal Society
1667	First animal-to-human (heterologous) blood transfusion in Britain (see 1615, 1665 & 1818)	Richard Lower, English physician. Patient was Arthur Coga who was successfully transfused with sheep blood
1667	First animal-to-human (heterologous) blood transfusion (see 1615, 1665 & 1818)	Dr Jean-Baptiste Denys, physician to the French king Louis XIV. He used sheep blood to transfuse a 15 year old boy. He then transfused 3 other patients a total of 7 times. After 2 of these patients died, one after the second transfusion and one after the third, the procedure of transfusion was banned by the Royal Society, the French Government and the Vatican in 1668
1668	Scientific suggestion that air had 2 components (key word: oxygen) (see 1774)	John Mayoh, Oxford, England. He proposed that air consisted of 2 separate components - divided in proportions of 4/5ths and 1/5th. The smaller portion being essential for life as it was used when breathing and when supporting burning. He called this component *spiritus igneo-aereus*
1669	Possibly the earliest description of compression of the vena cava in pregnancy (key words: postural supine hypotension) (see 1893, 1932, 1942, 1950, 1953, 1960 & 1968)	Richard Lower, English physician in Oxford, in his work *Tractatus de Corde*
1703	Phlogiston theory propagated (key word: oxygen)	George Ernst Stahl, German Professor of Medicine & Chemistry in Halle. This was basically the renaming of the "Terra pinguis" part of a 1667 theory of Johann Joachim Becher
1718	Invention of a tourniquet that incorporated an actual mechanical screw device (see 199BC, 1517, 1593, 1864, 1873, 1904 & 1984)	Jean-Louis Petit, a surgeon in Paris, who is credited with naming such devices "tourniquets" from the French word *tourner* meaning "to turn"
1730	Diethyl ether called "aether" (see 1275, 1525, & 1540)	German-born London-based chemist August Sigismund Froben (Frobenius) - presented to Royal Society in 1731 in paper titled "Spiritus Vini Aethereus"
1730	First time opium grown and produced in Britain	Dr Charles Alston at Holyrood in Scotland. While still a student of medicine and botany at Edinburgh University in 1716, he was appointed the King's Botanist and Keeper of the Royal Physick Garden in Holyrood. In 1721 he was given permission by Edinburgh Council to practise medicine without having taken examination. In 1738 he was appointed Professor of Materia Medica and Botany at Edinburgh University. Among many publications in both Latin and Greek, he published 2 *Dissertations on Opium* - one in 1736 and the other in 1742
1731	First Medical Society in Great Britain founded	Dr Monro *primus* . This became the Royal Society of Edinburgh in 1783

1732	Earliest recorded authentic successful resuscitation using mouth-to-mouth (expired air) ventilation (see c1300)	Dr William Tossach (Scottish surgeon) resuscitated a suffocated miner (Mr James Blair) on December 3 at Alloa, Scotland. Event published in Edinburgh Medical Essays in 1771.
1733	First record of direct intra-arterial measurement of blood pressure (see 1856)	Reverend Stephen Hales (English clergyman & physician) using a specially designed glass tube inserted into the femoral artery of a horse
1743	Written accounts of curare in which it was described as "flying death" that would "kill in less than a minute" (Other names: curara, curari, urirarery, urari, wourali, wourara, woorari). (Also see 1516, 1804, 1825, 1855, 1858, 1900, 1935, 1939, 1942 & 1945*)	Charles-Marie de La Condamine, French mathematician who was sent to Ecuador for studies on astronomy in order to accurately measure the size of the earth. He then crossed the Andes and was the first European to explore the length of the Amazon - it was there he made his observations on the drug. It is thought he was the first to bring back samples of the poison at the end of his expedition in 1745
1743	First record of a laryngoscope (see 1807, 1829, 1844, 1854 & 1858)	A French accoucher named Leveret. He used a bent reflective spatula and even developed a snare for laryngeal polyps
1745	First electrical capacitor developed (see 1775)	The Leyden (or Leiden) glass jar, which was developed separately by 2 individuals, Ewald Georg von Kleist (a German cleric) and Pieter van Musschenbroek (a Dutch scientist from Leiden). It is significant in that it led to experiments involving the electrocution of animals
1754	Early description of endotracheal tube for neonatal resuscitation	Dr Benjamin Pugh, surgeon in Chelmsford, England. It consisted of closely coiled wire wrapped in leather and was 10 inches long with a bore similar to that of the quill of a swan's feather; to be introduced blindly being guided by fingers in the mouth. He called it an "air pipe"
1757	Carbon dioxide (CO_2) discovered (see 1787 & 1910)	Joseph Black, Professor of Medicine and Lecturer in Chemistry at the University of Glasgow. During experiments with gases, limestone and acids, he determined that "fixed air" was exhaled by animals. In the early 1600's, Jan Baptist van Helmont, a Flemish chemist, physiologist and physician, had also recognized that a "gas" (the word was invented by him) was produced during fermentation and by burning wood - he called it "gas sylvestre" after the name given to the Spirit of the Woods: Sylvester; but he did not associate it with animal respiration
1763	Ground willow bark (precursor of aspirin) used to treat "ague" (see 1543 BC, 400 BC, 1828, 1853 & 1897)	Reverend Edward Stone (England). Given to 50 parishioners and results written in a letter to the Royal Society
1767	The use of bellows for respiratory resuscitation officially recommended (see 177, 1200s, 1543, 1771)	Society of Resuscitation of Drowned Persons of Amsterdam. They reported reviving 44 people within the first 2 years
1773	N_20 (nitrous oxide) first prepared	Joseph Priestley - English chemist & clergyman who also created soda water & discovered many other elements. In his paper, "Experiments and Observations on Different Kinds of Airs" in 1775 he described how this was done - he heated iron filings soaked in nitric acid. He named it "Dephlogisticated Nitrous Air" (see 1774 & **the foreword at the beginning of the Timeline**)
1774	(Re-)Discovery and naming of "dephlogisticated air" (key word: oxygen) (see 1668)	Joseph Priestley (see 1772 & **the foreword at the beginning of the Timeline**). He produced this by heating the red oxide of mercury in a closed container using a magnifying glass and sunlight. Priestly demonstrated this method to Lavoisier (see 1777) who had used a similar technique but failed because he put charcoal (which absorbed the oxygen) in the container. Apparently, Lavoisier was known for plagiarism and did not acknowledge Priestley's input. (Priestley used the term "dephlogisticated" because he continued to believe in the "phlogiston" theory (see 1703))
1774	The use of bellows for respiratory resuscitation also officially recommended in England (see 177, 1200s, 1543, 1767)	English physicians Thomas Cogan and William Hawes founded the *Institution for Affording Immediate Relief to Persons Apparently Dead from Drowning* . This eventually became the Royal Humane Society of London
1774	The application of cricoid pressure first described (see 1850, 1911 & 1961)	Dr Alexander Monro *secundus* , Professor of Medicine, Anatomy & Surgery at Edinburgh University. He described the technique in order to "*reduce water in the lungs and prevent gastric distension* " (with air) while attempting to resuscitate victims of drowning using mouth-to-mouth or bellows for lung inflation. He recommended using both mouth-nose and bellows techniques. He was also responsible for discovering the lymphatic system. (Also see Monro *primus* , his father, in 1731 entry)
1775	First record of (assumed) defibrillation (a term coined later) (see 1745) (key word: CPR)	Peter Abildgaard, a Danish veterinarian. He not only killed hens by electrocution but he also resuscitated them by giving them electric shocks across their chests

1777	Naming of "oxygen"	French chemist Antoine-Laurent de Lavoisier (see 1774) after discrediting the phlogiston theory of air by producing what he thought were the two components of air and what he called "vital air" and "azote" (from the Greek for "lifeless"). The latter became known as nitrogen in English. He called his "vital air" *oxygène* from the Greek ὀξύς (meaning: sharp, as in the taste of acids) and -γενής (meaning: producer) as he mistakenly believed it to be an essential ingredient of all acids. In 1794, Lavoisier was beheaded during the French Revolution for his work with the regime as a tax collector. By arrangement with observers, he managed to continue blinking for 15 seconds after the guillotine severed his head from his body!
1780	The discovery of electrophysiology	Luigi Aloisio Galvani, Italian physician & physicist in Bologna. He initially observed muscle spasms in the legs of frogs that he had hanging from copper hooks when they accidentally brushed against an iron balustrade at his home. Further experimentation ensued by Galvani and later Alessandro Volta
1781	First reports of oxygen being used for the resuscitation of newborn babies (see 1806)	French obstetrician François Chaussier in Paris after inventing his own machine to produce oxygen
1787	"Fixed air" shown to be carbon dioxide (CO_2) (see 1757 & 1910)	Antoine-Laurent de Lavoisier (see 1774 & 1777)
1788	First report of successful (assumed defibrillation) resuscitation of a human (see 1745, 1775, 1842, 1849 & 1947) (key word: CPR)	A 3 year old girl, who had fallen from a window in London, was shocked by a Mr Squires using a Leyden jar. The report was made to the Royal Humane Society by Charles Kite. (There remains uncertainty, however, about the immediate post-trauma cardiac status to start with!)
1797+	The system of "triage" of injuries established (also see Pirogov (Pirogoff) 1847)	Dr Dominique Jean Larrey, Surgeon-in-Chief of the Napoleonic armies from 1797 to 1815. Using specially trained drivers, corpsmen and stretcher-bearers, he also instituted "Flying Ambulances" and MASH-like army field hospitals. For his extreme bravery and his equal treatment of wounded soldiers belonging to both friend and foe, he was made a Commandeur of the Légion d'Honneur in 1807 and a Baron by the Emperor in 1809. He was highly respected by both friend and foe and actually had his life spared by Prussian captors due to this fact. He is considered to be the instigator of modern battlefield management of wounded personnel (refer Pirogov 1847)
1799	Nitrous oxide noted to produce pain relief and called "laughing gas" (see 1802, 1831 & next entry)	Sir Humphry Davy - British chemist & inventor (of Davy's Miner's Lamp et al). He suggested this in his publication "Researches, Chemical and Philosophical" which described his experiments with nitrous oxide. He discovered its "laughing quality" in the company of Dr Thomas Beddoes whose writings on the subject also mentioned its ability to produce pugnacity. Although he noticed it relieved a toothache that he had, Davy failed to progress the idea into something that could relieve the pain of surgery
1799	Nitrous oxide shown to be safely "respirable" while producing extraordinary behavioural effects (see 1802, 1831 & previous entry)	Dr Thomas Beddoes and Humphry Davy at the Pneumatic Medical Institute in Bristol, England. Having named it "laughing gas", their demonstrations were a significant step in the introduction of "travelling sideshows", including those conducted through the Royal Institution by Davy himself. After one such exhibition in 1802, a member of the audience, one James Stodart, used a supply he had at home to relieve right-sided facial pain. Davy actually noted in his writings that nitrous oxide relieved pain but failed to progress that observation, which Horace Wells did much later. James Watt, of steam engine fame, designed and manufactured Beddoes' apparatuses. In his own writings, Davy listed 18 people, apart from himself, on whom he had experimented and shown the safety of breathing the gas - despite the claim from the American physician, politician and polymath Dr Samuel Latham Mitchill that one deep breath of nitrous oxide would result in instant death from the introduction of the plague!!. The 18 listed by Davy included the 2 poets Samuel Taylor Coleridge and Robert Southey, Josiah Wedgewood of pottery fame and Peter Roget of Thesaurus fame
1802	Earliest known classroom demonstrations of nitrous oxide in USA (see 1799 & 1807)	Conducted by James Woodhouse, Dean of the Medical School of the University of Pennsylvania in Philadelphia, after visiting Humphry Davy in England. He produced "extremely impure" nitrous oxide and so got his students to breathe "atmospheric air". The students reported 'positive' effects so Woodhouse decided that imagination caused all the effects ascribed to nitrous oxide. However, he repeated the trial in 1806, this time with pure nitrous oxide and had to attest to the reported genuine effects

1803	The correct composition of air elucidated & the first chart of atomic weights created	John Dalton, chemist, England, when introducing his concepts which became the Law of Partial Pressures. He also studied the composition of air at different altitudes, including on Mont Blanc. He became a teacher at his school at the age of 12 years and the Principal of the school at the age of 18 years - a post which he held for 9 years. Both he and his brother were red-green colour-blind (often called "Daltonism") - a condition he correctly postulated was hereditary and that he researched at great length
1803	Opium alkaloids first extracted	Jean-Francois Derosne, a pharmacist in Paris. He extracted opium with water and then used either calcium or potassium carbonate (reports vary) to precipitate crystals that he called "salt of opium" while developing a test for the presence of opium. Although Derosne determined that these were alkaline substances, it was not until 1818 that they became known as "alkaloids" at the hand of Karl Friedrich Wilhelm Meissner. Derosne became a member of the Académie Royale de Médecine and twice served a the President of the Société de Pharmacie de Paris
1804	Morphine isolated from opium (see 1831 & 1845)	Friedrich Wilhelm Adam Sertürner, German apprentice pharmacist. It was initially named "morphium", after Morpheus, the Greek god of dreams. It was also called "principium somniferum" (the soporific principle) - a water-insoluble crystalline substance. This was produced in oral form as morphine acetate and was difficult and expensive to produce. The Frenchman, Gay-Lussac, in an editorial accompanying a French translation of Serturner's latest paper on the subject in 1817, proposed the name morphine instead of morphium
1804	Animals paralysed by curare observed to be capable of surviving if artificially ventilated for a sufficient length of time. (Also see 1743, 1825, 1845, 1855, 1858, 1900, 1935, 1939, 1942 & 1945*)	Charles Waterton in Portuguese Guiana by "field" observations after being asked to investigate curare by Sir Joseph Banks who was at that time the President of the Royal Society. Such survival also noted independently by Benjamin Brodie in 1812 and Edward Bancroft in England at about the same time. The Macushi Indians gave Waterton the recipe for Wourali. The Wakefield Museum in England has what Waterton brought back with him - a block of curare, blowpipe arrows, arrowheads and a quiver
1804	Early record of general anaesthesia for surgery in Japan (see 1881)	Dr Seishi Hanaoka removed a breast tumour from Kan Aiya, a woman who had lost all her sisters to the same disease. The anaesthetic was called "tsusensan" and consisted of an oral herbal concoction, which included the anticholinergics atropine and scopolamine, that had been developed by the surgeon himself. The surgeon even eventually operated on his own wife and daughter and over 150 other patients. "Anaesthesia Day" in Japan, held on October 13, celebrates this early record
1805	Tenon's capsule (fascia bulbi) described (see 1884 & 1992)	Dr Jacques-René Tenon - French surgeon, pathologist & member of French Academy of Sciences
1806	The Chaussier endotracheal tube developed (see 1781)	By French obstetrician François Chaussier at the École Polytechnique in Paris. This was a curved metal tube with a side hole at the tapered end that was introduced by feel using a finger to guide the tip into the trachea. He developed it specifically for the resuscitation of newborn babies
1807	Earliest public demonstration of nitrous oxide effects in USA (see 1799 & 1802)	John Griscom in New York after attending lectures by James Woodhouse (vide) in Philadelphia. Griscom arranged for 30 friends to contribute $50 each to purchase equipment from William Allen in London and is known to have charged the public $12 to attend his 'lectures on chemistry'
1807	Early record of laryngoscopy (see 1743, 1829, 1844, 1854 & 1858)	Dr Philipp Bozzini, Germany. He developed an instrument called a 'lichtleiter' (light conductor) for endoscopy of numerous body cavities, which was really the forerunner of endoscopy. It was illuminated by reflected candlelight. However, it was condemned by the Viennese faculty of physicians and this condemnation meant the value of his invention was virtually lost for decades
1809	Atropine first isolated (see 1819, 1831, 1833, 1867 & 1901)	Louis Nicolas Vauquelin, French pharmacist & chemist and Professor at University of Paris. He is also responsible for detecting beryllium & chromium. In concert with Pierre Robiquet he also isolated asparagine - the first amino acid to be isolated
1816	Stethoscope invented	Dr René Theophile-Hyacinthe Laennec (Paris) after deciding to listen to a "large" lady's chest through a rolled up piece of paper instead of the usual ear placed against the chest. First manufactured it as a monaural wooden tube. He produced a binaural version in 1829 but the first known written description of a binaural version was printed in The London Medical Gazette on August 12, 1829, which described that made by an Irishman, Nicholas Comins. (see 1850)

1817	Morphine marketed as an analgesic & a treatment for opium & alcohol addiction	Sertürner & Co
1818	First documented successful use of autologous blood transfusion in humans - salvaged vaginal blood from post-partum haemorrhage washed in saline (then had 75% mortality with the technique) (see 1615, 1665, 1667 & 1914)	Dr James Blundell (obstetrician) at Guy's Hospital, London. It is also said that the patient received homologous blood taken from her husband by syringe, which would also make this the first successful homologous human-to-human blood transfusion
1819	Atropine recognized as being an alkaloid (see 1809, 1831, 1833, 1867 & 1901)	Simon Rudolph Brandes
1824	Carbon dioxide shown to have anaesthetic properties in animals (see 1960)	Dr Henry Hill Hickman, England, who at the age of 17 years was admitted to the Royal College of Surgeons in London after a year of study at the University of Edinburgh Medical School. He showed that he could amputate parts of animals (kittens, puppies and mice) without pain or response while they were "in suspended animation" under the influence of high concentrations of carbon dioxide. The animals regained consciousness. Although his work was scorned both in England and France at the time, the Anaesthetic Section of The Royal Society of Medicine in 1931 instituted a triennial international award for meritorious work in the field of anaesthesia - the *Hickman Medal* , which was first awarded in 1935 (*vide*). Hickman died at the age of 30 years from syphilis, leaving behind his wife and 4 children
1825	Classic description of experiments with curare. (Also see 1743, 1804, 1845, 1855, 1858, 1900, 1935, 1939, 1942 & 1945*)	Charles Waterton when back in England. Involved 3 donkeys: First donkey injected and died within 12 minutes; second donkey injected distal to a tourniquet stayed alive for over an hour until the tourniquet released and then died within 10 minutes; third donkey injected and allowed to collapse within 10 minutes but given a tracheostomy and ventilated with bellows, with return of consciousness, until ventilation ceased - ultimately ventilated for two hours (by Dr Francis Sibson !) until movement returned and survived. Third donkey sick for about a year and then lived healthily for another 20 years with the name of "Wooralia" (the then current name for curare)
1826	Nerve conduction theory described (see 1848, 1849 1912)	Professor Johannes Peter Müller, German physiologist, when proposing his theory of "specific nerve energies"
1828	Salicin (precursor of aspirin) isolated in pure crystal form & named (see 1543 BC, 400 BC, 1763,1838, 1853 & 1897)	Professor Johann Buchner (Pharmacist, University of Munich) (Note that the Latin word for willow is 'salix' - hence salicin)
1828	First measurement of blood pressure using mercury-filled manometer	Jean-Louis-Marie Poiseuille, French physician & physiologist in Paris. His special interest in blood flow through the smaller vessels ultimately led him to formulate 'Poiseuille's equation' (also known as the 'Hagen-Poiseuille equation')
1829	Paraldehyde first synthesized (see 1882 & 1913)	Wildenbusch
1829	Salicin (glycoside precursor of aspirin) isolated from willow bark (see 1828)	Frenchman, Henri Leroux, developed a relatively productive technique for extraction after Johann Buchner had isolated pure salicin crystals the previous year
1829	Indirect laryngoscopy first described (in presentation to the Hunterian Society) (see 1864)	Dr Benjamin Guy Babington, physician & epidemiologist
1829	Development of a laryngoscope that had both an epiglottic retractor and a laryngeal mirror (see 1743, 1807, 1844, 1854 & 1858)	Dr Benjamin Babington in a paper presented to the Hunterian Society in London. Illumination was obtained from sunlight reflecting off a dental mirror. A tongue depressor was attached to the mirror
1829	The "Leroy d'Etiolles Method" of resuscitation advocated	This was presented to the French Academy of Sciences by Parisian surgeon Dr Jean-Jacques-Joseph Leroy d'Etiolles and consisted of placing the person supine, then compressing the chest and abdomen at the same time, so enhancing expiration with inspiration then resulting from the natural recoil of the body at the end of compression. The suggested technique apparently did not gain popularity
1831	Introduction of a cheap chemical process to isolate morphine hydrochloride and codeine hydrochloride from opium by an interaction with calcium chloride (see next entry)	Dr William Gregory, a medical graduate from University of Edinburgh. He later became a Professor of Chemistry at several institutions in Scotland after graduating in chemistry at the University of Giessen. This "muriate of morphia" was also known as "Gregory's salt" (see next entry)
1831	A cheap and easy method of producing morphine developed (see 1804 & 1845) (also see previous entry)	William Gregory's process was later further refined by brothers William & Thomas Smith, Scottish surgeons, who practised as apothecaries and who started to produce morphine as the hydrochloride (see previous entry). William Smith also developed methods for producing both ether and chloroform. A third brother, Henry, combined with Thomas to form a joint-venture apothecary business - T & H Smith

1831	Chloroform (trichloromethane = $CHCl_3$) first prepared (see 1831, 1847 & 1864)	An American surgeon and inventor, Samuel Guthrie, had a tub in his laboratory filled with a chemical compound (later, in 1834, named "chloroforme" by French chemist Jean-Baptiste Dumas), which was a by-product of another experiment. His 8 year old daughter, Cynthia, tasted an excessive amount of it and became unconscious. For some reason Guthrie did not account for the significance of this event (see 1847). German chemist Professor (Baron) Justus von Liebig and Eugène Soubeiran, a French pharmacist and the then Director of *Pharmacie Centrale* in Paris, also each independently discovered this chemical in this same year but until Dumas made a pure sample and analysed its chemical structure (initially incorrectly as being C_2HCl_3) it was variously known as chloric ether; bichloric ether; perchloride of formyle; chloroformyl; or terchloride of carbon.
1831	Chloric ether began to be used in prescriptions as a solution in alcohol for the treatment of hysteria (see 1831, 1847 & 1864)	Prior to 1847, the vapour of chloric ether had been tried as an anaesthetic but failed because of its high concentration of alcohol
1831	Nitrous oxide public exhibitions used to fund the development of the famous "Colt 45" (key word: nitrous oxide)	Samuel Colt, at the age of 17 years. While a seaman in 1830 he designed his revolver in carved wood. Returning to land in 1832, and needing funding for the development and production of his gun, he spent the next 3 years travelling throughout the USA and Canada demonstrating the effects of nitrous oxide under the name of "The Celebrated Dr Coult (sic) of New-York, London and Calcutta". He had learnt about the gas from the chemist who worked in his father's textile factory
1831	Atropine first isolated in pure crystalline form (from a member of the Solanacea plant family, Atropa belladonna - Deadly Nightshade, which was named after Atropos, one of the 3 Fates of Greek mythology, who was responsible for deciding the method of mortals' death and cutting the thread of life) (see 1809, 1819, 1833, 1867 & 1901)	German apothecary by the name of Heinrich Friedrich Georg Mein and simultaneously by Geiger & Hesse
1832	First successful saline-based infusion of intravenous fluids (see 1876, 1932 & 1933)	Dr Thomas Aitchison Latta, Britain. In treating patients suffering from cholera, his solution was hypotonic, containing 58 meq sodium, 49 meq chloride and 9 meq bicarbonate. He based this solution on the chemical analysis of cholera patients' blood and excrement done by Dr William Brooke O'Shaughnessy in 1831. Of his first 25 case reports, 8 survived
1832	Codeine isolated	Pierre Robiquet in France
1832	Chloral discovered by chlorinating ethanol (by exposing absolute alcohol to chlorine gas , which resulted in hydrochloric acid and the oily aldehyde chloral) (see 1869 & 1874)	Professor (Baron) Justus Freiherr von Liebig - a German chemist in Gieben who is extremely famous for contributions to agriculture and biological chemistry (see 1833)
1832	British Medical Association (BMA) was founded	Founded by Sir Charles Hastings of Worcester. Initially called The Provincial and Medical Surgical Association, it changed its name in 1855 to the British Medical Association
1833	Chemical formula of atropine derived - $C_{17}H_{23}NO_3$ (see 1809, 1819, 1831, 1867 & 1901)	Professor (Baron) Justus Freiherr von Liebig
1836	The first subcutaneous "placement" of morphine (see 1845 & 1863)	G V Lafargue, a French physician. He inoculated his own arm with morphine paste in 13 sites hoping to produce a local effect but actually produced a systemic effect of profound drowsiness. He failed to recognize the potential benefits because he was focussed on looking for local effects
1838	Salicin (precursor of aspirin) converted into salicylic acid (see 1543 BC, 400 BC, 1763,1828, 1853 & 1897)	Raffaele Piria (Italy)
1839	Reports of ether vapour being used to relieve the pain of intractable migraines and facial neuralgia	500 cases reported by Dr Prosper Menière, Parisian physician of 'Meniere's Disease' fame.

1841	Dr John Snow's neonatal resuscitation device described	In a paper presented by Snow himself to the Westminster Medical Society on October 16. Up to this point he had spent time in General Practice and noticed a lot of babies were still-born (from asphyxia) - official figures were 5% of births! While also being a proponent of mouth-to-mouth, his device consisted of 2 smallish syringes fused together such that the plungers went in and out together. One syringe was connected to the mouth via a tube, the other through the nose by another tube. One way valves enabled one syringe to aspirate the mouth and lung air while, at the same time, the other syringe drew in fresh air; pushing the plungers in then pumped fresh air into the lungs while expelling the old contents. He also recommended the use of supplemental oxygen "*generated, in great purity in a few minutes, from chlorate of potash by means of a spirit-lamp and a small retort..., after which it could be mixed with air in one of the bags belonging to the instrument* ". Throughout his career, he was a great advocate of the use of artificial respiration in cases of cardiac arrest, particularly in those cases occurring during anaesthesia.
1841	Anaesthetic effects of sulphuric ether on humans first recognized	During an "ether frolics" party in Anderson, Georgia, USA, a medical student named Philip Abney Wilhite "administered ether to a young black boy, who became deeply anaesthetized, to the point that all present believed that he had been killed" (according to Wilson C Wilhite, a descendant of Philip Wilhite, writing in the Bulletin of Anesthesia History 2011). Philip Wilhite sent for a doctor but the boy had recovered by the time the doctor arrived. It is thought that Philip Wilhite told one of his teachers about the incident - the teacher was Dr Crawford Williamson Long! The historic Wilhite House still stands in Anderson.
1842	(January) Diethyl ether first used (unofficially) for anaesthetic purposes, as opposed to use for "ether frolics" (see next entry)	Administered using an ether-soaked towel by William Edward Clarke (a chemist and medical student at Berkshire Medical College in Pittsfield, Massachusetts) for the removal of a tooth from a Miss Hobbie by dentist Elijah Pope
1842	Diethyl ether first (officially) used on a human for surgery (1 sebaceous cyst from the neck of Mr James M Venable - a friend of the surgeon) - first fee for anaesthesia & surgery was US$2.00 plus 25 cents to cover the cost of the ether (see previous entry)	Anaesthesia & surgery by pharmacist & physician Dr Crawford Williamson Long in Jefferson, Georgia. Operation performed on 30th of March 1842 but not reported in literature until 1849 in the *Southern Medical and Surgical Journal* and titled "An Account of the First Use of Sulfuric Ether by Inhalation as an Anaesthetic in Surgical Operations". A 2nd tumour was excised from the same patient by Long on the 6th of June 1842 using the benefit of ether. Long's 3rd, and final use of ether in 1842, was for the amputation of a toe from a black boy, who was "the property of Mrs S Hemphill". Long used ether anaesthesia for another 5 operations before the 1846 Boston demonstration but he never publicised or promoted the discovery. The Crawford W Long Museum was opened in Jefferson in 1957. Also in honour of Long, the USA recognizes the 30th of March as " Doctor's Day"; in 1920, the State of Georgia created Long County; on the 8th of April, 1940, the US Postal Service issued a 2 cent stamp, with a picture of him, in his honour ; and in 1926, a statue of Long was gifted by the State of Georgia to the Statuary Hall at the Capitol Building in Washington DC
1842	Ventricular fibrillation (a term coined later) first described following ligation of coronary vessels (see 1849 & 1874) (key word: CPR)	J E Erichsen, in the London Medical Gazette
1844	Horace Wells attended a public exhibition of nitrous oxide by "Professor" Gardner Quincy Colton	This was held on December 10 in Hartford, Connecticut and at which Wells (*vide*) noticed one of the participants, Sam Cooley, bruised his legs while under the influence but failed to be bothered by the incident

1844	*Strychnos toxifera* named (see 1895 & 1961)	Named by the famous (later Sir) Robert Hermann Schomburgk, a German botanist, geographer and ethnographer, when working for the British Government leading an expedition to British Guiana. Using local guides, the expedition found its way to the Kanuku Mountains where Robert was also introduced to the Urari plants/vines, to which he allocated the scientific name *Strychnos toxifera* . He believed the Macusi tribe of Indians produced the best grade of poison. As a result of Robert's many achievements, including the trip to Guiana, he was knighted by Queen Victoria in 1845. He was also a knight of the Legion of Honour and a recipient of the Prussian Order of the Red Eagle. One of his brothers, Moritz Richard Schomburgk, also a botanist and explorer, was part of that expedition. After returning to England later in 1844, Moritz then took 3 years to write a 3-volume detailed report for the Government on the travels in Guiana. In 1849, Moritz migrated to the State of South Australia where, eventually in 1865, he became the Director of the Adelaide Botanic Garden – a post he held until 1891 !!
1844	Amyl nitrite first synthesized (see 1866 and 1903)	Antoine Jérôme Balard, a French Professor of Chemistry at the University of Paris and the Collège de France
1844	N_20 (nitrous oxide) used to extract a molar tooth from Horace Wells on December 11 (a dentist in Hartford, Connecticut)	Extraction done by John Riggs (dentist) while Gardner Quincy Colton (a "travelling scientist" titled "Professor" working for Phineas Taylor Barnum of circus fame) administered the gas (see 1868)
1844	Amylene discovered	Monsieur Balard, Professor of Chemistry to the Faculty of Science of Paris. Dr John Snow, after experimenting with it on animals, first used it clinically on humans in 1856, writing extensively about it in early 1857. After successfully using it on 238 cases he had 2 patients die while under it later that year - he immediately stopped using it after the second death and within 9 days had the details published in the *Medical Times and Gazette*
1844	Development of enhanced lighting for a laryngoscope (see 1743, 1807, 1829, 1854 & 1858)	Dr John Avery, a surgeon at Charing Cross Hospital, London. He modified a miner's lamp to concentrate and focus candlelight down an aural speculum
1844	Sibson's fascia described	Dr Francis Sibson, a noted English anatomist, physician, surgeon and anaesthetist. This fascia is the thickened layer covering the cupola of the pleura and is the layer pierced by an errant needle (causing a pneumothorax) when performing a brachial plexus block - not that it was described with such relevance at the time because local anaesthetics were not developed then
1845	Horace Wells invited to Boston to demonstrate the use of nitrous oxide for anaesthesia	Through the good graces of Thomas Morton, a previous partner of Wells and an enrollee at MGH, an invitation was made by Dr John Collins Warren at the Massachusetts General Hospital in January and after Wells had used the technique on only 15 patients. The patient at MGH groaned, however, during the tooth extraction and Wells' efforts were labelled humbug by the medical audience. Wells never recovered from this set-back and became quite depressed; also addicted to nitrous oxide. He did at one stage become a chloroform salesman. After being arrested in 1848 for throwing acid at two prostitutes, he committed suicide, after inhaling a small dose of chloroform in jail (!), by cutting his own femoral artery and bleeding to death at the young age of 34 years.
1845	First hypodermic administration of liquid for therapy (cannula & spring-loaded trocar with gravity feed). This constituted the first regional nerve blockade/anaesthetic (see 1836)	Dr Francis Rynd in Dublin (a surgeon) - administered morphine ("*15 grains of acetate of morphia, dissolved in one drachm of creosote* ") for trigeminal neuralgia. Syringes of different sorts had been used since about the 5th Century BC but had only been used for irrigation of wounds, aspiration of pus or administering enemas
1845	Curare first used clinically in the United Kingdom - to help treat tetanus & hydrophobia (Also see 1743, 1804, 1825, 1855, 1858, 1900, 1935, 1939, 1942 & 1945*)	Sir Arnold Knight, Physician, in Liverpool. It is thought he obtained the distillate of *Chondrodendum tomentosum* from Charles Waterton (*vide*) of Walton Hall, Wakefield
1845	First reported use of ether to allay labour pains (see Simpson 1847)	Dr Crawford Williamson Long. One of his 12 children, a daughter, Frances Long Taylor, apparently reported to a friend and in her biography of her father how he administered ether to relieve his own wife's labour pains at Frances' own birth on December 27, 1845 - 13 months before Simpson used it for similar purposes on January 19, 1847 in Edinburgh

1846	First recorded* private use by W T G Morton of diethyl ether: to extract a wisdom tooth (from patient Eben H Frost) September 30	William Thomas Green Morton in Boston - a dentist (after experimenting with ether on his goldfish, his wife's pet terrier and himself). He used a handkerchief soaked in ether. A dentist colleague, Dr Hayden, held a lamp (!) for Morton because it was night time. *In the *Journal of the American Medical Association* (1911, June 3, p1677), Morton's son, Dr W J Morton of New York, stated that "It is not generally known that previous to the first use of ether at the Massachusetts General Hospital (in 1846) my father, Dr Morton, had employed this for thirty-seven private operations done by Dr Henry J Bigelow, and that, before beginning the administration of ether, he was accustomed to give large doses (40 minims) of laudanum". (This latter practice should rightly stand to be called the first use of 'premedication', although the term was not actually introduced until 1920 *(vide)*)
1846	Morton's famous glass ether inhaler provided	This was delivered to Morton by an instrument maker named Chamberlain on the morning of the historic public demonstration of 16th of October. Morton, when considering using a gas bag, took advice from his former teacher and boarding mate, Professor Charles Thomas Jackson (a polymath, chemist and geologist, by whom also the invention of the telegraph was controversially claimed against Samuel Morse), who had experience of "ether frolics" and who gave Morton a glass flask and tube to use and suggested "Burnett's" ether was the purest available
1846	First successful public demonstration of anaesthesia with diethyl ether (then called sulfuric ether): (to remove vascular lesion on neck of Mr Edward Gilbert Abbott by surgeon & founder of the "New England Journal of Medicine", John Collins Warren) October 16	William Thomas Green Morton (using Morton's Ether Inhaler) in the Bullfinch amphitheatre (subsequently named the "Ether Dome") of Massachusetts General Hospital, Boston. After performing the surgery, Warren uttered the famous words: "Gentlemen, this is no humbug". Morton tried to patent ether as "Letheon" in the USA but too many people new what "his" compound was for that move to be successful. [In England, a Mr James A Dorr of Duke Street, St James, acted as Morton's patent agent and, by writing to *The Lancet* in December 1846 and subsequently, attempted to enforce the patent for "Letheon". Dr Boott replied via *The Lancet* that he had received legal advice from 'Her Majesty's Counsel' (a Barrister, Mr J B Kington,) that doctors could continue to administer ether "without the slightest fear of legal consequences" with the exception that apparatuses for administration might be patentable.] Because of his involvement and advice to Morton, Charles Jackson (see previous entry) negotiated a 10% slice of any profits that Morton might have obtained but also fought the patent attempt via the US Senate. Morton died penniless in 1868
1846	Term "anaesthesia" (from the Greek: $\alpha\nu\alpha\iota\sigma\theta\eta\sigma\iota\alpha$) re-introduced to describe *'insensibility - more particularly to objects of touch'* (see also "nothria" 1957)	Professor Oliver Wendell Holmes (Senior) - Harvard Medical School (also famous author & member of "Fireside Poets"). He proposed this term, in a letter of reply to a request for a descriptive term, to dentist William Thomas Green Morton. Although claiming (in communication with Dr Edgar William Willett, as reported by the latter in *The British Medical Journal* , 1894 Oct 20 p898) that he "invented" it as the opposite of the then used word of 'aesthetic', meaning 'sensitive', the word had actually been used in the *Boston Medical and Surgical Journal* of 1845 Sept 24 p153 when describing partial loss of sensation in a patient's legs
1846	First anaesthetic machine constructed. It was designed to deliver ether	William Thomas Green Morton in Boston

1846	Ether first used in England (see 1847)	Three events: (1) London dentist, Dr James Robinson, both anaesthetized (using an inhaler of his own design) and removed a molar tooth from a Miss Lonsdale on December 19 in a private house (52 Gower Street) belonging to an American doctor and botanist, Dr Francis Boott (Robinson's neighbour). Miss Lonsdale was Boott's niece. Boott had been told of Morton's demonstration in a detailed communication sent by a friend in Boston, Professor Jacob Bigelow, the father of Henry J Bigelow - the latter had been present at Morton's demonstration at the Massachusetts General Hospital in Boston. Bigelow's letter had arrived in London on the SS Acadia, one of the four wooden paddle steamers belonging to the Cunard Company, which sailed from New York on December 1 and reached Liverpool on December 16; (2) An anaesthetic given in Dumfries, also on December 19, for the amputation of a leg injured in a cart accident - unfortunately, the patient died and little else is known of the incident; (3) Medical student William Squire administered ether at University College Hospital on December 21 enabling Professor Robert Liston to amputate a leg from a Harley Street butler/chauffeur, Frederick Churchill. Liston had been at Boott's house two days earlier. The ether and the inhaler had been made and provided by a pharmacist, Peter Squire, President-Elect of the Pharmaceutical Society of Great Britain, pharmacist to the Queen and William Squire's uncle. The inhaler had been made by Peter Squire himself. Liston has been attributed with calling the use of ether "This Yankee dodge" while addressing those present in the theatre, both before and after the event
1846	Ether first used for labour pains	Dr John Snow
1846	First ether anaesthetic for surgery in France	Administered on the 15th of December by Francis Willis Fisher, a doctor from Boston, Massachusetts. This was for the excision of a lip cancer in a 59 year-old man
1846	Startin's Pneumatic Inspirator invented	This probably became the first ether inhaler to be manufactured and commercially mass-produced. It was designed by Dr James Startin, General Practitioner, founder of the London Infirmary for the Cure of Diseases of the Skin and later a Fellow of the Royal College of Surgeons. He described his apparatus in a proposal to the (later Royal) Society of Arts on May 29. The Society's Committee considered and approved of the proposed item on June 3 when Startin described the use as appropriate for places where noxious fumes were to be avoided. He also suggested its use for breathing "Nitrous Oxyde and other gases". Its development was aided by the then recent invention of Hancock's** Vulcanised Indian Rubber, which provided 2 valves (opening in opposite directions) on the oronasal facemask that was made of differing substances (metal, leather, porcelain or wood). The mask was held in place by an elastic band around the head. A tube extended from the bottom of the mask and led to either open air or to a vapour-filled canister. The apparatus was described in the *Medical Times* of January 30, 1847 as Startin's Pneumatic Inhaler and was marketed immediately by Joseph Walters & Company. Its accompanying marketing note described its valued use with ether. ****Thomas Hancock established the British rubber industry following the invention of vulcanized rubber (from what was until then called natural, Indian or latex rubber) by the American inventor Charles Goodyear in 1839. Sir Joseph Priestley (mentioned at the beginning of this Timeline) coined the term "rubber" for an eraser in 1770 after noticing natural rubber erased pencil markings.**
1846	Nitroglycerine synthesised (see 1844, 1866, 1903 & 1981)	Professor Ascanio Sobrero, Italian organic chemist (who had also studied medicine) at the University of Turin. He actually ascribed to vasodilation the intense headaches he suffered after handling and tasting it. (Alfred Nobel, a student of his, eventually made his fortune by using his knowledge of it to produce dynamite and gelignite.) While the Scottish physician (later Sir) Thomas Brunton introduced amyl nitrite into practice for the relief of angina pectoris on the incorrect assumption that angina was caused primarily by hypertension and thus reducing vaso-motor tone, and hence hypertension, would relieve the angina, the English physician, William Murrell, started using nitroglycerin in 1878 to treat both angina pectoris and hypertension and wrote about it in his paper of 1879 "Nitro-glycerine as a remedy for angina pectoris". In order to prevent alarm among the community, the medical profession has used the alternative name of glyceryl trinitrate, or GTN, even though in such a dilute form the substance is not explosive (see 1981)

1847	The first report in an Australian newspaper of overseas (England) ether anaesthesia *(*see next 2 entries*)	The *Maitland Mercury* of May 8 in New South Wales published news of "Painless Surgery"
1847	Ether used in Australia for the first anaesthetics for surgery (June 7) (for removal of a tumour from beneath a girl's jaw and also for cataract extractions from a man) *(*see next entry*)	Dr William Russ Pugh at St John's Hospital and Dispensary, Launceston. He prepared the ether in his own laboratory where he also made his own inhaler from a sketch of William Hooper's 1846 Ether Inhaler in the January 9th, 1847, *Illustrated London News* . (William Hooper was a chemist & innovator who based his inhaler on that designed by Dr James Robinson - see 1846). (A question mark remains over whether Dr Colin Buchanan, assisted by Dr James Douglas, administered ether (using a nitrous oxide bag apparatus) to a man named Hickey earlier, during the month of May, when he repaired a *popliteal aneurism* (*sic*) in Stroud, New South Wales at the Australian Agricultural Settlement's Company Hospital - if so, this latter would have been the first ether anaesthetic in Australia and, given the report in the geographically nearby *Maitland Mercury* (see previous entry), it is quite possible that it was. To perform the operation, Buchanan had a company man named David Fletcher make *an aneurismal needle and a pair of retractors*)
1847	Ether used in Australia for what has been thought for a long time to be the first anaesthetics for dental extraction (June 7). *(*see previous entry*)	Dr Charles Nathan (surgeon) with Dr John Belisario ('S*urgical Dentist and Cupper* ' - also often called "The Father of Australian Dentistry") in Sydney. References by the Editor of The Sydney Morning Herald on June 8 and 16, however, reveal that one of the patients from June 7 had already received anaesthesia under Dr Belisario (reference: "The First Anaesthetics in New South Wales"; Gwenifer Wilson, *(Anaesthesia and Intensive Care (1979, Vol 7, No. 3, pp 278-281)* . This means Belisario's use of ether preceded that of Pugh, but only for dental procedures
1847	First documented use of ether in New Zealand	Dr Marriott in Wellington Hospital in September when he extracted a tooth from a prisoner. The same day, he administered ether to a Maori chief so that Drs Fitzgerald and Monteith could remove a large tumour from the patient's back
1847	First administration of ether for general anaesthesia in the State of South Australia	This occurred on September 30 with a report in the "South Australian" newspaper on October 1. Dr Kent administered the ether for a patient undergoing surgery for breast cancer. The surgeon was Dr Bayer. Information about the use of ether had arrived in Adelaide from England on the ship "Lightning" on May 4 (the earliest arrival of such news in Australia) but its use in that settlement did not occur until this case, making this township the last one in Australia to adopt it
1847	Ether probably first used in Scotland (Edinburgh) (see Long 1845)	Professor (later Sir) James Young Simpson who, after visiting Professor Robert Liston (*vide*) just after his first use of ether, used it to assist childbirth on January 19 - the same day he was told of his appointment as one of Her Majesty's Physicians for Scotland
1847	Ether first used in Malta	English doctors Thomas Spencer Wells (later Sir), (surgeon with the British Royal Navy), and Alfred J Burmester, (a civilian surgeon practising in Valletta), at the Naval Hospital in Malta. Spencer Wells developed an interest in anaesthesia and used a Hooper's modification of James Robinson's ether inhaler. From just March through June that year alone he gave and documented 54 successful anaesthetics
1847	First use of ether anaesthesia in a battlefield	Professor Nikolai Ivanovich Pirogov (Pirogoff). He was a much feted and awarded Russian surgeon who graduated from medical school at the Moscow State University at the age of 16 (in 1827), having started at 14. He was a member of the Russian Academy of Sciences and has been considered to be "The Father of Field Surgery". Among many achievements, he also introduced a 5-level system of triage (refer Larrey 1797+)
1847	John Snow's ether inhaler produced	After hearing about the demonstration of the use of ether by Dr James Robinson (*vide*) in Gower Street London for a tooth extraction, Dr John Snow arranged to witness such cases in Robinson's surgery on December 28, 1846. Within 6 months, Snow designed and had produced this inhaler within 6 months. Having realized that the concentration of ether in air would vary with the ambient temperature, and having worked out how much ether vapour would be held in air at various temperatures, he incorporated a water bath with a temperature of 50 - 60 degrees Fahrenheit. He also specified the breathing tube to be wider than the trachea
1847	First attempt at describing "stages" of anaesthesia	Drs John Snow & Francis Plomley (see 1937)

1847	Publication of John Snow's *On the Inhalation of the Vapour of Ether in Surgical Operations*	Published at either the end of September or in early October. Its cover also states: "*Containing a Description of the Various Stages of Etherization, and a Statement of the Result of Nearly Eighty Operations in Which Ether Has Been Employed in St George's and University College Hospitals, 1847* "
1847	The first textbook on ether anaesthesia published (see 1846)	Written by Dr James Robinson (*vide*), a London dentist, in about the first week of February, which was only about 7 weeks after he administered the first ether anaesthetic to be given in the United Kingdom on December 19, 1846. The publication was titled "*A TREATISE ON THE INHALATION OF THE VAPOUR OF ETHER FOR THE PREVENTION OF PAIN IN SURGICAL OPERATIONS* ". It consisted of 16 pages of text by Robinson and also copies of the famous letters of Dr Francis Boott (*vide*) to the journal, The Lancet, of December 21, 1846.
1847	Early recognition of the anaesthetic properties of chloric ether (chloroform) (see several Simpson entries and Guthrie 1831)	While working in John Bell & Co's chemist shop in Oxford Street, London, in order to pay for his future studies at the College of Surgeons, Michael Cudmore Furnell (later Surgeon General with the British army in India) became addicted to "sniffing" ether. In the Spring of 1847, when his employer withdrew the ready availability of ether, Furnell found a bottle of chloric ether in the basement and soon realized its potential to produce similar effects to those of ether. He even gave some to Dr Richard Holmes Coote who used it to anaesthetize several cases for surgeon Sir William Lawrence at St Bartholomew's Hospital. Its further use did not eventuate until later the same year when James Young Simpson popularized its use. (This information came to light after a letter to the *Medical Times and Gazette* in 1875 by Scottish Professor Sir Robert Christison, the then President of the British Medical Association, and was again mentioned in *The Lancet* of 1877)
1847	Chloroform "discovered" to be an anaesthetic agent (see 1831)	Dr Marie Jean-Pierre Flourens, France, "realized" this when experimenting with it on animals
1847	Anaesthetic properties of Ethyl Chloride first described (also see 1903)	Dr Marie Jean-Pierre Flourens, France
1847	Professor (later Sir) James Young Simpson discovered the effects of pure chloroform as an anaesthetic agent (see 1831, 1847 & 1864)	Simpson met Dr David Waldie, a Scottish surgeon/apothecary when the latter was the chief chemist at Liverpool Apothecaries Company, who suggested using pure chloroform (as opposed to the already available chloric ether (*vide*). Waldie's laboratories burnt down before he could supply, so Simpson arranged for (John) Duncan & (William) Flockhart & Co (chemists) of Edinburgh to supply. They produced a high-grade chloroform by triple distillation using the following formula - 4lb Chloride of Lime; 12lb Water; 12 fl oz Rectified Spirit. (Rectified spirit is highly concentrated ethanol purified by repeated distillation known as "rectification")
1847	Chloroform first used clinically (November) (to relieve labour pains, which were thought by many to be punishment for & method of atonement for Original Sin!) (see 1831, 1851 & 1853)	Professor (later Sir) James Young Simpson of the University of Edinburgh (obstetrician & gynaecologist) - having previously experimented on himself & some guests*, by breathing from glasses what was then known as "sweet whiskey", at the dinner table on Thursday 4 November at the family home at 52 Queen Street, Edinburgh. *(Apart from himself and his wife, Jessie, at the dinner party, there was Mrs Simpson's sister, Miss Grindlay; her niece, Miss Petrie; his brother-in-law, Captain Petrie; and Drs James Matthews Duncan & George Skene Keith). Simpson's first public announcement of his recognition of chloroform as an anaesthetic was in a paper, titled *Historical Researches regarding the Superinduction of Insensibility to Pain in Surgical Operations: and announcement of a New Anaesthetic Agent* , presented to the Medico-Chirurgical Society of Edinburgh on November 10. The first woman to receive chloroform during labour was Jane Carstairs, the wife of Dr William Carstairs, a physician retired from the Indian Medical Service. Jane's previous pregnancy had been delivered by craniotomy after 3 days of labour, so she was very anxious about this one. According to the new baby's son, in a letter to *The Scotsman* newspaper in 1948, while Jane named the baby Wilhelmina, Simpson nick-named it "Anaesthesia"! The first surgical cases to receive chloroform were at the Royal Infirmary on November 11 or 12 - a 4 year-old, Barney Dempsey, with an osteomyelitic sequestrum of the radius; a soldier, John Sutherland, with a buccal fistula; & a patient having a toe amputated. It has also been reported that Simpson, at his own expense, gave Florence Nightingale 1,000 doses of chloroform to take to the Crimean War, which ran from 1853 to 1856

1847	The first dental mouth prop specifically devised for use during anaesthesia (see 1858)	Dr Francis Brodie Imlach who was a fully qualified Scottish surgeon in Edinburgh with a special interest in dentistry. He co-founded the Edinburgh Dental Dispensary and had his dental practice rooms at 48 Queen Street, just 2 doors away from Dr James Young Simpson's rooms at 52 Queen Street. His props were made of ivory and shaped like a cartoon-drawn bone
1847	The first use of chloroform for a dental extraction	Dr Francis Brodie Imlach on November 11 when he removed a tooth from a dental colleague, James Darsie Morrison. (See also entries for Simpson regarding dates of interest)
1847	First woman in USA to receive ether for labour analgesia	Frances (Fanny) Appleton Longfellow, the second wife of the American poet Henry Wadsworth Longfellow. The ether was administered on April 7 by Dr Nathan Cooley Keep, who was also a dentist and, in the practice of which, had already given more than 200 dental ethers. He later became the first Dean of Dentistry at Harvard University
1847	First ether anaesthetic given in Ireland - January 1	Dr John MacDonnell, a surgeon at the Richmond Hospital in Dublin. After another surgeon, Dr Edward Hutton, showed him an article about the ether event in Massachusetts and also an editorial about Liston's use of ether in London, MacDonnell had a vaporizer made and tried the ether on himself. MacDonnell both anaesthetized and operated on a patient, 18 year-old Mary Kane who was suffering severely (after failing to respond to several weeks of treatment and even developing a bed-sore) from an abscess of the elbow after an encounter with a thorn, underwent amputation of her arm.
1847	First ether anaesthetic given in Russia	By Professor Fjodor Ivanovich Inozemtsev on February 7 at Moscow University clinic for a 48 yearold woman with a breast tumour, although Dr B F Berenson had used it on January 15 in Riga, the capital of Latvia, which was then part of Imperial Russia. Inozemtsev had established the first departmental surgical clinic in Russia in 1846. In 1858, he edited and published the *Moskovskaia Meditsinskaia Gazeta* (Moscow Medical Newspaper) and, in 1861, founded the Society of Russian Physicians in Moscow
1847	First chloroform anaesthetic given in Russia	Professor Nikolai Pirogov (Pirogoff) on November 30 (see other Pirogov entries this year)
1847	First use of rectal ether anaesthesia in a human	Professor Nikolai Pirogov on April 1. After much experimentation in animals, he determined it could only be given rectally as a vapour, as distinct from liquid form (when it would be immediately expelled), and was impressed by the smoothness of induction after 3 minutes using a dose of about 56 ml. He reported this to the St Petersburg Medical Society. (see other Pirogov entries this year)
1847	John Snow's ether inhaler produced (see 1848)	After hearing about the demonstration of the use of ether by Dr James Robinson (*vide*) in Gower Street London for a tooth extraction, Snow arranged to witness such cases in Robinson's surgery on December 28, 1846
1847	The first written anaesthetic incident report made (see 1846)	This was made by the very famous Dr Jonathan Pereira (surgeon, physician, pharmacist and the author of *The Elements of Materia Medica and Therapeutics* , among many other publications*)* when anaesthetizing a patient at the London Hospital for a compound dislocation of an ankle that necessitated amputation. He made the report, containing illustrations, in a letter to the then President of the Pharmaceutical Society, Mr Jacob Bell. It described the malfunction of an expiratory valve, consisting of a heavy wooden ball, and the step taken to overcome the problem during the operation - after removing the ball, the assistant had to close the valve hole with his finger during inspiration and release during expiration
1847	The first report of a death under ether anaesthesia (see 1848-Greener)	This was reported in the "Gazette Médicale" of March 4, 1848. This article followed a report of the case in "L'Union, Journal de l'Yonne" published on July 15. The case occurred in Auxerre, France, on July 10 at the "Hôtel-Dieu de la Madeleine" ("Hôpital des grandes Charités"), now a museum, during an operation on a 55-year old man having a tumour of the left breast excised. His name was Alexis Montigny, a blacksmith by trade. He was anaesthetized using a Charrière device. Post-mortem suggested the cause of death was due to both asphyxia and high levels of ether; findings describe signs of probable obstruction, which would be consistent with the description of events as he struggled during induction and the initial surgical incision drew black blood
1847	"Patient Controlled Analgesia" (PCA) first proposed (see 1967 & 1969)	William Morton, Boston dentist, advocated its use in labour when suggesting the woman herself should hold an ether-soaked sponge and breath on it when experiencing labour pains

1847	Erichsen's pump for ventilation/resuscitation produced	Dr John E Erichsen, a surgeon in London. The pump was cylindrical and used an intranasal pipe through which ventilation was achieved
1847	The Parisian Medical Society acknowledges Horace Wells as the "discoverer" of inhalation anaesthesia	This followed a visit to Paris by Wells early in the year. After meeting Dr C S Brewster, an American dentist practising there and who happened to be aware of the controversy over the "discovery", Wells was invited by Brewster to plead his case before the Académie des Sciences, the Académie de Médicine and the Parisian Medical Society. Although Wells returned to America and collected all the required affidavits from witnesses to prove his claim, all of which he sent to Brewster, he never knew about the recognition because he died* in 1848 before the news got back to America (*see details in 1845 entry). **Dr Brewster was quite a celebrity - he became the dentist to the French Royal family, attended dignitaries throughout Europe and was also knighted by the Emperor of Russia. He was later joined in practice for several years by another American, Dr Thomas Wiltberger Evans, who was responsible, in his capacity as United States Commissioner to the Exhibition, for inviting Gardner Quincy Colton to demonstrate the effects of nitrous oxide at the Universal Exhibition (aka World Fair) held in Paris in 1867**
1847	Recognition of the benefits of hand hygiene/washing/antiseptic technique (see 1894)	Dr Ignaz Philipp Semmelweis (later Professor) a Hungarian obstetrician. While working at the Vienna General Hospital, he noticed the long-standing difference in mortality (5-fold) from puerperal sepsis between 2 clinics: one run by nurses and another run by doctors who had earlier in the day been routinely working in the morgue. Semmelweis noticed a colleague had died from septicaemia after being pricked by a scalpel in the morgue and he put two and two together and assumed there was "something" being carried on the doctors' bare hands to the women in the clinic. He introduced hand washing in chlorinated lime solution for the doctors coming from the morgue - this reduced mortality from 11.4% to 1.3%. His theory (not published until 1861) and practice were not accepted by the profession until the work of others on germ theories later in the century (also see Sédillot)
1848	Pamphlet produced: "*Answers to the Religious Objections Advanced Against the Employment of Anaesthetic Agents in Midwifery and Surgery and Obstetrics* "	Professor James Young Simpson in Edinburgh
1848	John Snow's chloroform inhaler produced (see 1847)	This was temperature compensated, wicked, low resistance, draw-over and portable. It allowed for a maximum 5% chloroform-air mixture. In over 4200 cases using chloroform, he had only one death
1848	First reported death occurring during anaesthesia using chloroform (see 475 BC, 400 BC, 1847-Montigny, 1853, 1860, 1911, 1946 & 1961)	This occurred on January 28. A 15 year-old girl named Hannah Greener was the patient. She was undergoing "*the extraction of the nail and matrix of the great toe, for onychia* ", having had a similar operation several months before under diethyl ether without problems but had complained that the ether "*had made her head bad for two or three days* ". Dr Thomas Meggison administered the anaesthetic and subsequently wrote that the operation was performed rapidly and while the patient was still not fully anaesthetised because she reacted to the stimulus with leg movement, spluttering, blanching of the face and apnoea. He assumed syncope and responded by administering cold water and brandy into her pharynx (customary at the time for syncope). This, consequently, led to pulmonary aspiration and, ultimately, death. Dr Meggison did not believe, especially because he had given only a low dose (a teaspoonful on a towel), that chloroform toxicity, as had been demonstrated in animals, was to blame. Post-mortem findings presented to the Coroner supported his idea but the coronial jury decided that death was due to chloroform toxicity. In the medical community debate that followed, Professor James Young Simpson offered a similar opinion to Dr Meggison but Dr John Snow suggested too much chloroform had been administered and caused the cessation of respiration
1848	First chloroform anaesthetic administered in Australia	On April 11, by surgeon Dr Charles Nathan at the Sydney Infirmary and Dispensary. Surgeon for the operation was Dr McEwan
1848	First death in Australia from chloroform anaesthesia (see 1860 & 1911)	On July 19 at Windsor, New South Wales. Patient having operation for carcinoma of the mouth. Dr White administered anaesthesia; Drs Dowe and Bell were the surgeons; and a veterinary surgeon, Mr John Shanes, was used to time the individual applications of chloroform soaked handkerchiefs

1848	Nerve "action current" first detected (see 1826, 1849 & 1912)	Emil Du Bois-Reymond, Professor of Physiology in Berlin. He developed equipment, based on the Galvanometer, that was sensitive enough to detect nerve electrical potentials
1848	The term "local" anaesthesia first used in a publication	Professor James Young Simpson in the *Lancet* (July 8)
1849	Accurate demonstration of the speed of nerve conduction(see 1826, 1848 & 1912)	Hermann von Helmholtz, a German physician, physicist, physiologist & psychologist in Königsberg. He also invented the ophthalmoscope
1849	Ventricular fibrillation (a term coined later) first described following electrical stimulation of the heart (see 1842 & 1874) (key word: CPR)	M Hoffa & C Ludwig. This was recorded using Ludwig's "kymographion" after "faradization" of the heart
1849	The Bourdon Pressure Gauge patented	Invented by Eugene Bourdon, France. It consists of a coiled tube connected to a dial. The degree to which the tube uncoils is dependent on the gas pressure that it is measuring
1849	Nitroprussides named (key word: SNP, hypotension)	Following some of the chemical reactions of Leopold Gmelin, Professor of Chemistry at Heidelberg University, in the early 1800's that involved combining nitric acid and the ferri-cyanides (known as the "prussides"), the resultant chemicals were named "nitroprussides" by L Playfair
1850	Morphine first used specifically to prevent pre-operative anxiety (see 1908 & 1920)	Dr Lorenzo Bruno of Turin. He recommended giving an injection of morphine one hour before surgery "to lessen psychic trauma"
1850	Sibson's chloroform inhaler produced	Dr Francis Sibson (refer 1844). He designed this mask specifically to allow for artificial ventilation in cases where patients were adversely affected by chloroform. In such events, the gas supply tubing could be disconnected from the mask and mouth-to-mask ventilation commenced. It incorporated one-way valves to enable this method. An interesting description of the mask by himself includes "*The basis of this inhaler is the mask I invented for the inhalation of ether, which mask Dr Snow employed in May last.This inhaler is made of copper, brass or white metal. It has a border or face-piece of thin flexible lead lined with oiled silk, covering the nose and mouth, and from its ductility easily adapted to any face".* During his description of the technique of resuscitation, he describes the action of "*pressing back the larynx* " (refer Monro 1774 and also Sellick 1961)
1850	First recorded fire under anaesthesia	Reported in the Boston Medical and Surgical Journal. The case involved ether anaesthesia with surgery on the face and the use of cautery to control bleeding
1850	First coca leaves brought to Europe (Germany) to permit isolation of cocaine	Brought from Peru aboard frigate "*Novara* " by Austrian Dr Carl von Scherzer. Its effects on humans had been noted long before by the Florentine traveller Amerigo Vespucci (1451-1512)
1850	Curare's site of action described as being somewhere between nerve and muscle	Claude Bernard (French physiologist). Using frogs, he showed that nerve conduction remained normal as did muscle response on direct stimulation. The exact mechanism of action was not defined until Sir Henry Dale et al demonstrated the chemical basis of myoneural transmission in the 1930s
1850	Stethoscope 'tube' modified with the addition of woven flexible tubes leading to binaural ivory ear-pieces with a rubber band used to pull the ear-pieces towards each other. Retained the wooden chest piece (see 1816)	Dr George Cammann (New York, USA)
1851	Florence Nightingale expresses her belief in the use of chloroform for anaesthesia (see 1847)	This followed her observation of an amputation. During her involvement in the Crimean War, in which she worked from 1854, she helped advocate the use of chloroform during surgery on wounded soldiers; this despite the expressed opposition (although not an order) from the Inspector General of Hospitals, Dr John Hall, who has been quoted as saying "*the smart of a knife is a powerful stimulant and it is much better to hear a man bawl lustily than to see him sink into a grave* " ! The mortality from chloroform during the Crimean war has been reported as being between 1 in 12,000 and 1 in 13,000 cases

1852	A French publication *Rules for the Use of Chloroform in Surgical Operations* produced	French military physician & surgeon Professor Charles-Emmanuel Sédillot. This paper was presented to the then called *Académie Impériale de Médecine* . He had also presented *Loss of Sensation Produced by Chloroform and Ether and Pain-free Operations* in 1848. Ten years prior to Semmelweis (*vide*), in 1851 & 1853, he had linked post-operative infections to the proximity of anatomy services and dissection rooms and had proposed washing of hands and instruments and banning re-use of dirty dressings. His interest in these matters led him to invent the word "microbe" (Greek: *mikros* (small) & *bios* (life)) in his 1878 paper to the Academy of Sciences, *On the influence of the work of Mr. Pasteur on the progress of surgery* . (He had met Pasteur while working as the Chair of External Pathology and Clinical Surgery at the University of Strasbourg)
1852	First direct laryngoscopy controlled operation	Dr Horace Green, the first specialist airway physician in the USA. Using a bent spatula to displace the tongue and sunlight to see, he removed a laryngeal tumour, which had been causing intermittent obstruction, from a child
1853	Acetyl salicylic acid produced and found to be kinder than salicylic acid on the stomach (see 1543 BC, 400 BC, 1763, 1828, 1838 & 1897)	Charles Frédéric Gerhardt (France) by mixing acetyl chloride with sodium salicylate
1853	Chloroform used on Queen Victoria for birth of 8th child - Prince Leopold. Administered in small quantities, using a handkerchief, during contractions for 53 minutes until delivery - not to the point of unconsciousness. Technique became known as "*chloroform à la reine* ". Use of chloroform by the Queen, as Head of the Church of England, ended all religious debate of its use: even to the point where later that year the daughter of the Archbishop of Canterbury received chloroform for her confinement at Lambeth Palace. Queen Victoria again used chloroform in 1857 for the birth of her 9th (and last) child, Princess Beatrice	Administered by Dr John Snow on both occasions, according to his diary, by "dropping" the agent in 15 minim doses onto a folded handkerchief covering the face. {A very old but undated pharmacopoeia lists 80 minims = 5cc and therefore 15 minims = 0.94ml} However, in an unrelated letter that Snow wrote in 1855 he described 15 minims as being = 67 drops, which equals 3ml if the drops were the size of regular water drops – but note that a modern paediatric intravenous drip set gives 60 drops/ml. It has been said that the Queen's husband, Prince Albert, had already started administering chloroform during the labour for Princess Beatrice's birth even before Dr Snow had arrived. Dr Snow is honoured by being one of the two bearers on the coat of arms of the Royal College of Anaesthetists - the other being Dr Joseph Thomas Clover who, incidentally, took over John Snow's anaesthetic practice after Sir Benjamin Ward Richardson, Snow's former assistant/partner, turned down the offer
1853	First documented death during anaesthesia definitely due to pulmonary aspiration (also see 475 BC, 400 BC, 1848, 1946, 1951 & 1961)	This case, not reported until 1862 at a meeting of the Obstetrical Society of Edinburgh by Dr G W Balfour while divulging information included in a letter from an army field surgeon, a Dr John Balfour, involved the death of a soldier during the Burmese war. He was undergoing a femoral artery ligation for recurrent bleeding after a leg wound when he vomited and died shortly afterwards. Post-mortem revealed a trachea full of vomitus
1853	First practical syringe developed (see 1853 x2 & 1869)	Dr Charles Gabriel Pravaz - a French physician. This was made wholly of silver and had a screw-down plunger allowing some estimation of dose. Its capacity was 1ml. He first used it to inject iron perchloride into an aneurysm in a sheep
1853	Production of partly glass syringe with mechanism for attaching a hollow platinum trochar (needle) (see 1853 x2 & 1869)	Mr Daniel Ferguson, an instrument-maker in Giltspur Street, London (see next entry)
1853	First "hypodermic" (term coined by Dr Charles Hunter, a surgeon in London) injection using a proper glass syringe and hollow needle attached (see 1853 x2, 1858, 1863 & 1869)	Dr Alexander Wood in Edinburgh - he injected local morphine to treat a woman with neuralgia using the Ferguson-produced syringe that he had designed and commissioned (see previous entry). Despite noticing, but being annoyed by, the resulting somnolence of the patient, he, like Lafargue, got side-tracked by his intention of producing local effects. For his efforts, Wood has been referred to as the "father-in-lore" of local anaesthesia.
1854	Distillation of pure (high grade) ethyl ether achieved	Dr Edward Robinson Squibb, the eventual founder of E J Squibb and Sons. He had analysed all the available ether products and determined that they all varied greatly in their purity and strength. This led him to develop the required distillation equipment needed to produce the quality product. He also did this using a steam-based method rather than the more dangerous open-flame method in existence up till then. He published his methods in full in the American Journal of Pharmacy in 1856
1854	Description of mirrors used to view larynx (in paper to the Royal Society of London) (see 1743, 1807, 1829, 1844 & 1858)	Manuel Patricio Rodriguez Garcia - Professor of Music & singing teacher of Jenny Lind (Swedish Nightingale) et al. He was the first person to view his own larynx using sunlight and a dental mirror. He died at the great age of 101 years
1855	Cocaine isolated from coca plant (Erythroxylon coca) & called "erythroxyline"	By chemist Friedrich Gaedcke in Germany

1855	Classic description of physiological effects of curare described. (Also see 1743, 1804, 1825, 1845, 1855, 1858, 1900, 1935, 1939, 1942 & 1945*)	Professor Claude Bernard, Chair of Physiology at the Collège de France. He determined: curare had no effect if ingested; the heart was not affected primarily; artificial respiration would keep the 'victim' alive; motor nerves affected, not sensory nerves; muscles affected in particular sequence (extremities, thoracic, diaphragm); and, site of action between nerve ending and muscle
1856	Reynaud's chloroform mask introduced	Auguste Adolphe Marc Reynaud, the French Chief Naval Surgeon in charge of the Health Service & Military Hospital of the Port of Brest. It was a truncated cone-shaped mask, made of thick cardboard and stood 14 centimetres high. Its base covered both nose & mouth and the apical opening was 4 centimetres wide. The anaesthetic agent (mainly chloroform then used in the navy & army) was administered onto a diaphragm made of discs of thick cloth and positioned in the middle of the cone. In 1858, Reynaud became the Inspector General of the Bureau of Medicine & Surgery. In 1895, so it could be sterilized and re-used, the construction of this mask was converted to metal by the French naval surgeon, Dr Jules Fontan, who was also famous for performing the first open suturing of a cardiac injury - in this case, a knife wound to the left ventricle
1856	First direct monitoring of human arterial blood pressure (see 1733)	French surgeon Dr Jean Faivre. He measured both brachial and femoral pressures in a patient (an amputee) using a mercury manometer
1856	"Marshall-Hall Method" of respiratory resuscitation advocated (key word: CPR)	After disagreeing with the Royal Humane Society's basic methods, especially the rule that an apparently asphyxiated person "should be carried to the nearest house" for resuscitation, this London Doctor and Fellow of the Royal Society argued that (a) in the prone position, the tongue falls forward (opening the airway) and the weight of the thorax and abdomen would force expiration and (b) in the lateral position, the aforementioned weight would be removed and inspiration could take place. His recommendation, therefore, was that the rescuer should kneel beside the prone body and alternate the suggested positions 16 times per minute
1858	The "Silvester Method" of respiratory resuscitation advocated (key word: CPR)	Dr Henry Robert Silvester, London, writing in the British Medical Journal. He called it the "Natural Method". He devised it after seeing the Marshall technique fail to revive an infant. He suggested placing the person supine and alternately raising the arms up and then resting them back on the chest (causing inspiration followed by weighted expiration). Success was noted with an infant. Gordon,in 1952, showed this method could give a tidal volume of 1069 mlin an adult
1858	Curare first used clinically in the United States - to help treat tetanus (Also see 1743, 1804, 1825, 1845, 1895, 1900, 1935, 1939, 1942 & 1945*)	Dr (later Professor) Lewis Albert Sayre, a famous orthopaedic surgeon, who also had general medical interests, in New York. The patient was an Irish labourer working in New York
1858	Systemic action of morphine first fully recognized and appreciated (see 1853 & 1863)	Dr Charles Hunter, a surgeon in London. Using Alexander Wood's technique of injection, he noted that the pain relief afforded by a remote injection was equivalent to that of a "local" injection. Hunter referred to his injection as "hypodermical" and Woods insisted on calling it "subcutaneous". A special committee from the Medical and Chirurgical Society then took 2 years to decide that systemic effects of morphine were of primary importance compared with local effects
1858	First registration of medical practitioners in the world	This occurred in Britain under the *Medical Act,* which was legislated so the public could identify those practitioners who had undertaken appropriate training. It created the General Medical Council
1858	Development of widespread interest in medical laryngoscopy (see 1743, 1807, 1829, 1844, & 1854)	Johann Czermak, Professor of Physiology at the University of Pest, was responsible for kindling such an interest by persisting with the idea and efforts of Ludwig Türck, Professor of Laryngology in Vienna, who had been unsuccessful in his efforts earlier in the year
1858	A delayed description of a mouth prop ("gag") for dental surgery (see 1847 & 1869)	Developed and described by Dr John Snow in his posthumously published book "*On Chloroform and Other Anaesthetics* " - Benjamin Ward Richardson, a friend of Snow, organized the publishing of the book. The prop was a cork placed between the molars. It was tied to a piece of string "lest it should be swallowed".

1858	Separate post-anaesthesia Recovery Rooms (aka PACU) proposed (see 1953 James)	Dr John Snow - "*a room might be set aside in which the patient who has undergone surgery and anaesthesia could recover under skilled care and free from outside disturbance* ". However, it was not until the 1940s (see J Alfred Lee) that widespread action stopped many patients from being recovered back in their original ward. Statistics, such as those mentioned by The Anesthesia Study Commission of the Philadelphia County Medical Society, where 95 out of 307 fatal post-operative cases (from 11 years of reporting beginning in 1935) were the result of inadequate nursing care and respiratory obstruction, helped cement the concept of dedicated nursing care to be provided in dedicated and appropriately equipped recovery rooms close to the operating rooms
1860	Cocaine purified with a molecular formula identified and named	Albert Niemann, PhD student at University of Göttingen in Germany. Niemann identified its molecular formula as $C_{16}H_{20}NO_4$, however, after Niemann's death in 1861, his student Wilhelm Lossen, in 1865, corrected the formula to $C_{17}H_{21}NO_4$. Its actual structure was identified in 1898
1860	Introduction of open-drop administration of general anaesthetic agents	Sir James Young Simpson. He documented this using chloroform "dropped" onto a towel, spread fan-shaped over the patient's nose and mouth. This technique was a marked advance in safety over the pre-existing "cone" method of administering either chloroform or ether (see 1862 & 1879)
1860	The "ACE" anaesthetic mixture devised (see 1848)	Dr George Harley, a remarkable Scottish physician. This was a mixture of ethyl **a**lcohol, **c**hloroform and diethyl **e**ther in the proportions of 1:2:3 respectively. In 1864, a Committee of Inquiry into Chloroform, set up by the Royal Medical and Chirurgical Society after chloroform had been directly implicated in the deaths of 163 patients, officially recommended the use of "ACE". Its use persisted well into the 1900's (see 1911)
1862	Clover's Chloroform Apparatus produced (Clover's Bag)	Dr Joseph Thomas Clover. This was exhibited at the International Exhibition held in London that year. The idea was based on one of Dr John Snow's but came with an innovation of Clover's that was a large anaesthetic reservoir bag (made from waterproof silk cloth) slung over the user's shoulder. Clover filled his bag with approximately 4.5% chloroform using a concertina bellows of 1,000 cubic inches (16 litre) capacity to pump that much air through a vaporizer, into which he injected 2.4ml of chloroform, and onwards into the bag. He then disconnected tubing from this apparatus and plugged his bag into the patient's mask. One way valves were incorporated in the circuit close to the patient's face to prevent rebreathing. He was able to anaesthetize anyone within 4 minutes using this arrangement
1862	Skinner's anaesthesia mask introduced	Dr Thomas Skinner, obstetrician in Liverpool, England. This was made of wire and covered with domette (a wool & cotton fabric) onto which he dripped chloroform. He designed this structure to lift the material covering the face off the skin specifically to prevent chemical burns. It had a folding handle and was designed to fit under a top hat. This mask was subsequently used extensively on the Continent (see 1860 & 1879)
1863	The Colton Dental Association founded in New York	Gardner Quincy Colton, initially with 2 dentists (one of whom was John Allen), at 22 Bond Street. Up until 1897, 194,000 dental anaesthetics using nitrous oxide were recorded as having been administered by this Association. The Association grew to include 6 other cities
1863	The sphygmograph first described (see 200)	Invented by Étienne Jules Marey, a French physiologist at the Collège de France, who described it in detail in a monograph published that year
1863	First recorded use of subcutaneous morphine injection for post-operative pain relief	Dr James Paget, Middlesex Hospital, England, administering ⅓ grain (= 20mg) to a patient who had had a leg amputated. He recommended doses of ¼ to ½ grain (= 15 to 30mg). His report implied this was not the first case to receive morphine this way

1864	Barbituric acid synthesized (see 1902 & 1932)	Adolf von Baeyer, Germany, by condensing urea with an apple ester, diethyl malonate thus forming malonylurea, also known as 6 hydroxy uracil. One theory is that the name, barbituric acid may have been suggested from the fact it was discovered on the feast of St Barbara - December 6. Another theory is that von Baeyer et al were celebrating the discovery/development in a hotel when an artilleryman, who was there celebrating the feast of Saint Barbara (the patron saint of gunners), suggested the combination name for the compound. It took 10 more years to discover its actual structure. It has no sedative properties. Von Baeyer became a Nobel prize-winner in 1905 for his life-long work in chemistry
1864	The first "Chloroform Committee" established (see 1831, 1875, 1891, 1901, 1911 & 1946)	Set up by the Royal Medical and Chirurgical Society (now The Royal Society of Medicine) to investigate the use of chloroform in Britain. It determined that chloroform was the most widely used agent in Britain but that ether was safer. Joseph Clover developed his "Clover Bag" while serving on the Committee
1864	Development of infra-red absorption measurement of carbon dioxide (CO_2) in human breath	John Tyndall - Professor of Physics Royal Institution of Great Britain
1864	First use of a tourniquet specifically to produce a bloodless operating field (see 199BC, 1517, 1593, 1718, 1873, 1904 & 1984)	Baron Sir Joseph Lister, surgeon at the Glasgow Royal Infirmary and pioneer of antiseptic surgery. He also recommended exsanguinating a limb before application of a tourniquet
1864	First direct laryngoscopy performed (see 1829)	Dr Adelbert von Tobold (Adelbert Augustus Oscar Tobold), Berlin. Considered to be the Father of German laryngology, he used a mirror for illumination and a tongue depressor to enable the view. Tobold also developed and patented, in 1860, the adjustable surgical chair; this could have the patient sitting upright, semi-recumbent or lying flat
1865	"Glottiscope" described	Dr Benjamin Guy Babington
1865	First successful operation performed using topical / local anaesthetic spray	Operation performed by Mr Peter Matthews in London on December 11. Female patient having 5 teeth extracted. Anaesthesia provided by the eminent and most notable Dr (later Sir) Benjamin Ward Richardson using his personally developed "ether spray" device. Richardson had for years been investigating a means of effective local anaesthesia (ice being too slow) in order to avoid the sudden deaths associated with chloroform (see 1911). In 1862, following a prank on him at a ball where a lady sprayed eau-de-cologne on his forehead with a Rimmel's vaporiser, he realised he temporarily lost sensation when it froze after evaporating. He then spent 3 years testing various substances, eventually settling on ether. The use of his device gained great popularity after it produced anaesthesia on the arm of the President of the British Association allowing him to be painlessly punctured with needles. Richardson is also famous for his work with amyl nitrite that eventually led to Thomas Brunton's (*vide*) clinical introduction of it for the treatment of angina pectoris. Richardson also invented the double-valved mouthpiece for chloroform administration
1866	Amyl nitrite introduced into clinical practice to treat angina pectoris (see 1844, 1846 and 1903)	Dr (later Sir) Thomas Lauder Brunton, Royal Edinburgh Infirmary. Up until then, treatment of angina had been mainly by blood-letting, although digitalis, aconite (wolf's bane) and brandy had all been tried. Brunton reasoned that blood-letting reduced blood pressure (he believed hypertension was the cause of it) and so amyl nitrite, in causing vasodilatation (an effect previously noted and studied by Benjamin Ward Richardson and Arthur Gamgee in Edinburgh), would do the same thing but could be employed on a more regular basis. Brunton used the recently invented sphygmograph (*vide*) in his related studies (see 1903)
1867	Junker's Inhaler produced	German surgeon Dr Ferdinand Edelbert (or Ethelbert) Junker von Langegg while at the Samaritan Hospital in London. Krohne & Sesemann of London manufactured the device. It was the first inhaler to use the "blow-over" principle. A hand bellows was used to this end. For safety reasons (such as to avoid documented fatality from pure liquid chloroform being blown onto the face), it was later modified by others, including Drs Frederic Hewitt, Dudley Buxton and C Carter Braine. The device was popular for many years and became part of Shipway's Apparatus

1867	Rendle's ether inhaler produced	Dr Richard Rendle, England. This was dome-shaped and lined with flannel. The top of the dome was fenestrated to allow air entry. It was originally designed to administer methylene bichloride (a mixture of chloroform and methyl alcohol - in use for many years) but was later adapted to administer the 'triple' mixture of ethyl alcohol, chloroform and diethyl ether ("ACE") in ratio of 1:2:3 (see 1860). There was no in-built control of dosage
1867	Atropine first noted to prevent the bradycardic effects of vagal stimulation (and chloroform) (see 1809, 1819, 1831, 1833 & 1901)	Dr Albert von Bezold at the University of Jena in Germany where he later became the Professor of Physiology at the age of 23. Later still he became the Foundation Professor at Würzburg but died from rheumatic mitral stenosis at the age of 32. F Bloebaum aided von Bezold in these experiments
1868	Method of converting nitrous oxide gas to liquid for storage in cylinders developed	George Barth & J Coxeter, of Coxeter & Sons, England. They produced iron cylinders weighing 9lb (4kg) with a capacity of 100 Imperial gallons (454.6 litres). Gasometers were also supplied
1868	Nitrous oxide started to be used regularly in dental practices in London	Followed demonstrations by American dentist Thomas Wiltberger Evans who had been working in Paris (Napoleon III among his patients) and probably enhanced by the ability to liquefy the gas in cylinders (see previous entry). Prior to this, dentists had been preparing nitrous oxide in their rooms by heating ammonium nitrate and capturing the gas for patients to breathe in 100% concentration until the point of unconsciousness
1868	Recommendation that oxygen be added to nitrous oxide when the latter was to be administered for dental anaesthesia (see 1844)	Edmund Andrews, Professor of Surgery at the Chicago Medical School - "The Oxygen Mixture - A New Anesthetic Combination". This was in contrast to Gardner Quincy Colton's belief that 100% nitrous oxide was necessary for adequate dental anaesthesia. Later, in the 1880s, experiments by Paul Bert demonstrated that the addition of oxygen really was necessary to prevent asphyxiation
1868	Probably the first clinically-used carbon dioxide absorber produced (see 1905, 1910, 1911, 1915 & 1921)	London-based dental surgeon Alfred Coleman developed an apparatus that used partially slaked quicklime to remove "carbonic acid and aqueous vapour" from exhaled breath in order to be able to re-cycle nitrous oxide back to the patient. He developed the idea of doing this after an article in the British Medical Journal that year referred to the work of a Berlin-based physiologist, Ludimar Hermann, that had been published in 1864, which revealed nitrous oxide was eliminated unchanged from the body. In 100 cases, Coleman showed that he saved between 67% and 75% of nitrous oxide together with its associated cost and production. His apparatus became known as "Mr Coleman's economizing apparatus for re-inhaling nitrous oxide gas" and was supplied by Coxeter & Sons, England. Some unknown time before 1881, Coleman abandoned the use of his apparatus probably due to the increasing availability of nitrous oxide and hence its reduction in cost
1868	Clover's Chloroform Apparatus adapted for administration of nitrous oxide	Dr Joseph Thomas Clover. This was done, after observing problems Dr Thomas Evans encountered during a demonstration, to improve the administration of nitrous oxide during dental extractions by providing a reservoir for the gas and, with adaptations of the mask, to limit dilution by air
1868	Recognition of the relationship between quaternary ammonium groups of curare molecule and the existence of its neuromuscular blocking activity	Alexander Crum-Brown (Scottish Organic Chemist) and Thomas Richard Fraser (Scottish Pharmacologist) in presentation to the Royal Society of Edinburgh. These two were also the first to attempt to produce synthetic relaxants with their production of the quaternary compounds, methyl-strychnine & methyl-brucine
1868	Cocaine first reported as blocking transmission in a nerve (sciatic in a frog)	Moreno Y Maiz in his book titled *Recherches chimiques et physiologiques for l'erythroxylum coca du Perou et la cocaine*
1868	Protamine sulphate discovered and named (see 1936)	Johann Friedrich Meischer while investigating cell nuclei. He isolated the substance from the heads of sperm cells of salmon
1868	Reduced body temperature (hypothermia) noted in association with general anaesthesia (see 1603, 1611, 1953, 1956 & 1961)	Dr Weir during a meeting of the New York Academy of Medicine when discussing the effects of ether and chloroform reported noting this when monitoring with a thermometer
1869	First description of human endotracheal intubation (via tracheotomy) for the purpose of administering general anaesthesia	Dr Friedrich Trendelenburg (German surgeon). His equipment consisted of "a delicate double-walled india-rubber tube of about 3.4cm in length" and a seal was obtained by inflating a small india-rubber balloon with a pilot balloon attached "through a small tube opening into the external wall" of the tracheotomy tube - this was obviously a very advanced product for the time!

1869	The first "conventional" mouth prop ("gag") invented (see 1858)	Dr Joseph Clover. This device consisted of a spring-loaded telescopic cylinder that held the mouth open. He later incorporated a ratchet to ensure the mouth stayed open
1869	Chloral hydrate (formed by distilling chloral with sulphuric acid and then adding water) first described as an oral premedication (see 1832 & 1874)	Oscar Liebreich, a pharmacologist in Berlin. Its hypnotic effects had, earlier that decade, been experimented with in both animals and humans by the German chemist, pharmacologist and doctor, Rudolf Buchheim, together with his students - although without publication. It subsequently was combined in solution with alcohol to produce "knockout drops" and obtained notoriety when used by a Chicago bar owner by the name of Michael (Mickey) Finn who used to rob his patrons after putting them under its influence
1869	First all-glass syringe (see 1853 x3)	Parisian-based medical instrument-making company (Wülfing Luer Company) whose principal was a German, Hermann Wülfing Luer (see 1896 & 1906)
1869	Subcutaneous morphine noticed to intensify & prolong chloroform anaesthesia (see 1930)	Claude Bernard (French physiologist), Professor of Physiology at the Sorbonne, during experiments on animals. Following his lectures at the Collège de France, Drs Léon Labbé and Félix Jean Casimir Guyon decided in 1872 to use morphine as a premedicant before chloroform anaesthesia on 4 patients at the Pitié Hospital in Paris and presented the results to the Académie des Sciences
1869	The "Howard Method" (aka "Direct Method of Artificial Respiration") of resuscitation advocated (key word: CPR)	Benjamin Howard, Professor of Clinical and Operative Surgery at the Long Island College Hospital, New York. He published a 5 page booklet, *Plain Rules for Restoration of Persons Apparently Dead from Drowning,* outlining his 6 point technique and suggested everyone should practise on a friend and then not wait for a doctor to be called before commencing resuscitation efforts should an event occur. He travelled extensively promulgating his technique, which is described in detail in an article, titled *The Direct Method of Artificial Respiration for the Treatment of the Drowned, Still-Birth, Etc* , that he wrote in The British Medical Journal, June 18, 1881, pp963-965. Basically, it involved putting a large roll of clothing under the patient's chest in the prone position and expressing inhaled liquid by compressing the chest like bellows; then turning the patient supine with the roll under the back of the chest and squeezing the rib cage and upper abdomen, again like bellows, for up to one hour
1860s	Chisolm nasal chloroform inhaler produced (see 1909 & 1910)	Dr Julian John Chisolm, while a Confederate army surgeon. Designed to be portable and small because of the shortage of chloroform for the southern American forces in the Civil War following a naval blockade of supplies to the Confederate forces. It became popular throughout the whole of the US after the war due to its efficacy
1860s	*Vin Mariana* marketed as a tonic	Developed by Angelo Mariana, a Corsican doctor. This was a tonic made by steeping coca leaves in Bordeaux wine. Sigmund Freud was among more than 8,000 doctors who prescribed this tonic - he as a remedy for the torpor of morphine addiction. His fascination for the properties of cocaine led him to suggest its use to Carl Koller (see 1879 & 1884)
1870	First reliable statistics regarding the mortality rate from chloroform anaesthesia	Sir Benjamin Ward Richardson. He collected data on 35,162 cases from 14 hospitals and determined the mortality rate due to the administration of chloroform (11 cases) to be 1:3,197 cases (see 1902 & 1911)
1872	Hawksley's Ether Inhaler produced	This was designed by Dr G Everitt Norton ('chloroformist' to the Middlesex Hospital) and manufactured by Hawksley of Oxford Street, London. Its basis consisted of a metal box divided into 6 horizontal compartments each divided by flannel-covered shelves. Each shelf had a hole in the middle and a row of holes at the end. A tube to the patient's mask came from the lowest level. The design was based on a Dr Smith's carbonic acid apparatus, described in "Philosophical Transactions" of 1859-1861, in which "air was made to travel over the largest amount of surface in the smallest compass"
1872	Atropine shown to inhibit salivation (key word: atropine)	Dr Rudolf Peter Heinrich Heidenhain, a German physician & Professor of Physiology at the University of Breslau
1873	Clover's Double Current Ether Inhaler produced	Dr Joseph Thomas Clover. This was his first commercially produced ether inhaler and was designed specifically to administer controlled dosage to minimize side effects such as vomiting. It also used expired air to help warm the ether reservoir and was also fitted with a system that could be interpreted as the first attempt at scavenging in order to limit the smell of ether in the room

1873	Esmarch's rubber bandage/tourniquet introduced (see 199BC, 1517, 1593, 1718, 1864, 1904 & 1984)	Johannes Friedrich August von Esmarch, a notable German military surgeon
1874	First successful human intravenous anaesthetic administered (see 1832 & 1869)	French surgeon Dr Pierre-Cyprien Oré. He had been using chloral hydrate to treat the convulsions of tetanus and strychnine poisoning from 1872 but in 1874, while sedating a tetanus case, he also undertook some minor surgery on the patient and realized its anaesthetic benefit
1874	Heroin (diacetyl morphine) synthesized from morphine	Felix Hoffman (Friedrich Bayer & Company, Germany)
1874	The term "fibrillation" coined (see 1745, 1775, 1788, 1842, 1849 & 1947) (key word: CPR)	Edmé Felix Alfred Vulpian, a French Physician and Neurophysiologist
1875	The First Anaesthesia Committee of the BMA was formed (see 1864, 1891 & 1901)	This followed a recommendation by the BMA's Surgical Section. The Committee was asked to investigate the use of chloroform, ether, nitrous oxide and any other agents used during surgery throughout Britain; to conduct appropriate experimental investigations; and to report on relative advantages. The Committee's final report in 1880 concluded that ether was much safer than chloroform but also recommended the future use of ethidene-dichloride as an inhalational agent
1876	Ringer's Solution developed for intravenous infusion (see 1831, 1932 & 1933)	Professor Sydney Ringer, English physician, cardiovascular physiologist & pharmacologist, University of London. His was the first isotonic solution developed for infusion after he noticed the better response when tap water was used instead of distilled water. He demonstrated that definite and precise concentrations of sodium, potassium, calcium and chloride were necessary for protoplasmic activity
1876	Methylene blue developed	Heinrich Caro, a German chemist
1876	Clover's Nitrous Oxide & Ether Inhaler	Dr Joseph Thomas Clover. This was a modification of his earlier Double Current Ether Inhaler
1877	Clover's Portable Ether Inhaler produced	Dr Joseph Thomas Clover. This actually formed the basis of many later designs by others, including Louis Ombrédanne
1877	First modern anaesthetist to produce an emergency surgical airway (tracheotomy) (using a curved metal cannula pre-designed by himself years before for the specific purpose, if it ever arose!) (see **1625**)	Dr Joseph Thomas Clover (who had actually trained to be a surgeon but became a full-time anaesthetist) when unexpectedly encountering obstruction by an oral tumour post-induction. Dr Clover also promoted the anterior jaw thrust manoeuvre to pull the tongue forward off the posterior pharynx. He is also noted for having anaesthetized Napoleon III, the Princess of Wales (later Queen Alexandra), the Prince of Wales (later King Edward VII), Florence Nightingale & Sir Robert (Bobby) Peel. He has been honoured by being one of the two bearers on the coat of arms of the Royal College of Anaesthetists - the other being Dr John Snow.
1877	Acetaminophen (paracetamol) synthesized	Harmon Northrop Morse during search for low-toxicity compounds of aniline (the first being acetanilide) (see 1887 & 1953)
1877	First "official" American Nurse Anesthetist	A Catholic nun, Sister Mary Barnard, working at Saint Vincent's Hospital in Erie, Pennsylvania. Some years before, however, during the American Civil War, which ran from 1861 to 1865, several nurses (including a Catherine S Lawrence) provided anaesthesia services by themselves
1878	First oral endotracheal intubation of human (blind digital technique) for anaesthesia (previously only used for victims of drowning)	Regius Professor (later Sir) William MacEwen (Scottish surgeon, Glasgow Royal Infirmary) to prevent aspiration during removal of a tumour from the base of the tongue. He had developed the technique by practising on cadavers. He subsequently ceased using the technique after a tube dislodgement (by the patient) during induction of the second such surgical case resulted in the death of the patient
1879	Cocaine used to treat morphine addiction	Dr Sigmund Freud (This lead to "The Cocaine Incident" involving an acute "cocaine psychosis" and later the death of his friend Fleischl-Marxow) (see 1887)
1879	Cocaine first used as an anaesthetic	Dr Vasili Konstantinovich von Anrep, a Russian physician working at the Pharmacological Institute in Würtzburg, Germany. He was the first person to inject cocaine into a human (himself). He injected it subcutaneously and described the warm numbness that lasted about 30 minutes. He was the first to suggest its use for surgery but, probably because he was not a surgeon and his findings were not published in a surgical journal, this suggestion was not immediately acted on. Sigmund Freud, after becoming familiar with cocaine in *Vin Mariana* (see 1860s), eventually noticed Anrep's suggestion and gave cocaine to Carl Koller and J Konigstein (Ophthalmologists) for them to experiment with on humans (see 1860s & 1885)
1879	Esmarch's anaesthesia mask introduced	Dr Johannes Esmarch, military surgeon in Germany. This was a simplified version of Skinner's mask (see 1860 & 1862)

1881	Cyclopropane discovered (see 1929)	August von Freund, a chemist in Vienna
1881	Ringer's solution developed for IV infusion	Professor Sydney Ringer, scientific physiologist & pharmacologist, Fellow Royal College of Physicians, Professor of Materia Medica & Therapeutics and also of Medicine and Clinical Medicine University of London, Fellow of Royal Society. Worked at University College Hospital London (also see 1932 - Hartmann's solution)
1881	First somewhat successful sphygmomanometer developed (see 1896)	Samuel Siegfried Ritter von Basch (Austrian physician). The device comprised a water-filled rubber ball, which was connected to a manometer and applied to the skin until arterial pulsation disappeared. Basch was also famous for attending Mexican Emperor Maximillian as personal physician
1881	Scopolamine (hyoscine) first isolated (see 1804)	Albert Ladenburg, scientist at the Poliklinik of Freiburg University in Germany, from a member of the *Solanacea* plant family - *Scopolia carniolica* (named after Johann Scopoli who did a lot of work with the plant). Hyoscine is named after the scientific name of the plant *Hyoscyamus niger* . Later, in 1890, scopolamine was also separated from *Scopolia japonica* by Schmidt
1881	Clover's Down-Draft Dilutor designed	Dr Joseph Thomas Clover. Although designed to administer a constant and precise amount of anaesthetic agent, he died in 1882 before it could be manufactured to completion
1882	Paraldehyde first used in clinical practice (see 1829 & 1913)	Dr Vincenzo Cervello, United Kingdom
1882	First clinical use of O'Dwyer's endotracheal tubes(see 1900 & 1919)	Dr Joseph O'Dwyer, physician at the Foundling Hospital in New York. He developed these as a substitute for the then standard use of tracheotomy in diphtheria cases. He is credited with popularising tracheal intubation due to his success in dramatically reducing diphtheria mortality from the then 100%. He developed tubes of varying sizes to be used according to a scale based on the age of the child. Oral intubation was achieved with the aid of digital palpation of pharyngo-laryngeal structures. It is safe to assume O'Dwyer was motivated by the fact that his 4 sons had died from diphtheria
1883	Oxygen first liquefied	Professors Zygmunt Wroblewski & Karol Olszewski in Krakow, Poland
1884	Cocaine first used as local anaesthetic for the eye	Dr Carl Koller, while an intern at Allgemeines Krankenhaus in Vienna, after experimenting on a frog's eye, used it in his own eye, which he then poked with needles to test its efficacy. This was after being asked by Sigmund Freud to explore its properties and effects and also after he noticed how numb it made his own tongue. On September 11, he first used it on a patient for surgical treatment of glaucoma. Koller emigrated to the USA in 1888, settled in New York and became the first Chief of Ophthalmology at the Mount Sinai Hospital in 1901 (see 1860s & 1879)
1884	Cocaine used to anaesthetize respiratory system	Dr E Jelinek, Vienna
1884	Use of sub-Tenon's route for injection of local anaesthetic first described	Dr C S Turnbull using cocaine for enucleation of an eye
1884	First retrobulbar injection for eye surgery	Professor Hermann Jakob Knapp, a German-American ophthalmologist and otologist. He used 4% cocaine to perform an enucleation. He later decided cocaine was too toxic to continue using it in this way
1885	First spinal anaesthetic given (accidental during attempted peridural (epidural) with cocaine on a dog) (see 1898)	Dr James Leonard Corning (neurologist in New York) who also coined the term "spinal anaesthesia" & was the first to describe post-dural puncture headache in patients. In the same year, Corning injected cocaine between the 11th & 12th vertebrae of a man suffering from "spinal weakness and seminal incontinence" but, as he did not obtain spinal fluid in his syringe and the man did not lose full control of, or sensation in, his legs, it has been speculated that Corning administered an epidural injection rather than a spinal. He did suggest that this method could be used instead of general anaesthesia. He used a short-bevelled gold needle with an introducer and a depth screw
1885	Cocaine first used to block peripheral nerves (supraclavicular brachial plexus under direct surgical vision) (see 1911, 1978 & 1992)	Dr William Stewart Halsted - American surgeon. He and Dr Richard J Hall had previously published their use of cocaine to block the ulnar nerve, musculocutaneous nerve of the leg, dental nerves and lingual nerve, however, Vasili von Anrep is credited with preceding them in its clinical use but the latter only published his findings in a Russian journal, *Vrach* (Physician), and not in the widely used scientific language of the day, German. Halsted apparently became addicted to cocaine

1885	Cocaine sold to public in cigarettes, powder & mixture for IV injections with needle and syringe included	Parke-Davis
1886	"Coca Cola" marketed - an elixir of cocaine & caffeine	John Styth Pemberton of Atlanta, Georgia. This began as an elixir made of extracts from the coca leaf and the Kola nut (from a cocoa African tree) in a sugar syrup and supplied from a soda water fountain in Dr Crawford Long's pharmacy in Athens, Georgia. The fountain was under a lease arrangement to a Willie Venable, a relative of Crawford Long's first patient, James Venable (vide). Another pharmacist, Asa Griggs Candler, later bought the elixir business and changed the part named Kola to Cola. Cocaine was mostly removed from the recipe in 1906 but some remained until complete removal in 1929 when scientists developed techniques that allowed complete removal of psychoactive substances from the coca leaf
1886	Sodium nitroprusside (SNP) injections shown to be lethal (key word: SNP, hypotension)	L Hermann, when working with animals at the Prussian University of Königsberg. In 1887, his pupil, K Davidsohn, showed that sub-lethal doses would produce hypotension. W Gibbs & E T Reichert also demonstrated the latter effect in 1891
1886	First safe storage of injectates in glass "ampoules"	Stanislaus Limousin (French pharmacist)
1886	Death of Thomas Edwin Bartlett - aka "The Pimlico Poisoning Mystery"	This man died with a fatal amount of chloroform found in his stomach. His wife, Adelaide, was tried for his murder but acquitted by a jury after the prosecution could not demonstrate how she might have introduced the chloroform into her husband's stomach. There was no damage to his throat and no obvious apparatus for insertion/ingestion. A tangled tale involving an alleged love triangle with a Methodist minister, George Dyson, who had bought 4 small (to avoid signing for a large quantity) bottles of chloroform. The story featured on radio, titled "Four Small Bottles" and as a television series, titled "A Question of Guilt"
1887	Sigmund Freud accused of "unleashing the third scourge of humanity" (cocaine - after alcohol & opiates) (see 1879)	Dr Albrecht Erlenmeyer (a Viennese psychiatrist)
1887	Acetaminophen (paracetamol) abandoned (see 1877 & 1953)	Following clinical trials by Joseph von Mering who mistakenly claimed it produced methaemoglobinaemia
1887	Use of bellows for intermittent positive pressure ventilation (IPPV) or "forced respiration" rediscovered	Dr George Edward Fell, a Canadian civil engineer who became a medical doctor, practising in Buffalo, New York. The bellows could be operated by hand or foot but Fell thought an electric motor could be used for pumping. He famously used his device for approximately 84 hours to successfully resuscitate another doctor, ventilating via a tracheostomy. He is considered to be the pioneer of prolonged ventilation
1888	The first "Honorary" Anaesthetist appointment made in Australia (see 1888 & 1894)	This occurred at St Vincent's Hospital, Sydney. The appointment was termed "Honorary Chloroformist" and was made to provide expertise in response to an unacceptable rate of anaesthesia mortality throughout the State of New South Wales. According to the hospital's Annual Report, Joseph Labatt De Lambert Esq., a Hungarian-born doctor with a Paris-based medical degree, was appointed and retained that appointment until 1892. He was followed in that year by Dr A A Cohen whose appointment was then termed "Honorary Anaesthetist". Cohen was born in Newcastle, NSW, with a medical degree obtained overseas in Aberdeen. De Lambert's appointment was initially offered to Dr C H Maher who declined due to ill-health and then to Dr Childs Macdonald but it is unclear whether the latter ever accepted even for a brief time

1889	World's first female anaesthetist graduates from her medical course	Rupa Bai Furdoonji was 1 of 5 female Indian medical graduates of Hyderabad Medical School, having begun their studies in 1885 with the encouragement of the British Medical Officer, Major Edward Lawrie, who was then the Principal of the Medical School and the Chief Surgeon of the Afzal Gunj General Hospital (now called Osmania General Hospital). Furdoonji showed a preference for anaesthesia becoming a deft chloroformist at the Afzal Gunj, British Residency (now Sultan Bazaar) and Victoria Zenana Maternity Hospitals in Hyderabad. In 1909, she travelled to the University of Edinburgh where she studied and obtained a Diploma in Physics & Chemistry (the closest thing then to a qualification in anaesthesia) and eventually obtained a medical degree from Johns Hopkins University in Baltimore, USA. (The latter obtained at a time when no other University, including Harvard, would admit women into a medical degree course). She contributed to the 1st and 2nd Hyderabad Chloroform Commissions of 1889 and 1891 respectively (*vide*)
1889	The First Hyderabad Chloroform Commission (see 1891)	Recommended by Surgeon-Major Edward Lawrie (*vide*) and commissioned, and paid for, by the then ruler of Hyderabad State, Mir Mahbub Ali Khan. The President of the Commission was Surgeon-Captain Patrick Hehir. The work of the Commission inquired into the effects of chloroform on the respiration & circulation of dogs. Its report was published in the *Indian Medical Gazette* 1889 and *The Lancet* 1890. Results showed that no cardiac syncope occurred in dogs and that it was important to keep respiration going. If the latter was maintained appropriately then anaesthesia would be safe. Lawrie based his belief in the safety of chloroform on his claim to have given chloroform anaesthetics for more than 15 years, up to 5 times a day, without fatality and that this was because he had been trained in the Glasgow method under Professor James Syme. *The Lancet* critically questioned the Hyderabad report and suggested further investigation, which resulted in the Second Hyderabad Chloroform Commission
1889	First method for gaining access to the spinal cerebrospinal fluid developed	Dr Walter Essex Wynter, a London physician. He used a cut-down approach followed by cannulation into the CSF, in 4 patients suffering from tuberculous meningitis, only performed in order to relieve intracranial pressure
1889	Invention of cuffed tubes (these being for endobronchial tubes) (see following entry & 1939)	Henry Head (later Dr (neurologist & physiologist) & subsequently Sir) at the University College Hospital, London These were designed for physiological lung studies in dogs. They had cuffs made from India rubber tubes that were inflated using syringes filled with glycerine
1889	Double-lumen endobronchial tube invented (see previous entry & 1939)	Dr Henry Head (physiologist & neurologist) to study differential lung function in dogs at The (now Royal) London Hospital. They were made from thin metal and India rubber tubing - the latter making cuffs that were inflated using syringes filled with glycerine
1889	First reliable pressure-reducing valve for the controlled release of gases from high pressure containers - called the "Lubeca Valve"	Johann Heinrich Draeger (Dräger)& his son Bernhard, the founders of Draegerwerk (Drägerwerk), in Lubeck, Germany. The device was initially developed for mixing high-pressure CO_2 for beer-on-tap
1889	The first University Tutor in Anaesthetics in Australia appointed	Dr Robert H Todd at Sydney University Medical School, which had been established in 1882 and was associated with Royal Prince Alfred Hospital as its Clinical School
1889	Demonstration that diabetes was a disease of the pancreas (see 100, 1909, 1921, 1926 & 1955)	Medical researchers Joseph Von Mering & Oskar Minkowski in Germany. After removing the pancreas from a dog to see what would happen, they noticed it urinated frequently and flies swarmed around the urine. Testing the urine revealed loads of sugar
1889	Demonstration of heat production in body when electric current passes through the body (see 1897, 1900, 1907, 1909, 1910 & 1926)	The most notable Professor Elihu Thomson, English engineer and inventor
1890	Ether declared a poison by the English Government Chemist Department	This occurred after some members of the Department drank ether and reported that it did indeed make them feel intoxicated. This was done during an investigation into the then common practice of Irish folk who, having taken "the pledge" of abstinence from alcohol, would drink ether to obtain a similar feeling to that of alcoholic intoxication. This practice had also expanded due to the Government's then campaign to close down illicit stills
1890	Schimmelbusch mask produced	Dr Curt Theodor Schimmelbusch - German surgeon & pathologist in Berlin. He unfortunately died from tuberculosis in 1895 at the early age of 35 years.

1891	Hewitt's Inhaler produced	Dr (later Sir - knighted 1911) Frederic William Hewitt in London. This had a wide bore and provided less resistance to breathing than Clover's Inhaler (see 1873, 1876 & 1877)
1891	Hewitt's oral gag produced	Dr (later Sir) Frederic William Hewitt - anaesthetist to both King Edward VII and King George V. His device resembled those of today with reverse-opening scissor-like action and a ratchet ring to slide along the handles. It came in 5 sizes and the molar rests were angled to lie flat against the teeth when the mouth was fully open. He later added 'chloroform tubes' along the arms to maintain anaesthesia when connected to Junker's inhaler
1891	Tropacocaine introduced as a local anaesthetic for spinal anaesthesia	
1891	Cyclodextrin compounds first described (see 1903, 1935, 1953, 2001, 2005 & 2008)	A Villiers (France) detected both alpha- and beta-cyclodextrins when produced by the digestion of starch by Bacillus amylobacter. He called them "cellulosine"
1891	Use of sharp bevelled needle for draining CSF to relieve raised intra-cranial pressure (hydrocephalus) & for diagnostic purposes first described	Professor (Internal Medicine and Neurology) Heinrich Irenaeus Quincke (*vide* anaphylaxis 1913) - Kiel, Germany. Cases he reported on by/in this year (having started this procedure in 1890) included 5 children & 5 adults. He gave credit for the idea/technique to Dr Walter Essex Wynter (*vide*)
1891	World's first anaesthesia journal published (occurring in the July of that year)	Called "*The Dental and Surgical Microcosm - A Quarterly Scientific Journal* ". The "*Controlling Editor* " was Dr Samuel J Hayes D.D.S. and the "*Assistant Editor* " was Dr Frederick Gaertner A.M.M.D. It was "*Devoted chiefly to the Science of Anaesthesia and Anaesthetics* ". It was published by the Hayes Dental and Surgical Manufacturing Company of Pittsburgh. The journal ceased publication when Hayes died in 1897. [This fascinating book, comprising Volumes 1 & 2 of the journal, has been digitized courtesy of the University of Toronto and can be read and downloaded from https://archive.org/details/dentalsurgicalmi01na]
1891	The BMA's second "Anaesthesia Committee" formed (sometimes called the "Second Chloroform Committee) (see 1864, 1875, 1901 & 1911)	This was to investigate on-going concerns about the relative safety of anaesthetic agents of the day. Data was collected from every hospital in Britain and even the lay press was analyzed by an independent agency for reports of deaths under anaesthesia. 25,920 cases of anaesthesia were analyzed. The report took 8 years to compile
1891	The Second Hyderabad Chloroform Commission (see 1889)	Held due to *The Lancet* having questioned the report from the first Commission. The Commission President was (now) Surgeon-Lieutenant-Colonel Edward Lawrie (*vide*) having been commissioned again by Mir Mahbub Ali Khan. Experiments, using approximately 600 animals (490 dogs, as well as horses, monkeys, goats, cats and rabbits) were this time conducted under the guidance of Dr Lauder Brunton (a leading British physiologist & pharmacologist). Conclusions drawn (incorrectly) were that primary cardiac syncope did not occur with chloroform (i.e. no direct effect on the heart by chloroform); that cardiac problems are secondary to respiratory impairment; that there is no need to feel the pulse during anaesthesia; and that maintenance of an even respiration was essential for safe anaesthesia under chloroform
1892	Early experiments on electrotherapy producing electronarcosis (see 1902, 1907 & 1910)	Jacques-Arsène d'Arsonval, a biophysicist in France. Although the effects of electrotherapy on pain had been known from ancient Roman times (when shocks from live torpedo fish had been noted by Scribonius Largus to cure headaches and joint pains) and fish themselves had been subjected to electrical shocks in 1875, d'Arsonval was able to demonstrate anaesthesia-like states induced with high frequency (> 10,000Hz) electrotherapy
1893	Hewitt's nitrous oxide and oxygen anaesthesia apparatus produced	Dr (later Sir - knighted 1911) Frederic William Hewitt in London. This produced an hypoxic mixture of up to 12.5% oxygen and allowed for about 44 seconds of dental work following induction and removal of the mask. Following several deaths, the method was eventually condemned in 1916 (see 1900)
1893	First description of an oesophageal stethoscope (see 1954)	Dr Solomon Solis-Cohen, Jefferson Medical College, Philadelphia
1893	The first recorded pneumonectomy	Dr David Lowson, the Assistant-Surgeon at the Hull Royal Infirmary, United Kingdom, after experimenting on a
1893	Another suggestion of compression of the vena cava in pregnancy (key words: postural supine hypotension) (see 1669, 1932, 1942, 1950, 1953, **1960** & 1968)	Sir Frederic William Hewitt (*vide*) in his textbook *Anaesthetics and their Administration* when describing the weak pulse felt in a healthy young woman during a Caesarean section under chloroform anaesthesia

1893	The Society of Anaesthetists founded in London - the first such body in the world	Initiated by Dr John F Silk of Kings College Hospital. The first President was Dr Woodhouse Braine. Membership, which included females (it was the first medical society in the world to admit women as equal members), was not limited to the United Kingdom but also included representatives from the United States, Canada, Australia, South Africa and Switzerland. It was housed in leased rooms at 20 Hanover Square - a house owned by the The Royal Medical & Chirurgical Society of London, the forerunner of The Royal Society of Medicine
	The first physician specialist anesthetist appointed in the United States of America (see 1909)	Dr Thomas L Bennett at St Margaret's Hospital in Kansas City. This provided the first supervised anesthetic department in the USA. Dr Bennett later moved to New York where he had a similar appointment at the New York Hospital in 1898, 1899 and 1900. He was also appointed to the Mt Sinai Hospital in 1905. While in Kansas, he developed the "Bennett apparatus for ether administration"
1894	Introduction of surgical gloves (see 1847, 1965 & 1980s)	Although the use of rubber gloves had been suggested by the famous English physician, Sir Thomas Watson, in 1843 (specifically to protect the surgeon), the idea was not immediately adopted, probably because the process for commercial rubber production was then in its infancy. A Dr J Williams of Manchester claimed in the January edition of *The Lancet* of 1871 to have used gloves made of India-rubber before 1871 to protect himself from a patient with syphilis. The gloves had been made by a Mr Walters of Moorgate Street. The famous Dr Liston began using such gloves from the same source a few months after that publication. Dr (later Professor) William Halsted at the Johns Hopkins Hospital, Baltimore, USA, which opened in 1889 is usually credited with introducing the routine use of surgical gloves. In order to mitigate the dermatitis that his theatre nurse, Miss Caroline Hampton, was developing from the repeated hand antisepsis using mercuric chloride or carbolic acid (phenol) (sources differ as to which one), Halsted asked the Goodyear Tire and Rubber Company to produce thin sterile rubber gloves. The whole theatre staff then decided to wear them. It is claimed the inspiration for the gloves came from his romantic desire to keep his nurse close and working in theatre with him - he subsequently married her!
1895	Curare classified into 3 groups according to the way they were prepared and stored by South American natives (see 1897 & 1938). The potent alkaloids are obtained from *Chondrodendron* and *Strychnos* species of plants (see 1844)	Rudolf Albert Martin Boehm, German Professor of pharmacology at Leipzig University. (1) calabash curares (stored in a gourd); (2) tubo curares (stored in a bamboo tube); & (3) pot curares (stored in an earthen pot). Tubo curares were the most potent
1895	First direct laryngoscope with transmitted light ("autoscope")	Dr Alfred Kirstein, Germany
1895	Liquefaction of air achieved	Carl Paul Gottfried Linde (see 1901), a German engineer. He also developed the process of refrigeration with the first refrigerant being dimethyl ether
1895	Adrenal gland extracts obtained and named "nadnerczyna" (see other 1895, 1901 & 1904)	Napoleon Cybulski (Polish physiologist)
1895	Adrenal gland extracts found to raise blood pressure upon injection into experimental animals (see other 1895, 1901 & 1904)	George Oliver and Edward Schäfer
1895	The first anaesthetic chart designed and used	Dr Ernest Amory Codman at the Massachusetts General Hospital (Harvard Medical School) where he was a Junior House Pupil with Harvey Williams Cushing. He and Cushing made a firm decision to improve the morbidity and mortality of "etherization" (as experienced first-hand) and so the recording of pulse and respiratory rate became a part of that effort. Later, in 1902, Cushing added the recording of systolic blood pressure to the chart after visiting Riva-Rocci's clinic in Padua. (Note that Korotkov did not describe his sounds until 1905 thus enabling diastolic pressure to be identified). Codman has also been credited with being the originator of medical audits. Cushing's clinical efforts were honoured posthumously by the US Postal Service in April 1988 with the release of a 45 cent stamp bearing an artist's impression of him in bust form
1895	"Infiltration anaesthesia" established	Professor Karl Ludwig Schleich, University of Berlin. He introduced the use of diluted solutions of cocaine in order to safely allow the use of large volumes of infiltrate to cover surgical procedures
1896	Orthoform & New Orthoform synthesized	Alfred Einhorn introduced these as insoluble powder local anaesthetics for topical use on wounds and ulcers

1896	Luer-"Slip" conical syringe connection developed (see 1869 & 1906)	Invented by Karl Schneider of the Parisian-based medical instrument-making company (Wülfing Luer Company) whose principal was a German, Hermann Wülfing Luer. It was originally applied to glass bottle stoppers
1896	Riva-Rocci blood pressure cuff developed (see 1828, 1881, 1895, 1897 & 1905)	Dr Scipione Riva-Rocci (Italian internist & paediatrician) in Padua. His design was for a cuff that had a 5cm width. Dr Heinrich von Recklinghausen later improved this by making the cuff 10cm in width for adults
1896	First description of the use of a stethoscope (precordial) during anaesthesia (see 1954)	Dr Robert Kirk at the Glasgow Western Infirmary. He started by using an ordinary binaural stethoscope but later switched to using a phonendoscope, which had been invented in 1894 by physicist Professor Eugenio Bazzi and Aurelia Bianchi, Professor of Preparatory Clinical Medicine and Pathology, in Florence, Italy
1897	First record of blood pressure monitoring in anaesthesia (see 1896)	Sir Leonard Hill (Physiologist) and Harold Leslie Barnard (surgeon), London Hospital. They used a cuff device similar to Riva-Rocci but with a round metal pressure gauge which revealed that, under chloroform, systolic blood pressure dropped rapidly between 20 and 40 mmHg
1897	"Curarine" produced and named (see 1895 & 1912)	Rudolf Albert Martin Boehm, German Professor of pharmacology at Leipzig University. This was a partially purified extract from calabash curare
1897	Development of process to synthesize acetyl salicylic acid in commercial quantities with naming of "aspirin" (see 1543 BC, 400 BC, 1763, 1828, 1838 & 1897)	Felix Hoffman (Friedrich Bayer & Company, Germany) [**NB: a controversial attribution - possibly should be attributed to H Dresser of Munich]
1897	First rigid bronchoscopy performed to remove a pork bone under topical cocaine	Gustav Killian - Professor of Laryngology at University of Berlin. Because of this & other ENT surgical developments, Killian became the first Honorary Member of the Society of American Oto-Rhino-Laryngology and was also made an Honorary Member of the American Medical Association (see 1909)
1897	The term "block" introduced to describe the use of local anaesthetics (see 1901)	Dr George Washington Crile, an American surgeon who was also a co-founder of the Cleveland Clinic
1897	The term "diathermy" coined to describe a therapeutic heating effect (NB: The difference between 'diathermy' and what was later and more accurately termed 'electrosurgery') (see 1889, 1900, 1907, 1909, 1910 & 1926)	Dr Carl Franz Nagelschmidt, German physician, when using high-frequency electric currents as therapy in joint and circulatory diseases. He designed a prototype machine in 1906
1897	The "Schäfer Method" of resuscitation advocated	This was named after Professor Edward Sharpey-Schäfer who chaired a committee tasked with determining the most appropriate method of resuscitation. This technique involved having the patient prone, with their forehead resting on one forearm, the other arm extended above the head, kneeling while straddling the patient's hips and rocking backwards and forwards applying manual pressure from behind and laterally at the spot where the ribs meet the abdomen - 12 to 15 times per minute. Used universally and virtually exclusively before WWII - but rarely successful. Gordon, in 1952, showed this method only gave a tidal volume of 485 ml and was associated with an early severe drop in oxygen saturation
1898	Cocaine first synthesized & structure elucidated	Richard Willstätter et al
1898	Heroin marketed as a non-addictive form of morphine and sold directly to the public	Bayer pharmaceutical company, Germany
1898	First intentional spinal anaesthetic on a human (see 1885 & 1899)	Dr August Karl Gustav von Bier (German surgeon) when he used 15mg of cocaine on a man needing an operation on a tuberculous ankle. Bier actually performed spinal anaesthesia (using 15 or 17 gauge Quincke needles) on a total of 6 patients before he and his assistant, Otto Hildebrandt, gave each other a spinal to prove the efficacy and safety to their colleagues. During this attempt at proof, the block on Bier failed as CSF and the cocaine drained out through the needle after a mechanical hitch while fitting the syringe to the needle hub. The block on Hildebrandt worked well using 5mg of cocaine - its efficacy was tested by Bier using needle pricks & cigar burns on legs, pulling on pubic hair, traction & pressure on testes and hitting the shins with a hammer. Bier had post-dural puncture headache for 9 days and Hildebrandt for 4 days. Bier never used the technique again although he did postulate using fine bore needles would minimize loss of CSF and the consequent headache
1898	Post-dural puncture headache linked to CSF loss (see 1926)	Dr Jean-Anthanase Sicard, Paris
1899	Procaine (Novocaine) developed	Alfred Einhorn - German chemist. It was first used clinically in 1905 by Heinrich Braun who was a German surgeon with an interest in anaesthesia (see 1902)

1899	The first spinal anaesthetic given in America (October 26) (see 1885 & Matas - next entry)	Dr Frederick Dudley Tait & Guido E Caglieri, surgeons in San Francisco who had received their medical training in Europe - Tait having been a student under Tuffier (*vide*). Prior to injecting into living humans, they experimented widely on cadavers, cats, dogs, rabbits, guinea pigs and horses - access to animals through a veterinary school affiliated with the University of California. They reported in 1900 on 11 patients who had received between 5mg & 15 mg of intrathecal cocaine for lower body operations
1899	The first written account of a spinal anaesthetic in America (? Date performed; published December) - (see 1885 & previous entry)	Procedure performed by Professor A Rudolph Matas, renowned surgeon in New Orleans who has also been credited (erroneously) with developing the intravenous drip technique (*vide* 1832). He was also allegedly the first to surgically repair aneurysms. In this particular spinal anaesthetic, he used 20mg of intrathecal cocaine to provide anaesthesia for the removal of haemorrhoids. Earlier that year he had observed Tuffier (*vide*) conducting a spinal anaesthetic during a conference in Paris. Matas was the first person to use intrathecal opioids - he began adding morphine to his anaesthetic solution
1899	Intradural (spinal) anaesthesia began to be popularised in Europe (see 1885 & 1899x2)	Particularly by Dr Marin Theodore Tuffier, a French surgeon, who began demonstrating his technique at a conference in Paris. By 1908, he had performed 125 cases and published 20 papers on the subject in which he emphasised the importance of aseptic technique and how patient positioning affected the block level. His specific audit of 60 cases showed no serious complications but an incidence of post-dural puncture headache of 40%! He described what is now known as "Tuffier's line" between the iliac crests denoting L3/L4 spinal level, the latter being useful for anaesthetists in locating the site for lumbar spinal & epidural puncture. Tuffier also designed a chloroform inhaler
1899	The Schneiderlin technique of anaesthesia advocated	Dr Schneiderlin, a German surgeon and pharmacologist. He advocated the hourly injection of doses of a combination of morphine and scopolamine (usually 3 doses totalling 25mg of morphine and 1mg of scopolamine were required) to provide an amnestic state of reduced consciousness sufficient to allow surgery. He developed this technique to try to avoid the complications of using chloroform. The technique was adopted more by obstetricians for childbirth than by the surgical community and became known as "Dämmerschlaf", loosely translated as "twilight sleep". It was also called "The Freiburg Technique"
1899	Hedonal (methyl propyl carbinol urethane) discovered	H Dresser, Munich, by furthering ideas of Oswald Schmiedeberg, a pharmacologist in Strasburg, Germany, namely, to replace the ethyl group in ethylurethane with a heavier chain. Initially using it orally from 1901, Nikolas P Krawkow of the Military Medical Academy in St Petersburg, after animal experiments, first used it intravenously on a human in 1909 - an elderly man with a malignancy on his leg. It gained widespread usage but was last used about 1930
1899	One of many hypothesised mechanisms of general anaesthesia suggested (see 2020)	Dr Hans Horst Meyer, German medical practitioner with a Doctorate in Medicine and later Professor of Pharmacology. He related the potency of general anaesthetics to their degree of lipid solubility. Charles Ernest Overton, British biologist who became a professor in Sweden, supported this theory in 1901 with his "Biomembrane Model" that supported lipid transport across membranes. This combination gave rise to the Meyer-Overton Hypothesis of anaesthesia
1899	Cardiac defibrillation first demonstrated (key word: CPR)	This was performed in a dog by Frédéric Batelli & Jean-Louis Prévost – Swiss physiologists. They also observed that while a small electrical shock induced ventricular fibrillation, a larger shock reversed the arrhythmia
1900	Reversal for curare accidentally discovered. (Also see 1743, 1804, 1825, 1855, 1858, 1935, 1939, 1942 & 1945*)	Jacob Pal, a Viennese physiologist. While working with a dog paralysed by curare, he injected physostigmine to examine the effects of physostigmine on the gut and noted reversal of muscle paralysis. He also recommended the use of atropine to counter the effects of physostigmine
1900	Eucaine synthesized - the first totally synthetic local anaesthetic	C Harries - by alteration of the cocaine molecule. There is some reference that he may have synthesized this in 1896. "*After both the alpha and beta forms were listed alongside opium, cocaine and heroin in the Pure Food and Drug Act of 1906, both eucaines fell out of favor* " (direct quote from Professor George S Bause, Curator, Wood Library-Museum of Anesthesiology)

1900	Kuhn's flexo-metallic endotracheal tubes introduced	Dr Franz Kuhn, German surgeon, while Director of Surgery at the Elisabeth Hospital in Kassel. He developed these from his work on using similar devices to examine the gastrointestinal tract and after seeing a patient die from a pharyngeal haemorrhage. "*Tubage of the trachea* " was achieved after passing a tracheal introducer with digital palpation (after O'Dwyer - see 1882). His tubes were shaped to partially occlude the larynx from above and also had a phlange to prevent the teeth occluding the tube. He advocated positive pressure ventilation to prevent pneumothorax during thoracic surgery (as opposed to using the Sauerbruch Chamber - see 1904). He also introduced the use of sterile catgut sutures into surgical practice
1900	The first American nitrous oxide and oxygen anaesthesia apparatus produced	Dental Manufacturing Company of Philadelphia under Dr Samuel S White. This produced an hypoxic mixture of up to 10% oxygen and allowed for about 50 seconds of dental work following induction and removal of the mask (see 1893)
1900	First description of small tumour destruction using high-frequency electric current (see 1889, 1897, 1907, 1909, 1910 & 1926)	Dr A J Riviere, France
1901	Adrenaline (also called epinephrine) first hormone to be isolated in "pure" form (but eventually shown to be a mix of adrenaline and noradrenaline) from adrenal glands of sheep and oxen (see 1895 (x2) & 1904)	Japanese chemist Jokichi Takamine with assistant Keizo Uenaka, working in an independent New York laboratory under patronage of Parke-Davis & Company and using some of Abel's techniques. An inactive benzoyl metabolite had been isolated in 1897 by John Jacob Abel and Albert C Crawford who thought it was the pure hormone. Takamine organized a patent and had the word "Adrenalin" approved as a trademark. He is also responsible for gifting the cherry trees that still exist in Washington DC's Tidal Basin
1901	Atropine first synthesized (see 1809, 1819, 1831, 1833 & 1867)	German chemist (later) Professor Richard Willstätter at the University of Munich. He eventually received the Nobel Prize for Chemistry in 1915 for his work on plant pigments, particularly chlorophyll
1901	First epidural anaesthetic given	Dr James Leonard Corning (neurologist in New York) (?? In 1885)
1901	First report of intrathecal (subarachnoid) opioid - morphine (see 1979)	Dr Nicolae Racoviceanu-Piteşti, a Romanian surgeon
1901	First caudal (epidural) anaesthetics given (see 1979)	Given by Dr Jean-Anthanase Sicard and Dr Fernand Cathelin in Paris, working independently
1901	The term "regional anaesthesia" introduced (see 1897)	Harvey Williams Cushing - to describe pain relief by nerve block using local anaesthetics (see 1902 & 1904)
1901	Efforts to liquefy oxygen and nitrogen begun	Carl Paul Gottfried Linde (see 1895). This was eventually achieved in 1910 using the "Linde double-column" process, which was based on the fractional distillation of liquefied air
1901	ABO blood groups discovered (see 1940)	Austrian Dr Karl Landsteiner. For this discovery, he was awarded the Nobel Prize for Medicine or Physiology in 1930
1901	A "Special Chloroform Committee" set up by the British Medical Association (see 1831, 1875, 1891, 1911 & 1946)	In spite of previous such committees, this one was set up to study ways of measuring the concentration of chloroform in body fluids and work out a safe dose to use because the instigator, A D Waller (physiologist) believed chloroform deaths were due to overdosage. The committee members were a neurosurgeon, Victor Horsley, a physiologist, Charles Sherrington, two anaesthetists, W J McCardie and Dudley Buxton and a co-opted member who was a Reader in Chemistry in Oxford and Fellow of the Royal Society by the name of Augustus George Vernon Harcourt. The committee's final report was published in 1910 in the British Medical Journal and was considered to be no more useful than the findings of previous committees although it provided a list of vaporizers considered to deliver safe concentrations! In 1904, while on the Committee, Harcourt designed a draw-over chloroform inhaler that delivered a concentration between 0.5% and 2.0% - the latter being the considered desirable and safe maximum by the committee to prevent the induction of cardiac arrest. (see 1904 & 1912)
1902	Mortality from chloroform anaesthesia said to then be 1:2280 (see 1870 & 1911)	
1902	First commercially marketed barbiturate - diethyl barbituric acid (Veronal) - subsequently called barbital (USA) and barbitone (UK) following the events of 1917 - refer (see 1864 1932)	Re-discovered (and patented) in Germany by Hermann Emil Fischer & Joseph Freiherr von Mering and marketed by 2 companies, Bayer Pharmaceuticals and E Merck in 1904 (see 1917). This compound had originally been produced in 1882 but was only fully investigated at this time
1902	Benzocaine (p-aminobenzoic acid ethyl ester) synthesized	German chemist Eduard Ritsert

1902	Adrenaline first added to local anaesthetic agents	Heinrich Braun, a German surgeon with an interest in anaesthesia. He initially added it to cocaine with the specific intention of reducing the latter's rate of absorption and hence the systemic effects (see 1905)
1902	Electronarcosis much experimented with (see 1892, 1907 & 1910)	French biologist Stéphane Armand Nicolas Leduc. He demonstrated the narcotic-like state induced in animals for slaughter after the application of unidirectional (DC) "chopped" square-wave current. He even experimented on himself, with the cathode on his forehead and the anode behind his ear, inducing a "dream-like" state during which he was conscious but unable to move
1903	Amylocaine (Stovaine), the first synthetic local anaesthetic, developed	Ernest Fourneau while Director of Les Établissements Poulenc Frères in France, where it was marketed by Billon. Les Établissements bought the May & Baker Company in 1922 under whose name Stovaine continued to be manufactured and marketed from Dagenham, East London. ('Fourneau', in French, means furnace or stove and he allegedly named the substance after the latter object (and, thus, himself). This was widely used for spinal anaesthesia into the 1950s
1903	Ethyl Chloride popularised in UK as general anaesthetic	Dr W J McCardie after reporting using it for dental anaesthesia since 1901 at Birmingham Dental Hospital
1903	"Cellulosine" name changed to "crystalline dextrin" (see 1891, 1935, 1953, 2001, 2005 & 2008)	F Schardinger, Austrian microbiologist who produced the substances using Bacillus macerans. He later renamed them alpha- and beta-dextrin. They were more widely called the "Schardinger dextrins". These substances (especially beta-dextrins) were and are used as excipient solubilisers for drugs and in the cosmetics & food industries
1903	Electrocardiogram (ECG/EKG) introduced into clinical practice	Professor Willem Einthoven at the University of Leiden, Netherlands. He was awarded the Nobel Prize for Medicine in 1924 for this development. All the glory should not be his alone, however, as a British physiologist, Augustus Desiré Waller, had previously demonstrated voltage changes on a mirror galvanometer that were derived from the heartbeat of a dog standing with 2 paws in separate bowls of a salt solution . He did this in 1887 in a presentation to the Royal Society. Waller is thus rightly attributed with developing the first working electrocardiograph machine. Electrocardiography was not introduced into Australia until 1912
1903	First anaesthetic machine incorporating compressed gas cylinders produced - Teter Anaesthesia Machine	Charles K Teter DDS, Jay Heidbrink DDS and Samuel S White DDS, dentists in Cleveland, USA. Heidbrink added reducing valves in 1912. Walter Boothby & Frederic Cotton (Harvard) adapted it with water-bubble flow meters. James Tayloe Gwathmey (USA) made it portable. Henry Edmund Gaskin Boyle (*vide*)acknowledged his concepts came from this Teter/Gwathmey machine after meeting Gwathmey in 1913 (see 1914 & 1917). This Teter apparatus was very expensive to use due to the required high gas flows. Teter convinced the surgeon George W Crile of the benefits of the appropriate use of nitrous oxide and oxygen - see 1914
1903	The first Dräger (Draeger) anaesthetic machine produced. This was known as the "Roth-Dräger mixed anaesthesia apparatus" (see 1911)	Produced by the Dräger company with clinical input from Dr Otto Roth who was the Chief Physician at the German Hospital in Lubeck. It was very popular and sold world-wide after being shown at the 'Universal Exposition' of 1904 in St Louis (USA)
1903	Chevalier Jackson laryngoscope designed	Professor Chevalier Jackson (see 1909)
1903	Forerunner of MAST (military anti-shock trousers) suit developed	Dr George Washington Crile, co-founder of Cleveland Clinic and meritorious American surgeon. This device consisted of a pneumatic rubber suit to counteract hypotension during head and neck surgery. Not only does a particular pair of artery forceps designed by him bear his name but both a liberty ship and a lunar crater have been named after him in honour of his life-time of achievements (see 1897 & 1903)
1903	First idea that amyl nitrite produced coronary vessel dilatation (see 1844, 1846 & 1866)	Charles-Émile François-Franck, Professor of Physiology at the Collège de France. He had been an assistant to Etienne Marey (*vide*) in this pathology laboratory and succeeded Marey in the Chair
1904	Adrenaline first synthesized & became the first hormone to be produced artificially in a laboratory (see 1895(x2) & 1901)	Friedrich Stolz and Henry D Dakin
1904	The Yankauer wire-mesh anaesthesia mask developed	Dr Sidney Yankauer, Ear, Nose & Throat surgeon, Mt Sinai Hospital, New York (see 1907 & 1914)

1904	First pneumatic tourniquet introduced (see 199BC, 1517, 1593, 1718, 1864, 1873 & 1984)	Harvey Williams Cushing, American neurosurgeon who developed the idea after becoming familiar with the Riva-Rocci blood pressure cuff (and introducing that measurement method to North America after meeting the inventor). He developed this type of tourniquet to minimise the chance of limb paralysis after tourniquet application. He was also the first to describe "Cushing's syndrome"
1904	First clinical use of the "Sauerbruch Chamber" - a device that helped to introduce/enable thoracic surgery	Dr Ernst Ferdinand Sauerbruch, a German surgeon who invented this negative pressure glass ventilation chamber that enabled lung expansion during thoracotomy, thus preventing the then fatal complication of pneumothorax. He experimented successfully on 78 animals before progressing to humans as patients. He thus performed the first successful thoracotomy when removing a tumour from beneath a woman's sternum. The chamber enclosed both the patient and the surgeon (see also 1900)
1904	Harcourt's Chloroform Inhaler produced (see 1901 & 1912)	Augustus George Vernon Harcourt, Reader in Chemistry, Oxford University. This device was designed to be either suspended from the anaesthetist's neck with the flask being undesirably subject to shaking or it could be hung on a stable stand. It had two glass beads of special density that floated if the liquid temperature was below 16˚C and sank above 18˚C. Temperature regulation was obtained by holding or releasing the flask in or from the hand. There was a dial to regulate the air/chloroform mixture. The face mask was fitted with one-way valves.
1905	Auscultatory method of determining blood pressure using a Riva-Rocci cuff developed (see 1896)	Dr Nikolai Sergeyevich Korotkov (Russian surgeon)
1905	American Society of Anesthesiologists founded	By Dr G Adolph Frederick Erdmann ("There are a few physicians practicing (sic) anesthesia in the area, and these men ought to get together to form a society.") and 8 colleagues. Initially called the "Long Island Society of Anesthetists". In 1911 it was renamed the "New York Society of Anesthetists". In 1936 it was renamed the "American Society of Anesthetists". In 1945 it was again renamed, this time to its present nomen: "American Society of Anesthesiologists"
1905	First soda-lime CO_2 absorption cartridge introduced in an elementary closed system - proved to be inadequate (see 1868, 1910, 1911, 1915 & 1921)	Draegerwerk (Drägerwerk) Germany with Professor Franz Kuhn, a surgeon, describing its use in the journal "Deutsche Zeitschrift für Chirurgie"
1905	First human corneal transplant	Dr Eduard Zim in Czechoslovakia
1906	Oxygen generator using 'fused sodium peroxide' (called "Oxone") produced	Richard von Foregger (chemical engineer born in Austria) & George F Brindley (USA). First reported in Niagara Falls Gazette but later presented in paper at New York King's County Pharmaceutical Society. This system had enabled Foregger, in a trial conducted back in 1902, to survive 6 hours in an air-tight container that started with only 20 minutes of air. It also absorbed carbon dioxide (CO_2). It lead to significant developments in submarine craft. (see 1914)
1906	Suxamethonium (succinylcholine) synthesized (see 1932)	Reid Hunt (Chief of Division of Pharmacology in U.S. Public Health Service & later the Professsor of Pharmacology at Harvard) together with René de M. Taveaux while studying choline and its derivatives. However, its muscle relaxant properties were not recognized until 1932 because whenever it was used in the lab it was on curarized specimens
1906	Luer-"Lok" screw syringe connection developed (see 1869 & 1896)	Colonel Fairleigh S Dickinson after purchasing half the patent rights of the Paris-based company, Wülfing Luer, for US$40.00. He was co-founder of MB Company in New York in 1987 which became the present Becton Dickinson in 1906
1906	Continuous spinal (subarachnoid) anaesthesia first described (see 1939)	Dr Henry Percy Dean (surgeon) in London. This did not catch on at the time
1907	Open-drop ether first used in England	Dr H Bellamy Gardner, an anaesthetist at Charing Cross Hospital. He developed his wire-framed mask, covered with layers of gauze, to enable the administration. Open-drop ether had already started to be used in the United States around 1900
1907	First Intermittent Positive Pressure Ventilation (IPPV) device	Draeger (Dräger) "Pulmotor" in Germany. This was used mainly by firefighters & miners. Dr Otto Roth, Lubeck, had significant input into its development
1907	The Yankauer sucker developed	Dr Sidney Yankauer, Ear, Nose & Throat surgeon, Mt Sinai Hospital, New York (see 1904 & 1914)
1907	Histamine prepared by synthesis (see 1910, 1937, 1942, 1943 & 1953)	A Windaus and W Vogt, Germany. Unfortunately, they were not aware of its physiological implications

1907	Description of operation performed under electronarcosis (see 1892, 1902 & 1910)	Drs Marin Theodore Tuffier & Jardry (surgeons) in Paris. Tuffier also designed a chloroform inhaler and described "Tuffier's line" between the iliac crests denoting L3/L4 spinal level, the latter now being useful for anaesthetists in locating the site for lumbar spinal & epidural puncture. Tuffier was also one of the first to experiment with spinal anaesthesia in 1899
1907	Introduction of "bipolar" electrocoagulation (see 1889, 1897, 1900, 1909, 1910 & 1926)	Dr Eugene-Louis Doyen, Paris
1907	Publication of the first use of a hyperbaric solution for spinal anaesthesia	Professor Albert Barker, University College Hospital, London. He presented 3 papers with a total of 300 patients in whom he had used "heavy" stovaine. He also used a glass spine to demonstrate the spread of solution
1907	Papaveretum first prepared and suggested for use as an analgesic agent (see c.30 AD; key word: opium)	Professor Herman Sahli & Dr Scharges in Berne, Switzerland. Called Pantopon (from the Greek παν = all; όπός = juice) in Germany and Omnopon in the United Kingdom, it was marketed by Hoffman La Roche from 1909. It contained the following water-soluble chlorides of opium, the first 4 of which are the most relevant and active: morphine, codeine, narcotine, thebaine, noscapine, papaverine narceine, hydrocotarnine, codamine, laudanine, laudanidine, laudanoeine, meconidine, papaveramine, protopine, lanthopine, cryptopine, goscopine, oxynarcodine, xantholine, tritopine & noscapine. Noscapine was withdrawn in 1993 as it was found to be genotoxic to the foetus in 1991 by J R Sneyd *et al* . From 1993 it was produced containing only morphine, codeine & papaverine
1908	Bier's block introduced	Dr August Bier devised this block using procaine, which he called "direct vein anaesthesia" while working as a surgical assistant to Friedrich von Esmarch (of Esmarch's rubber bandage/tourniquet fame - refer)
1908	Oculocardiac reflex recognized	Separately, by both Dr Bernhard Aschner (an Austrian gynaecologist) and Dr Giuseppe Dagnini (an Italian physician)
1908	Barton's Ether Inhaler introduced	Dr George Alexander Heaton Barton, London, England. It was later fully described in his 1920 book *Backwaters of Lethe*
1908	Ombrédanne Ether Inhaler produced	Professor Louis Ombrédanne, a paediatric & plastic surgeon in Paris. At the suggestion of a mentor, Auguste Nélaton, he and his driver produced a prototype starting with an English lolly tin filled with felt to be soaked in ether. Influenced by Clover's inhaler, it eventually morphed into "Un appareil pour l'anesthésie par l'éther" that virtually replaced the use of chloroform in France, Germany and Latin America. It allowed for varying concentrations of ether in both fresh and re-breathed air using a pointer graduated from 0 to 8. During use, ether could not be spilt onto the patient and supplemental oxygen could be supplied via a tube placed under the mask. More than 80,000 units were manufactured and supplied by the Collins Company. Its simplicity allowed relatively untrained people to use it. It was last known to be used in the Falkland's war of 1982 by Argentinian forces
1908	Earliest known oropharyngeal airway described (February edition of *The Lancet*)	This was designed by London anaesthetist, Dr (later Sir) Frederic William Hewitt, for use with upper airway obstruction. It was described in *The Lancet* of 1908. It was made of straight, firm rubber tubing, no more than 8cm long and with a 12mm bore, that had a bevelled edge to face the larynx. The proximal end had a metal ring with a deep groove to fit between the teeth. Hewitt anaesthetized King Edward VII in 1901 for drainage of an appendiceal abscess for which he became a member of the Royal Victorian Order. In 1911 he became the first anaesthetist to receive a knighthood for his many services to medicine. Controversial French surgeon, Dr Eugène-Louis Doyen, also described a pharyngeal airway designed by himself in this same year in his textbook Traité de Thérapeutique Chirurgicale et de Technique Opératoire
1908	First official recommendations for administering "preliminary medication" prior to surgery (see 1850 & 1920)	Dr Dudley Wilmot Buxton as recorded in the Proceedings of the Royal Society of Medicine and then in 1910 by Mr Harold Bellamy Gardner writing in the British Medical Journal. Although opiates had been administered pre-operatively since the introduction of ether, they were recommended usually as an adjunct to the anaesthetic vapour (such as by Claude Bernard when working with animals in Lorenzo Bruno's clinic in 1869) to lessen the amount required of the latter during surgery rather than as a pre-operative anxiolytic.
1909	First caudal anaesthesia given for labour pains (see 1942)	Professor Walter Stoeckel in Germany

1909	Intravenous ether & chloroform first administered to produce general anaesthesia	Dr Ludwig Burkhardt, a surgeon in Würzburg, Germany. He used 4% solutions; initially using chloroform and later ether. The technique became widespread but ceased around the 1930s
1909	Reynold's Obstetrical Chloroform Inhaler produced (see 1860s & 1910)	Thought to have been produced by Frank S Betz Company, Indiana, USA
1909	Islets of Langerhans role suspected	J de Meyer. He named "insulin" without isolating it (see 100,1889, 1921, 1926 & 1955)
1909	Modern technique of surgical tracheostomy described (see 3600 BC, 2000 BC, 1546, 1620, 1625, 1955 & 1985)	Professor Chevalier Jackson (laryngologist). Professor at 6 Universities in the US and founder of the American Bronchoesophagological Association. He was also responsible for US Congress introducing the "Federal Caustic Poison Act" (1927) that required labels on products that were poisonous or corrosive in order to protect against their ingestion (see 1903 & 1913 also)
1909	First record of a 'suspension' laryngoscope	Dr Gustav Killian. Developed when his arm tired of holding a laryngoscope while a medical artist was drawing cadaveric laryngeal structures for him (see 1897)
1909	First full-time Specialist Anaesthetist in Australia (see 1888 &1894)	Dr Rupert Walter Hornabrook. His first appointment was as an Honorary Anaesthetist at the Royal Melbourne Hospital after returning to Australia from a colourful and most interesting career in India and the Boer War. He also obtained appointments at the Children's Hospital, the Melbourne Dental College and the Victorian Eye and Ear Hospital. Not surprisingly, he was the first to propose that an Australian Society or Association of the anaesthetic fraternity be established. This he did in 1913 at a meeting of the Victorian Branch of the British Medical Association - his suggestion was ignored. After the Australian Society of Anaesthetists was eventually established in 1934, Hornabrook was bestowed the privilege, in 1935, of becoming its first Honorary Member
1909	First American school for Nurse Anesthetists established (see 1877 & 1931)	Agnes McGee at Saint Vincent Hospital in Portland, Oregon
1909	The term "fulguration" coined (see 1889, 1897, 1900, 1907, 1910 & 1926)	Professor Samuel Pozzi, Paris, when using high-frequency, high voltage but low amperage electric currents to ablate/resect tumours. He used "Oudin's Resonator" to achieve this output
1910	Further descriptions of operations performed under electronarcosis (see 1892, 1902 & 1907)	Leclerc. He attempted 2 human operations: in the first, electrical stimulation produced a severe excitement phase; in the second, electrical stimulation produced respiratory paralysis, tachycardia and muscle twitching - the patient died 4 days later. The production of apnoea, cardiac arrest and convulsions in both animals and man, together with the "locked-in" effects in man led to a rapid decline in interest in electronarcosis (not electrotherapy, in which, of interest, Nikola Tesla (among others) was a leading researcher)
1910	Electro-dissection technique introduced (see 1889, 1897, 1900, 1907, 1909 & 1926)	Dr E Eitner and Professor Vincenz Czerny, Heidelberg, Germany. Czerny was a cancer surgeon who was the first to perform a vaginal hysterectomy and also the first to perform a breast implant (in the latter case he used a benign fatty tumour as replacement after resecting a cancerous tumour)
1910	Dopamine first synthesized	George Barger & James Ewens at the Wellcome Laboratories in London, England
1910	Bennett Obstetrical Chloroform Inhaler produced (see 1860s & 1909)	Designed by Dr John F Bennett for hand-held nasal self-administration to relieve labour pains. Produced by J F Hartz Company, Detroit, USA
1910	Histamine prepared by putrefaction (see 1907, 1937, 1942, 1943 & 1953)	By two research groups: (1) Professor Henry Hallett Dale and George Barger, London, by allowing putrefaction (a process known from previous experience where bacteria produce amine compounds) of *ergotinum dialysatum* . Dale had attended a demonstration of the dialysate's effect on uterine contraction and wished to pursue that proposition. In 1911, they isolated histamine from animal tissues; And (2) separately, by Professor D Ackerman, Würzburg, who prepared it by the putrefaction of histidine
1910	Rotameters used for first time on an anaesthetic machine	M Neu in Germany. Used for both O_2 & N_2O but machine was too expensive to be succesful in the market
1910	Introduction of the concept of rebreathing during anaesthesia (see 1868 Coleman)	Dr Willis D Gatch of Johns Hopkins Hospital, Baltimore. He developed apparatus with valves that allowed for either non- or total rebreathing and hence cheaper to run. He designed his machine and method to limit the concentration of inspired carbon dioxide (CO_2) to below 4% - a level suggested as being safe by John Scott Haldane (Scottish physiologist and, inter alia, developer of the first practical means of measuring carbon dioxide & inventor of the first gas mask during World War I)

1911	The introduction of the anaesthetic machine called the Dräger (Draeger) Combination Anaesthetic Apparatus, also known as "The Combi" (see 1903)	The Dräger Company. It incorporated pressure reducing valves for control of the compressed gases, mechanisms for ensuring accurate concentrations of anaesthetic agents, an early version of a carbon dioxide (CO_2) absorber and an effective ventilator (the Pulmotor) - all produced by the Dräger Company
1911	McKesson's intermittent flow apparatus introduced	Dr Elmer Isaac McKesson of Toledo State Hospital, Ohio, founder of the McKesson Appliance Company. This machine introduced the concept of intermittent source gas flow during inspiration as well as the principle of 'fractional rebreathing' where all expired gas was eliminated from the tubing with the exception of dead space gas
1911	Elsberg's Anesthesia Apparatus produced	Dr C A Elsberg, USA. This was an example of continuous flow machines (which were introduced after Samuel Meltzer & John Auer showed in animals that oxygenation did not necessarily rely on respiratory movements) and was used with the insufflation method, (especially for thoracic surgery), which required a long catheter inserted into the trachea down to the carina that infused oxygen, nitrous oxide and an anesthetic vapour.
1911	The "Lidwill Anaesthetic Machine for insufflational endotracheal and endopharyngeal ether anaesthesia" patented (also see 1926 &/or pacemaker)	Developed by Dr Mark Cowley ("Bunny") Lidwill. He was appointed as Honorary Assistant Physician to Royal Prince Alfred Hospital, Sydney in 1911 (with a strong interest in cardiology). In 1913, however, he became the first Lecturer in Anaesthetics in the Faculty of Medicine at Sydney University. He was also the second Tutor in Anaesthetics at RPA Hospital, which was aligned with the University of Sydney (Dr R H Todd being the first from 1889). He became the first Honorary Director of Anaesthetics at RPA in 1929 with the first Department of Anaesthetics in Australia being formally established under his Directorship in 1930. Not only was he a Foundation Fellow of the Royal Australasian College of Physicians in 1938, but, in 1954, he was the second person to receive the honour of being appointed an Honorary Fellow of the Faculty of Anaesthetists of the Royal Australasian College of Surgeons. His anaesthetic machine, designed in response to the introduction of "insufflational anaesthesia" in Australia, was used throughout Sydney for about 30 years. It was manufactured by Elliot Brothers, Sydney. Induction of general anaesthesia was achieved by ethyl chloride and ether drop method before the introduction of a Belfast intratracheal linen catheter for ether maintenance using the machine. (see 1926 &/or pacemaker)
1911	The application of cricoid pressure to prevent gastric regurgitation re-advocated (see 1774 & 1961)	Dr Otto Roth, Lubeck, Germany
1911	Phenobarbitone / Phenobarbital synthesized (Luminal)	Philipp Heinrich Hörlein, Germany. First used clinically & marketed by Bayer in 1912
1911	Cinchocaine (Dibucaine) (Nupercaine) synthesized (see 1929)	Karl Meischer, a chemist at Chemische Industrie Basel (Ciba)
1911	First percutaneous supraclavicular brachial plexus block performed (see 1885)	Diedrich Kulenkampff, German surgeon. He performed it on himself
1911	First axillary brachial plexus block performed	Georg Hirschel
1911	Death under chloroform anaesthesia shown to be due to ventricular fibrillation	Dr Alfred Goodman Levy (born in Melbourne, Australia, but raised in England) while Resident Anaesthetist at Guy's Hospital, London, demonstrated this effect while experimenting with cats and dogs and pursuing a line of research suggested by a Professor Cushny. He presented his findings to the Physiological Society: that the cause of death during light chloroform anaesthesia was ventricular fibrillation secondary to endogenous catecholamine release. He also warned that injecting adrenaline during chloroform administration would exacerbate the problem. He could not demonstrate similar adverse results using ether or during deep chloroform anaesthesia. He published full papers in 1913 & 1914
1911	A decree that every doctor in the United Kingdom, upon graduation, had to provide evidence of training in anaesthesia	The General Medical Council, United Kingdom. The Council also made the study of anaesthesia the 16th subject to be compulsory in the Universities' medical curriculum. It was the last subject to be made so!
1912	Curare (in the form of "curarine") first used to produce intraoperative relaxation of abdominal muscles (see 1897 & 1938)	Dr Arthur Läwen, German surgeon in Leipzig. He administered it by both intramuscular and subcutaneous routes and postulated that it would need to be given in much reduced dosage if ever administered intravenously

1912	Electrical stimulation of nerves in the intact, living person first described (see 1826, 1848 & 1849)	Georg Clemens von Perthes, Director of the Surgical Clinic at the University of Tübingen, Germany. His major interest appears to have been radiology where he is responsible for being the first to describe what is now known as Legg-Calvé-Perthes disease
1912	Heidbrink pressure relief valve introduced	Dr Jay A Heidbrink (dentist) of the Heidbrink Company of Minneapolis
1912	Gwathmey/Woolsey Nitrous Oxide-Oxygen Apparatus produced (see 1914)	Drs James Tayloe Gwathmey and William Cavan Woolsey in New York. Initially built by Langsdorf and then Richard von Foregger after 1915. This apparatus was inefficient because it had the breathing bag attached directly to the mask allowing for mixing of expired and inspired gases. In 1914 Gwathmey wrote what many consider to be the first comprehensive American textbook on anaesthesia - titled *Anesthesia.* He was also the founder and first President of the American Association of Anesthetists
1912	Harcourt's Anaesthesia Apparatus produced (see 1901 & 1904)	Augustus George Vernon Harcourt, an English chemist working at Oxford University. This was another example of a "draw-over" system. It heated the vaporizer with a candle and, in so doing, was designed to improve the control over the concentration of agent delivered. It limited the concentration of chloroform in an air mixture to a maximum of 2% because the findings of the BMA Chloroform Committee of 1901 concluded that deaths under chloroform anaesthesia were from overdosage. (see also entry Levy 1911)
1912	The use of intra-muscular injection of ether discussed in depth at the Société de Chirurgie deParis	Topic proposed by Professor Maurice Descarpentries. Method included injection of total 1ml/kg of ether into buttocks (distributed in several injection sites). Sleep induced in about 10 minutes with surgical anaesthesia in 15 - 20 minutes and lasted about 30 minutes. Patients remained drowsy for up to 24 hours and were found to be exhaling ether up to that time. Although the method was used widely on French soldiers during World War I, it did not catch on because of side-effects: nerve pain, muscle necrosis at injection sites, recurrent epileptic seizures over nearly 3 days. No animal experiments had been conducted.
1913	Tungsten bulb added as light source for laryngoscope (see 1903)	Professor Chevalier Jackson (American laryngologist). Considered to be the inventor of modern airway endoscopy & oesophagoscopy (see 1909 also)
1913	First battery-powered open-sided laryngoscope	Dr Henry Janeway - surgeon in New York. This was actually the first laryngoscope to be designed specifically for anaesthesia. Reinhold Wappler's company, the Wappler Electric Company (New York), worked with Janeway to produce this instrument. The batteries were in the handle. That same year, Janeway became the first person to suggest that a laryngoscope blade should be curved instead of straight
1913	Acetylcholine identified as possibly involved in neurotransmission (see 1921, 1926, 1929 & 1934)	Professor (later Sir) Henry Hallett Dale (et al), Director Department of Biochemistry & Pharmacology of the National Institute for Medical Research, London; later President of the Royal Society and also President of the Royal Society of Medicine. They isolated acetylcholine from the ergot fungus on rye and noted that it had the same nerve-stimulating effects as muscarine from mushrooms. Dale was also responsible for sparking the "Brown Dog Affair" in 1903 (a lengthy and heated political debate about vivisection) after he removed an anaesthetized (controversial point) dog's pancreas and then proceeded to kill the dog by stabbing it in the heart, all during a public scientific demonstration when he was working with Ernest Henry Starling & William Maddock Bayliss in London. He was eventually responsible for the introduction of "*Dale's Principle* " which names neurons according to the nature of their transmitters e.g. 'noradrenergic'. He received, with Otto Loewi, the Nobel Prize for Medicine or Physiology in 1936 for his work on transmission of nerve impulses (also see histamine)

1913	Nobel prize for Physiology or Medicine awarded for research into anaphylaxis	Charles Robert Richet, Professor of Physiology at the Collège de France, and Paul Jules Portier, a French zoologist and marine biologist. However, for some seemingly unfair reason, only Richet received the Nobel Prize. Richet was responsible for coining the term 'anaphylaxie' (from the Greek "phylaxis" meaning "protection"). Their experiments, in 1901 and beyond, involved injecting dogs with different amounts of the toxic extract from poisonous tentacles of sea-anemones (Actinia). Some of the dogs that survived small doses were used in further experiments several weeks later when it was noted that, even with very small doses again, the dogs reacted in unexpected ways (i.e. differently from the direct toxic effects of the poison), with 4 levels of reaction ranging from pruritus to death. This hypersensitivity formed the crux of their investigations. Their original experiments were inspired by a conversation with Prince Albert of Monaco, while sailing with him, about the poison from the tentacle of the Physalia (Portuguese galleys). It should be noted that the angio-oedema of anaphylaxis had previously been observed and described by Heinrich Quincke and was already called "Quincke's oedema". (see also histamine)
1913	Definitive description of the combined use of local anaesthesia & inhalational anaesthesia	Dr George Washington Crile in *The Lancet* in an article titled *"The kinetic theory of shock and its prevention through anoci-association (shockless operation)",* although this technique had certainly been used on occasions beforehand including on Queen Victoria in 1871 at Balmoral by Mr (later Lord) Lister to incise and drain an axillary abscess - Lister used a Richardson ether spray on the skin and Sir William Jenner administered "whiffs" of chloroform
1913	Paraldehyde first used as an intravenous anaesthetic agent (see 1829 & 1882)	
1914	Gwathmey O_2/N_2O/Ether anaesthetic apparatus produced (see 1912)	Foregger Company New York which was set up in this same year and became heavily involved with anaesthetists in producing many different items for anaesthesia (see 1906)
1914	The Yankauer-Gwathmey wire-mesh anaesthesia mask developed	This was the Yankauer mask modified by James Tayloe Gwathmey to deliver supplemental oxygen (see 1904 & 1907)
1914	Australian Red Cross formed	
1914	First successful "intra-operative" autologous blood transfusion - given for ruptured ectopic pregnancy (see 1818)	Dr M J Theis in Germany
1914	Citrate first used to prevent blood coagulation outside of the body (see 1950)	Dr Albert Hustin (Belgian physician). 7 months later, Dr Luis Agote (Argentinian physician) also determined this but it was not until 1915 that Dr Richard Lewisohn in New York determined the best concentration of Sodium Citrate that would provide appropriate anticoagulation for the stored blood without being toxic
1914	The Scottish Society of Anaesthetists formed	This was formed by a group of General Practitioners with special interest in anaesthesia at the Balmoral Hotel in Edinburgh on February 20. It has the distinction of being the oldest national anaesthetic society in the world. The inaugural President was Dr D C A McAllum who, it would appear, died within weeks of election. Dr James Paton Boyd then assumed the Presidency. Also present at the initial meeting were: Drs Torrance Thomson, J H Gibb, M H Jones, J S Ross, Lamb, Napier, Fairlie, Johnston & Mills. Drs Home Henderson, Ogston and Robertson gave apologies but were included in the inaugural membership roll. The first regular meeting was held on April 18, 1914, but the second regular meeting was not held until November 29, 1919 due to the disruption caused by WW1
1914	Opium, Morphine, Heroin and Cocaine became "controlled substances"	USA Congress via the Harrison Narcotics Act
1914	First recorded specific narcotic antagonist "nalodeine" (N-allylnorcodeine) developed (see 1942 - Weijland); (also see 1960)	J Pohl. This discovery went unnoticed
1914	The Van Lint block to produce akinesia of the orbicularis oculi muscle introduced	Dr Auguste Van Lint of Brussels. He used cocaine but, like others, decided that cocaine was too toxic and it was not until 1930 that this technique became popular with the widespread use of procaine
1914	The first publication describing "balanced anaesthesia"	A book called *Anoci Association* by surgeons George W Crile (founder of the Cleveland Clinic) and W E Lower, in a chapter by their nurse anaesthetist, Agatha Hodgins, in 1914 (see 1903). "Balance" came from the combined use of narcotic premedication, O_2/N_2O and local anaesthetic infiltration
1915	CO_2 absorber developed for use with closed circuit (see 1905, 1906 & 1921)	Dennis E Jackson (pharmacologist) St Louis USA

1916	Oxycodone developed	Freund & Speyer at University of Frankfurt
1916	Commonwealth Serum Laboratories established	in Melbourne to produce sera and vaccines
1916	Shipway's Anaesthesia Apparatus produced	Dr (later Sir) Francis Edward Shipway, London. This was an example of continuous flow machines and comprised 3 bottles: a Boyle bottle ether vaporizer, a Junker bottle chloroform vaporizer and a 'thermos' vacuum flask filled with hot water. It was introduced with the aim of providing warm vapours that were supposed to reduce the likelihood of a patient losing body heat. Shipway was knighted in 1929 after anaesthetizing the English King George V for a rib resection and drainage of empyema that complicated lobar pneumonia
1916	The first American journal to deal specifically with anaesthesia began publication	The 'Anesthesia Supplement' of *The American Journal of Surgery* . This was published until 1922. *Current Researches in Anesthesia & Analgesia* (see 1919) then began publication and lasted until 1946
1917	Definitive "stages" of anaesthesia described (for ether with spontaneous breathing)	Dr (Lieutenant) Arthur E Guedel - American anesthesiologist whose pet dog, which was at one time intubated & immersed in an aquarium in experiments on cuffing tubes (& survived), was called "Airway". Guedel published these stages in wall chart form for use by lesser trained field operatives during World War I, while working with casualties in France. In 1937, he formally published them in a book titled *Inhalation Anesthesia, a Fundamental Guide*
1917	The first English-designed anaesthetic "machine" (Boyle's machine) developed. This included cylinders for O_2 & N_2O & a "Boyle's Bottle" to vaporize diethyl ether (see 1903)	Dr Henry Edmund Gaskin "Cockie" Boyle, St Bartholomew's Hospital, London. He is also responsible for the Boyle-Davis gag. The machine was named in his honour by the makers, Coxeters and British Oxygen Company (B.O.C.) (see 1955). The design was based on Gwathmey's machine (acknowledged by Boyle), one of which had been shipped to England in 1916
1917	The local anaesthetic, Nikalgin, produced	Mr George Edwards, an electrical engineer by training from Stanford University. In his search for a dental local anaesthetic (having overheard 2 doctors speaking of the need for one) and then further spurred on by the events of World War I, he developed this local anaesthetic spray - a combination of quinine, urea & hydrochloric acid. It proved to be extremely & rapidly effective and was quickly adopted by the English and European militaries for use with surface wounds. It was also produced as a jelly available in tubes
1917	United States of America starts manufacturing many barbiturates	After the USA joined World War I in 1917, the Trading With The Enemy Act was passed by Congress and this allowed American manufacturers to ignore the 17-year patents the Germans held over barbiturates. Other countries followed suit with production. About 2,500 barbiturates were manufactured world-wide but only about 50 eventually received serious consideration
1918	The first ergot alkaloid, ergotamine, isolated in pure form	Professor Arthur Stoll, who established the Pharmaceutical Department of Sandoz in 1917, isolated this compound from the corn-fungus (ergot). It was introduced into clinical practice in 1921 under the trade name of Gynergen
1918	Heparin named	Professor William Henry Howell, physiologist at Johns Hopkins Medical School in Baltimore. Attribution of its discovery, however, is highly contentious: Medical student, Jay McLean, working under Howell in 1916 claimed to have isolated relevant phosphatides from liver but did not proceed to work with them. In 1918, Howell, in concert with another medical student, L Emmett Holt Jr., claimed to have isolated a different compound and named this heparin, reflecting its derivation - from dog liver cells (*hepar = liver (Greek)*). It is present in mast, liver and lung cells and is now commercially derived from pig intestines and cow lungs. In 1922, Howell claimed to have developed a distinctly different but related compound which became marketable but had side effects. In 1933, Charles Best (of insulin fame), D W G Murray et al began working to refine the compound. The first human use of heparin followed in 1937 by this latter team
1919	The Silk wide-bore rubber pharyngeal airway described	Dr J F W Silk. It was adapted for both oral and nasal use

1919	Red rubber endotracheal tubes developed (see 1882 & 1900)	Dr (later Sir) Ivan Whiteside Magill and Dr Edgar Stanley Rowbotham at Queen Mary Hospital, Sidcup (aka Queen's Hospital for Facial & Jaw Injuries, Sidcup) (to help anaesthetize for WW1 facial injuries in a special unit run by surgeon Major (later Sir) Harold Gillies) Connections to anaesthetic machine included a piece of car brake hose from a Morris MG car engine. The curve in the tube was pre-existing from the red rubber tubing being coiled but was purposefully preserved by storage in round tins. The cut ends of tubing were smoothed by rubbing them with chloroform-soaked swabs According to an interview with Magill, found at https://anaesthetists.org/Home/Heritage-centre/Collection/Oral-Histories, the first tube he used was from an old Boyle's machine because it was hard rubber. He found the rubber drainage tubing already in theatre was too soft. He eventually found a man named Benson who ran a rubber and toy shop in Tottenham Court Road who was able to supply him with appropriate tubing. Later Charles A King started a shop that specialized in anaesthetic items and was able to supply him. At one stage he was hardening the rubber tubing by putting it on his roof to 'weather' it. For children, he used thin-walled gum elastic tubes. He also designed the left-sided bevel so the end of the tube would not catch on the left vocal cord when he, being right-handed, inserted the tube from the right side of the mouth or right nostril
1919	The National Anesthesia Research Society of the United States founded	The inaugural President was the notable Dr Francis Hoeffer McMechan. Later, in 1922, he became the permanent Secretary General of the Society, which, in 1925, changed its name to the International Anesthesia Research Society. He was also the inaugural Editor of the Society's journal *Current Researches in Anesthesia and Analgesia* , which was first published in 1922
1920	"Blind nasal intubation" technique introduced	Dr Edgar Stanley Rowbotham following a chance blind naso-tracheal intubation with a wired nasal intra-tracheal catheter used to insufflate nitrous oxide, oxygen and ether. This method of insufflation had been developed by one of the so-called Fathers of Neurosurgery, Dr Charles A Elsberg, who was the founding chairman of Neurological Surgery at the Neurological Institute of New York, part of Columbia University Medical Center. This method of insufflation was introduced into England in 1912 by a surgeon in Liverpool, Dr R E Kelly
1920	Magill's forceps developed	Dr (later Sir) Ivan Whiteside Magill at Queen Mary Hospital, Sidcup (aka Queen's Hospital, Sidcup). The bend in the forceps was introduced to avoid the hand of the anaesthetist blocking the view of the larynx
1920	Somnifene (mixture of salts of diethylbarbituratic and diallylbarbituratic acids) synthesized	Tomas Alday Redonnet, a Spanish pharmacologist. Marketed by Hoffmann-La Roche & Co. Initially used for oral sedation by Liebemann in Zurich. First used clinically intravenously in 1921 by Bardet and Bardet (father & son) on a labour ward case. First used for surgery in 1924 by Fredet and Perlis. In the first half of the 20th Century it became the most widely used sedative/anaesthetic agent for "Deep Sleep" therapy
1920	The term "premedication" first used (see 1850 & 1908)	Dr Francis Hoeffer McMechan in the American Journal of Surgery Quarterly Supplement 34, 123
1920	Air conditioning recommended for operating theatres	Huntington with optimum temperature of 65-70 degrees Fahrenheit recommended by Herb
1921	"*Vagusstoff* " and "*Acceleranstoff* " discovered (see 1913, 1926, 1929 & 1934)	Professor Otto Loewi, physician & pharmacologist, Universities of Graz and Vienna, Austria. His famous "dream" experiment, involving the vagus nerve and the heart, proved that neurotransmission was chemical and not electrical. He received, with Henry Hallett Dale, the Nobel Prize for Medicine or Physiology in 1936 for his work on transmission of nerve impulses. "*Acceleranstoff* ", produced after he stimulated the sympathetic nerves to the heart, was later discovered to be noradrenaline (see 1946)
1921	CO_2 absorber concepts refined with development of Waters' "to-and-fro" canister which used soda lime (see 1905, 1906 & 1915)	Dr (later professor) Ralph Milton Waters (while practising in Sioux City, Iowa, USA) (see 1927 & 1933)
1921	Islets of Langerhans role proven by isolating insulin (see 100, 1889, 1909, 1926 & 1955)	Dr Frederick G Banting & medical student Charles H Best, University of Toronto (see 1909 & 1955). They purified fluid extracted from animal pancreases and injected it into an 11 year old diabetic patient, Leonard Thompson, with dramatic results. Following this discovery, the Canadian Government introduced the Banting and Best Medical Research Act of 1923 with annual funding ensuing

1921	World's first voluntary blood donor panel established	Formed by Dr Percy Lane Oliver in London. He organised it from his home using volunteers who had been screened for diseases who would travel to hospitals when needed
1921	World's first use of (lumbar) epidural anaesthesia in humans - originally called "metameric anaesthesia" by Dr Miravé	Dr Fidel Pagés Miravé - a Spanish military surgeon
1922	Use of fine needle (for dural puncture) inserted through larger needle (for skin puncture) suggested as means of reducing incidence of post-dural puncture headache	Dr Hoyt (used needles similar in design to those developed by Dr Corning)
1922	Obturator nerve block described	Dr Gaston Labat - sometimes referred to as the "father" of regional anaesthesia. He was also responsible for popularising the Trendelenburg position for the treatment of hypotension (see Wood, Trendelenburg)
1922	Acetylene introduced as an anaesthetic agent	Even though it could be used as a sole agent with added oxygenation, its use did not last long due to it being explosive, left a garlic-like odour and produced nausea and vomiting post-operatively
1923	Ethylene introduced as an anaesthetic agent (see 1924)	Professor Arno B Luckhardt and J B Carter (physiologists) following observations that it (a plant hormone) put carnations to 'sleep' in a Chicago greenhouse. Its use was short-lived because it had to be used in a very high concentration and was explosive - cyclopropane took over in popularity! Professor Luckhardt was also famous for introducing calcium as treatment in cases of parathyroidectomy. He also later became President of the American Physiological Society. Ethylene was first prepared by Dr Jan Ingenhousz in 1799. Ingenhousz, a Dutchman and a some-time acquaintance of Joseph Priestly (who realized that plants took in and gave off gases), discovered that the gas that plants gave off in light was oxygen and, during darkness, was carbon dioxide
1923	Avertin (a solution of 2,2,2-tribromo-ethanol in amylene hydrate) (known as Tribromethyl Alcohol) developed	German chemists Professor Richard Willstätter (of chlorophyll / Nobel Prize) & Dr Carl Duisberg. It is thought that it may have first been used to settle the spasms of whooping cough by German paediatrician Dr Albert Eckstein of Düsseldorf with pharmacologist Fritz Eichholtz being involved. Eichholtz is also thought to have been involved with its introduction as a basal anaesthetic agent in 1926 by the surgeon Otto Butzengeiger in Wuppertal. Butzengeiger & another German surgeon, Otto Nordmann, both designed rectal tubes for Avertin's instillation and these were used extensively for decades. It was first used in England in 1928 by Drs J Blomfield and F E Shipway
1923	Glucagon discovered	C P Kimball & J R Murlin (see 1957)
1923	The British "*Journal of Anaesthesia*" founded	It became the official journal of the Royal College of Anaesthetists in 1990 but has retained its independent editorial board
1923	The American Society of Regional Anesthesia (ASRA) formed	Apparently in honour of Dr Gaston Labat who has been called the "father" of regional anaesthesia and pain medicine in the USA. He was a French surgeon who, after meeting American surgeon Charles Mayo in France, was invited by Mayo in 1920 to visit the USA for a year to teach his techniques of regional anaesthesia. Labat ended up staying in the USA, establishing and becoming ASRA's first President with a membership that was initially mostly neurosurgeons. The membership of ASRA, which added pain management unofficially into its interests in 1930, was eventually absorbed into the American Society of Anesthesiology in 1940. Dr Alon Winnie et al re-started ASRA in 1973. It officially adopted pain management in the 1990s
1923	The "Visual Analogue Scale" for pain assessment introduced into clinical practice	This had its roots in an idea conceived by Walter Dill Scott, an American industrial psychologist. Scott, and another psychologist, Bingham, at the time of WWI were members of the Committee on Classification of Personnel, serving under the Adjutant General. Scott developed the "Man-to-Man Comparison Scale" which led to military promotions on merit instead of seniority. After the war, Scott founded the Scott Paper Company in Philadelphia. The Man-to-Man scale developed into the "Graphic Rating Scale" in 1920 by the noted Beardsley Ruml, then of the Scott Paper Company. In 1921, Hayes & Patterson of the Scott Paper Company converted this into the "Visual Analogue Scale". M Freyd, psychologist, modified the latter in 1923 to a standard 5 inch line with anchor words at each end for clinical application. Scott was awarded the Distinguished Service Medal for his services during WWI
1924	Introduction of the use of ethylene in Victoria, Australia (see 1923)	Dr George Leonard Lillies

1924	Circle breathing CO_2 absorption system first developed (initially for acetylene anaesthesia)	Dr Carl Gauss in Germany. Apparatus manufactured by Drägerwerk (Draegerwerk) of Lübeck. Same company produced systems for use with N_2O/O_2/Ether which were introduced into practice by Drs Paul Sudeck & Helmut Schmidt at the university hospital in Hamburg-Eppendorf (NOT Dr Brian Sword!) (see 1910 & 1927)
1924	Electroencephalogram developed (details not published until 1929)	Dr Hans Berger (psychiatrist) at Jena University Germany
1924	Development of nikethamide (Coramine) (pyridine-β-carbonic acid (aka: nicotinic acid) diethylamide)	E Faust in Switzerland. First marketed by Gesellschaft für Chemische Industrie in Basel. It was introduced into clinical practice mainly as an analeptic in cases of overdose of hypnotics, narcotics and/or anaesthetics. It is said to have been prescribed as a 'tonic' for Adolf Hitler by his personal physician, Dr Theodor Morell
1925	The glass electrode for the measurement of blood pH developed (key words: blood gas analysis)	Phyllis Margaret Tookey Kerridge, chemist, physiologist and (later) physician, London. Hers was miniature and a refinement of existing pH electrodes. She also included platinum in the glass, which provided much greater electrical signals than previous models. The concept of glass as an electrode was built on the paper published by Max Cremer in 1906 showing that there existed an electrical potential between acidic and alkaline solutions when separated by a glass membrane. Cremer's work was furthered by several workers, particularly Wilhelm Giese, H L F von Helmholtz, Fritz Haber and Zygmunt Klemensievics in the intervening years
1925	First heart-lung machine/device (called "*autojektor* ") developed (see 1952, 1953 & 1957)	Professor Sergei Sergeyevich Bryukhonenko, a Russian physiologist and physician and Professor Sergei I Chechulin, a Russian pathophysiologist and physician, who presented their apparatus and results to the Second Congress of Russian Pathologists. This device, capable of an output of 2.5 Litres/minute at an arterial pressure of up to 300 mmHg, was used in a series of experiments on animals (notably severed dogs' heads) and was evident in a 1939 film titled "Experiments in the Revival of Organisms". This development received international news status and featured in Time magazine in 1928. Bryukhonenko used his *autojektor* in 1934 to reanimate a suicide victim after the man had hanged himself 3 hours previously - it took several hours of blood exchange for warming and oxygenation but, after 2 minutes of successful reanimation and the dismay of a horrified group of onlookers, the machine was disconnected and future experiments were conducted on dogs only
1926	"*Vagusstoff* " suggested to be acetylcholine (see 1913, 1921, 1929 & 1934)	Professor Otto Loewi and E Navratil. Hence acetylcholine became the first neurotransmitter to be positively identified
1926	Insulin crystallized	John Jacob Abel at Johns Hopkins School of Medicine
1926	Magill laryngoscope blade produced	(later Sir) Ivan Magill - manufactured by Hamblin, London. This was a modification of the 1910 Hill laryngoscope, which itself was a modified Jackson laryngoscope
1926	First spinal needle with rounded tip designed	Herbert Merton Greene, University of Oregon. He experimented on cadavers and showed that a rounded tip parted, rather than cut, the dural fibres. He also postulated that post-dural puncture headaches were related to CSF loss rather than the then belief in dural trauma (see 1898)
1926	The first fully functional electrosurgery unit used (see 1889, 1897, 1900, 1907, 1909 & 1910)	Developed between 1920 and 1926 by William T Bovie, PhD in plant physiology (Harvard) and eccentric inventor. He used this to help Dr Harvey W Cushing resect a cerebral tumour without significant bleeding after a previous attempt had been abandoned due to haemorrhage
1926	First successful trans-cutaneous pacemaker resuscitation (see 1911, 1950 & 1958)	Dr Mark Cowley Lidwill, Sydney. This occurred at Crown Street Women's Hospital, Sydney where a neonate was resuscitated using 16-volt stimuli via an insulated needle inserted directly into the heart for pacing. Lidwill, in conjunction with physicist Edgar H Booth, had developed several versions of this pacemaker system including a portable one. **(Unrelated to anaesthesia, but interesting sidenote: in 1913 Lidwill is known for the first verified rod & reel catch of a black marlin in Australian waters - off Port Stephens & weighing 70 lbs; its skeleton is on display in the Australian Museum)**
1927	Circle anaesthetic system introduced into the United States	Foregger and Waters, after suggestions by two German surgeons, Helmut Schmidt and Hans Killian, who had been used to working with the DrägerWerk circle carbon dioxide absorber system in Germany. Foregger introduced the use of light flutter valves to direct the flow of gases. This version was tested and modified by suggestions from several practitioners including Brian Sword who reported the 1200 cases he had done by 1929. (see 1924)

1927	Drinker ventilator ("Iron Lung") produced	Invented by Professor Philip Drinker, Louis Agassiz Shaw & James Wilson of Harvard University. The prototype consisted of an iron box & 2 vacuum cleaners. It was the first electrically powered ventilator. It was first used at the Bellevue Hospital in New York and cost more than US$2,000 at that time
1927	The first Foregger "Midget" portable anesthesia machine marketed	By the Foregger Company in New York. The design resulted from collaboration between Richard von Foregger, Ralph Waters and Arthur Guedel. This machine had a water-depression flowmeter for oxygen, two 15 gallon (nearly 57 litres each) AA cylinders of oxygen and two AA cylinders of nitrous oxide
1927	World's first academic department of anesthesiology founded	Dr Ralph Milton Waters, later the world's first Professor of Anesthesiology. Founded at the University of Wisconsin in Madison, Wisconsin. The University itself had been established in 1848. Waters trained anaesthetists/anesthesiologist from around the world until 1949. His trainees became known as "Water's Babies" or "Aqualumni"
1927	The second full-time Specialist Anaesthetist in Australia (see 1888, 1894 & 1909)	Dr Geoffrey Alfred Kaye (né Kornblum). He became the resident Staff Anaesthetist at the Alfred Hospital. With the benefit of an annual income of £1,000 from his father, he was able to follow his interest in anaesthesia despite it being a relatively poorly remunerated field. In 1930, he became an Honorary Specialist Anaesthetist at the Alfred Hospital
1928	Tetracaine (Amethocaine) synthesized	O Eisleb. First used clinically by Kless in 1933
1928	Curare first used during anaesthesia for surgery in England. This also appears to be the first time anywhere in the world (see 1942)	Dr Francis Percival de Caux for 7 cases at the North Middlesex Hospital. Note that this was well before the more credited use by Griffith & Johnson (*vide*) in Canada in 1942. Unfortunately, de Caux could not get drug companies interested and he used non-standard solutions which resulted in varied results and interest waned. Having viewed a McKesson nitrous oxide-oxygen machine in America, he persuaded Charles A King to import one into England and so became the first person there to use one. He used it extensively in his practice, which had an emphasis on dental anaesthesia. After a trip to Russia in 1934, he sympathetically established an abortion clinic and service (then illegal) for which, in 1942, he was tried at the Old Bailey, gaoled for 3½ years and permanently de-registered. He had been born in New Zealand to English parents with the surname Cowx and migrated to England at the age of 20 years with the family where he officially changed his name
1928	Flagg laryngoscope blade produced	Dr Paluel Joseph Flagg, New York. This is considered to have been a precursor to the Miller blade. Flagg's design also had batteries in the handle ("*for the General Practitioner anesthetist* ") but with minimal electrical connections. This was produced in concert with William Allyn of the Welsh Allyn Company
1929	Acetylcholine isolated from animal tissues (horse spleens) (see 1913, 1921, 1926 & 1934)	Professor Henry Hallett Dale and Harold Dudley
1929	Amylobarbitone / Amobarbital - first report of use for intravenous anaesthesia (Amytal)	L G Zerfas and J T C McCallum, Indianapolis City Hospital
1929	Cinchocaine (Dibucaine) (Nupercaine) was first used clinically. It became the first commercially available synthetic amide local anaesthetic (see 1911)	Dr F La Perkaine Uhlmann
1929	Cyclopropane's anaesthetic properties discovered (see 1881, 1935 & 1936)	Velyien Ewart Henderson (Professor of Pharmacology) & G H W Lucas (chemist) at the University of Toronto on animals. They were conducting experiments using propylene and noticed some cardiac toxicity from one of the contaminants in the cylinder - the cyclic isomer of propylene (i.e. cyclopropane). Human trials were not done in Canada (because of several anaesthetic deaths due to ethyl chloride) but by Ralph M Waters & Erwin R Schmidt at University of Wisconsin with results published in JAMA in 1934. After colleagues in the Waters' department experimented on themselves in 1929, the first patient received cyclopropane in October 1930. The Nobel laureate Frederick Banting was the second person on whom it was used.
1929	Hypotension from sodium nitroprusside (SNP) again demonstrated (key word: SNP, hypotension)	Chas C Johnson while testing SNP for respiratory stimulant effects at the Department of Pharmacology at Stanford University
1929	Australian Red Cross Blood Transfusion Service established	Dr Lucy Bryce in Victoria

1929	Publication of the personal description by Dr Charles Horace Mayo (one of the 7 founders of the Mayo Clinic) of his introduction to the administration of anaesthesia	This information was published in Supplement No. 1, Volume 4, No. 51, (dated December 18) of the "Proceedings of the Staff Meetings of the Mayo Clinic" which was produced following the inaugural meeting of the "Anesthetists' Travel Club" (*vide*). Mayo describes how he was called into the operating room, at the age of 8 or 9 years, to continue administering chloroform anaesthesia, under the direction of his surgeon father, Dr William Worrall Mayo, whose practice laid the basis of the Mayo Clinic. This was because the physician who had been administering the anaesthetic had to leave the room to vomit ("seasickness") out on the lawn. The patient was having an ovarian cyst removed - in those days not operated on until the lesion weighed 80-90 pounds. The surgical assistant was the then 12 or 13 year-old William James Mayo, Charles' older brother and later also one of the 7 founders of the Mayo Clinic
1929	First meeting of the "Anesthetists' Travel Club"	The brain-child of Dr John Silas Lundy of the Mayo Clinic, this club was formed by invitation only (17 invitees only for the first meeting) and consisted of anesthetists from leading United States and Canadian medical centres. It was designed to provide a forum for the informal exchange of ideas, research results and practical demonstrations without formal lecture presentations, which Lundy believed were not as effective in spreading and helping the uptake of information vital to the advancement of the profession. It was an annual event spread over several days. Each year it was held in a different centre of excellence. A total of 14 annual meetings were held, with a hiatus during WWII
1929	First aircraft flight simulator built - called the "Link Trainer" or "Blue Box" (see 1969 & 1980s)	Edwin Albert Link who founded Link Aviation Inc. of New York. He received the Howard N Potts Medal in 1945 for developing various devices for training pilots. During his working life he took out 27 patents on aeronautical, navigational and oceanographic equipment. The latter included a submersible decompression chamber
1930	Combination of morphine and atropine recommended as premedication (see 1869 & 1872)	Dr Ernst von der Porten, Hamburg: 'morphine ameliorates psychical shock during induction of anaesthesia and reduces the consumption of anaesthetic drugs, while atropine eliminates salivation and reduces post-operative vomiting'
1930	Pentobarbitone / Pentobarbital synthesized (Nembutal)	Ernest H Volwiler & Donalee L Tabern of Abbott Laboratories, Chicago (see 1934)
1930	Divinyl ether (vinesthene / (aka) vinethene) developed as an anaesthetic agent	Chauncey Depew Leake and Mei-Yu Chen, pharmacologists in San Francisco. The compound had been discovered by Semmler in 1887. The first human studies were apparently performed by Samuel Gelfan and Irving Bell (on themselves) at the University of Alberta in 1933 although Dr Mary Botsford of the University of California allegedly anaesthetized using it in 1932
1930	External cardiac defibrillator invented (key word: CPR)	William Bennett Kouwenhoven, eventually Dean of Electrical Engineering at Johns Hopkins University. He and his team only ever experimented on dogs. He noted a success rate of 98% if reversionary shock given within 30 seconds of the onset of fibrillation with only 27% success if given after 2 minutes. The search for defibrillation ability was spurred on by the large number of electricity line-men who were being killed with the widening-spread of electricity supply in the 1920s. Research was heavily supported by the Consolidated Edison Company of New York, Inc.
1930	Introduction of the Holger Nielsen method of resuscitation (CPR)	Colonel Holger Louis Nielsen, a fitness trainer for the Danish army and an Olympian in fencing, shooting and discus. He sought to improve on previous methods with a more effective inspiration action, which he noticed during a visit to a physiotherapist for a shoulder injury. Red Cross initially rejected the technique because Nielsen recommended that 2 resuscitators were needed until he realized that only one would be required if the sole resuscitator knelt at the head instead of over the patient's hips. Patient is prone, with head resting on folded arms; resuscitator alternates between pressing on the shoulder blades and lifting the elbows. This technique was widely adopted by the mid-1950's. Gordon, in 1952, discovered it produced a tidal volume of 1056 ml and maintained oxygen saturation at over 90%

1930s	Wisconsin laryngoscope blade developed	This was fashioned after the design of a blade then favoured by anesthesiologists at the Wisconsin General Hospital at the Wisconsin University (now the University of Wisconsin Hospital and Clinics), Madison, USA. Entirely straight, C-shaped, with a step and widening flange with a gradually increasing height of the vertical step from proximal to distal end. A Mr James Hipple helped in its development. He later designed a modification of the Wisconsin blade, for use with infants, that had a straighter vertical step and flange but with a wider, more circular tip to aid in lifting the epiglottis - this was called the Wis-Hipple blade. In 1939, the Foregger Company adapted the Wisconsin blade with a more gradual progression of the increasing height of the vertical step distally, a wider flange and with the distal end bending to the right to aid in lifting the epiglottis - the Wis-Foregger blade
1931	Neostigmine (Prostigmine) synthesized $C_{12}H_{19}N_2O_2$ (see: physostigmine)	By J A Aeschlimann and M Reinert. It was patented in 1935 by J A Aeschlimann. It works (as an anticholinesterase) by inhibiting the cholinesterase enzyme so acetylcholine levels rise at the neuromuscular junction and thus competitively reverses the effects of the non-depolarizing muscle relaxants. It needs to be given with atropine to prevent bradycardia as well as reduce secretions that it would otherwise cause to increase. Dr Mary Broadfoot Walker discovered in 1934 that it could be used to treat myasthenia gravis, although its effects are quite transient with this condition
1931	"Cuffed" endotracheal tubes produced	
1931	Possibility of one-lung anaesthesia first recognized	Dr (later Professor) Ralph Milton Waters, at Madison, Wisconsin, after a misadventure where a patient was mistakenly one-lung ventilated by an extra long endotracheal tube that had inadvertently entered the right main bronchus
1931	American Association of Nurse Anesthetists established (see 1877 & 1909)	Agatha Coburg Hodgins. She had previously established, in 1915, the Lakeside Hospital School of Anesthesia in Cleveland, Ohio, which taught physicians, dentists and graduate nurses. This school was the first school producing 'nurse anesthetists'. Since 1908, Hodgins had been chosen by the surgeon, George Crile, to be his exclusive anesthetist. When Robert Andrew Hingson (*vide*) was appointed head of the Anesthetic Department at Case Western Reserve University (with which the Lakeside Hospital was associated) in 1951, he gradually abolished Hodgins' course as he developed a fully medically qualified staffing of the department
1932	First blood bank in the world (see 1935, 1939, 1940 & 1950)	Leningrad Hospital. This was the first civilian one
1932	Hartmann's Solution developed for intravenous infusion (aka Lactated Ringer's Solution) (see 1831, 1876 & 1933)	Dr Alexis Frank Hartmann (later Professor), pediatrician, clinical biochemist and chemical pathologist, St Louis, USA. He added sodium lactate to Ringer's Solution to counter acidosis in children. His excellence in teaching can be illustrated by having 20 of his pupils become professors of pediatrics all over the world
1932	Hexobarbitone (Evipan) produced (see 1864 & 1902)	Developed by chemists Helmuth Weese & Scharpff in Germany. Produced by Bayer. This was the first rapidly-acting intravenous anaesthetic drug. Became very popular and had been used over 10 million times by the end of World War II
1932	Suxamethonium first used (see 1906)	Dr Ranyard West in England. Used to treat tetanus cases & spastic disorders. Dr West eventually changed careers from a medical researcher to become a highly regarded psychoanalyst (see also West, 1935)
1932	Pethidine becomes first synthetic opioid & marketed as anti-spasmodic	Otto Eislib while looking for a substitute for atropine at IG Farben Laboratories in Germany. Otto Schaumann, at the same laboratories, was the first to recognize its analgesic properties

1932	Development of Minnitt's Gas & Air Apparatus	Dr Robert James Minnitt - Anaesthetist, General Practitioner & Physician, Liverpool, England. This was an adaptation of a McKesson oxygen therapy apparatus & was designed specifically for the self-administration of inhalational analgesia for women during childbirth. It was manufactured by the instrument maker Mr A Charles King. A minimum of 50% air was delivered. There was a large model for hospital use and a smaller portable one for use at home. Despite outset studies that showed only a slight decrease in maternal oxygen content and no change in umbilical vein oxygen, the device was eventually banned in 1970 because of the propensity for hypoxic gas delivery. Minnitt received numerous Honorary Fellowships during his life's work involving this apparatus
1932	Reports of "symptoms of shock" in women lying supine in late pregnancy (see 1669, 1893, 1942, 1950, 1953, 1960 & 1968)	Dr Anders Erik Gideon Ahltorp, Swedish obstetrician. He reported these cases in both 1932 & 1935. He noted "cardiac insufficiency" when the gravid uterus lay on the posterior abdominal wall and postulated 3 possible causes of the resulting shock: pathological elevation of the diaphragm; compression of the inferior vena cava; or, a "utero-cardiac neurological reflex"
1932	First Australian textbook on anaesthesia produced	Called "*Practical Anaesthesia*" the authors were staff members of the Alfred Hospital in Melbourrne, including Drs Geoffrey Kaye and George Leonard Lillies. It was also the first monograph under the name of the Baker Institute, which was founded in 1926 at the Alfred Hospital
1932	Association of Anaesthetists of Great Britain & Ireland (AAGBI) founded	Dr Henry W Featherstone (the first President) et al
1932	The first step in the formation of the Wood Library-Museum	Dr Paul Meyer Wood. While recovering from a possible myocardial infarction, Wood established the New York Society of Anesthetists-American Society of Anesthetists Library-Museum at his home in New York City. With many years of development since, it is now housed at the headquarters of the American Society of Anesthesiologists in Schaumburg, near Chicago
1933	"Dogliotti" method (loss of resistance) of epidural space location described	Professor Achillo Mario Dogliotti in Italy. In 1931 he also described "peridural segmentary analgesia"
1933	"Gutierrez" method (negative pressure drop sign) of epidural space location described	Dr A Gutierrez in Argentina
1933	First laryngoscope with a detachable blade produced	Mr William Allyn of the Welch Allyn Company, New York. Apparently, from the patent application picture, a Flagg-type laryngoscope (see 1928)
1933	Dry bobbin flowmeters replaced wet "bubble" flowmeters	
1933	Minnitt's "gas (nitrous oxide) & air" apparatus produced for analgesia during labour (see 1962)	Dr Robert James Minnitt, Liverpool, England, following a request by the Clinical Investigation Sub-Committee of the Liverpool Maternity Hospital. He held both FFARCS and FRCOG and numerous other plaudits. The machine was an adaptation of a McKesson oxygen therapy apparatus. Minnitt was helped by an instrument maker, A Charles King. The machine was used until 1970 and was then withdrawn primarily because of its ability to produce inspired oxygen levels as low as 11%
1933	First use of the intravenous barbiturate hexobarbitone / hexobarbital (Evipan) for surgery	Anaesthetist Ronald Jarman and surgeon Lawrence Abel in the United Kingdom
1933	Intravenous fluids produced in vacuum bottles (see 1831, 1876 & 1932)	Baxter Company. This eliminated pyrogens and microbial growth
1933	The world's first Professor of anaesthesia/anaesthesiology appointed	Ralph Milton Waters at the University of Wisconsin Medical School in Madison, USA. He was appointed as salaried and full-time to this post, having already taken up the invited (by Chief of Surgery, Erwin Schmidt) and full-time salaried post of Assistant Professor of Surgery in charge of anaesthesiology in 1927. He remained in this position until his retirement in 1949
1934	Acetylcholine shown to be involved in neuro-muscular transmission in striated muscle (see 1913, 1921, 1926, 1929 & 1934)	Professor Henry Hallett Dale, Wilhelm Siegmund Feldberg and M Vogt from the National Institute for Medical Research, London. Dale received, with Otto Loewi, the Nobel Prize for Medicine or Physiology in 1936 for this type of work
1934	Acetylcholine shown to be involved in synapses in autonomic ganglia (see 1913, 1921, 1926, 1929 & 1934)	Professor Henry Hallett Dale, Wilhelm Siegmund Feldberg, Professor John Henry Gaddum and Professor A Vartiainen (the latter from the University of Helsinki) - separately and together they showed that preganglionic synapses are all cholinergic and the postganglionic synapses are a mix of both cholinergic and adrenergic
1934	First activated carbon filter to scavenge ether vapour in expiratory limb of anaesthetic circuit	Dr Max Tiegel of Trier in the Dr Tiegel-Dräger Anaesthetic apparatus
1934	Thiopentone (sodium thiopental), (or more completely: sodium 5-ethyl-5-(2-methylpentyl)-4,6-dioxo-1,4,5,6-tetrahydropyrimidine-2-thiolate), synthesized (Pentothal)	Ernest H Volwiler & Donalee L Tabern of Abbott Laboratories

1934	Thiopentone (Pentothal / "Truth Serum") first used for induction of general anaesthesia on March 8	Professor Ralph Milton Waters at the University of Wisconsin - allegedly without a clinical trial. Three months later, Dr John Silas Lundy at the Mayo Clinic commenced a clinical trial following a formal request from the pharmaceutical company, Abbott Laboratories
1930s	Trichloroethylene (Trilene) introduced	Imperial Chemical Industries, Manchester, England. Used by British anaesthetists for preference during World War II due to its non-flammability. Because its odour was similar to chlorine's, waxoline blue was added to distinguish it
1934	Cyclopropane first used in the United Kingdom	Dr Edgar Stanley Rowbotham
1934	The classical retrobulbar block for eye surgery described in detail	Dr W S Atkinson, using procaine. His recommended supero-medial direction for the patient to turn their eye during needle insertion and injection in the infero-lateral quadrant was, with the advent of ultrasound showing what happens to the optic nerve in relation to the needle, revised by others to have the patient looking straight ahead
1934	Australian Society of Anaesthetists (ASA) founded January 19	7 founding members: Drs. Gilbert Brown (1st President), Gilbert Troup (2nd President), Harry John Daly (3rd President), Geoffrey Kaye (1st Secretary and organizer of the founding meeting), William Ivor Hotten, G. Leonard Lillies & Cedric Duncombe. Formed with a meeting at Hadley's Hotel in Hobart. It became only the 3rd medical organization to be established in Australia, preceded by the Royal Australasian College of Surgeons (1927) and the Association of Physicians of Australasia (1930); the latter eventually becoming the Royal Australasian College of Physicians in 1938
1934	Société Française d'Études sur l'Anesthésie et l'Analgésie established	The present organization is La Société Française d'Anesthésie et de Réanimation (SFAR). It was formed in 1982 with the fusion of La Société Française d'Anesthésie d'Analgésie et de Réanimation (SFAR) and l'Association des Anesthésistes Français (AAF)
1934	Societa Italiana di Anestesiologia established	
1934	Sociedad de Anestistas de Mexico established	
1935	Geoffrey Kaye Museum of Anaesthetic History founded	Dr Geoffrey Kaye. Then known as the Museum of Anaesthetic Apparatus, it was housed in Dr Kaye's home, which served as the ASA's headquarters until 1955. It then needed to be housed elsewhere and the Australasian College of Surgeons agreed to do so in their headquarters but only on the condition that it was donated to the new Faculty of Anaesthetists - thus the ASA lost the first 20 years of museum and library donations to what is now the ANZCA
1935	Cyclopropane first used in Australia (see 1929 & 1934)	Dr Gilbert Troup in Perth after visiting Ralph Waters in Madison
1935	"Controlled respiration" introduced into Australia (see 1936)	Dr Gilbert Troup in Perth after visiting Ralph Waters in Madison
1935	Thiopentone first used in Australia (see 1934)	Dr Gilbert Troup in Perth after visiting Ralph Waters in Madison
1935	First American blood bank established (see 1932, 1939, 1940 & 1950)	Dr John S Lundy at Mayo Clinic
1935	d-Tubocurarine isolated from curare. (Also see 1743, 1804, 1825, 1845, 1855, 1858, 1900, 1939, 1942 & 1945*)	Harold King, an organic chemist working in Sir Henry Dale's laboratories at the National Institute for Medical Research in Hampstead. He isolated it from a sample of curare provided by the Museum of the Royal Pharmaceutical Society in London. He also discovered its chemical structure
1935	d-Tubocurarine first used clinically	Dr Ranyard West reported to the Royal Society of Medicine about his use of it to treat a lady suffering from a spastic disorder (see also West, 1932)
1935	Establishment of the Diploma in Anaesthetics (DA) qualification by examination - the first post-graduate course of its kind in the world	The Conjoint Board of the Royal Colleges of Physicians of London and Surgeons of England, being official chartered examining bodies, did so at the request of the Association of Anaesthetists. The first examiners were Drs Claude Woodham Morris and Edmund Boyle
1935	First examinations held for the British Diploma in Anaesthetics (DA) although several members of the Association of Anaesthetists had previously been bestowed the honour without examination (see 1944)	Three Australian doctors with a special interest in anaesthesia, Lorna Bray (Melbourne), Mary Joyce Hudson (Sydney) and Stuart Vance Marshall (Sydney), were among the 46 candidates who were successful in obtaining the diploma at these exams. These three were obviously the first Australians with a DA. After returning to Sydney in 1936, Stuart Marshall entered private practice in Sydney, including an appointment to Royal Prince Alfred Hospital. He served as President of the ASA in 1951-52 when the ASA helped form the Faculty of Anaesthetists of the Royal Australasian College of Surgeons in 1952. Lorna Bray returned to practise in Melbourne. Mary Hudson stayed to practise in Birmingham, England

1935	Gamma-cyclodextrin discovered (see 1891, 1903, 1953, 2001, 2005 & 2008)	K Freudenberg and R Jacobi (Germany)
1935	Guedel laryngoscope blade produced	Dr Arthur E Guedel. This was a straight blade that was set at 72° on the handle in order to reduce the possibility of pressure on the top teeth. This blade was fixed on the handle but with a later model, Guedel also introduced the folding blade for ease of transport from hospital to hospital in the doctor's kit. It was manufactured by the Welch Allyn Company and marketed by the Foregger Company
1935	The Blease (Roberts) dental anaesthesia machine produced	Designed by Mr John Blease of Merseyside for his neighbour, Dr Henry Charles Roberts, a GP with a large dental practice. Although Blease had no medical training & had started work as a butcher's boy, he did have an engineer's mind. Because of his association with Dr Roberts and a full-time anaesthetist, Dr John Halton, Blease became an extremely competent anaesthetist such that, following the sudden death of Roberts in 1937, he took over that anaesthetic practice! During the London Blitzes of WWII, he was appointed "Emergency Anaesthetist" at Birkenhead General Hospital. He had become a much sought-after thoracic anaesthetist
1935	The Hickman Medal first awarded (see 1824)	Following an endowment of £200 from the Henry Hill Hickman Memorial Committee to the Royal Society of Medicine to award a bronze medal, no more often than 3-yearly, to anyone (not necessarily a medical person), of any nationality for highly meritorious contributions to anaesthesia as recommended to the Royal Society by the Council of the Section of Anaesthetics. The first recipient was a Canadian anaesthetist in Montreal, Dr Wesley Bourne, who also had a Master of Science degree in the physiology and pharmacology of anaesthetics and was a prolific researcher and lecturer as well as a practitioner of the art at the Royal Victoria Hospital. The list of subsequent recipients reads like a *Who's Who* of anaesthesia. It has been awarded 26 times since inception, with only 3 occasions in more recent times where no triennial award was made The medal itself was designed by the famous medallist Thomas Humphrey Paget of London - the obverse side has an image of Hickman, his dates 1800-1830 and the words 'PIONEER IN ANAESTHESIA'; the reverse side is inscribed with 'ANAESTHESIA VICTRIX DOLORUM' and the figure of a woman looking victorious on behalf of a man and another woman
1936	Cyclopropane introduced commercially, although experience with its use had been reported in 1934	(see also 1881 & 1929)
1936	The Shadwell laryngoscope designed	Dr Noel Alexander Gillespie while working at the Shadwell paediatric hospital. It was designed for use in resuscitation of the newborn
1936	Protamine sulphate recognized as an antidote to heparin (see 1868)	E Chargaff & K B Olson. Following successful experiments by H C Hagendorn et al in combining protamine with insulin to effectively delay the subcutaneous absorption of the insulin, several researchers tried combining heparin with protamine to provide delayed absorption of the heparin for treating cases of venous thrombosis. The combination provided a precipitate, which led to Chargaff & Olson recognizing protamine as a heparin antidote
1936	The term "controlled respiration" coined (see 1935)	Professor Ralph Milton Waters
1937	Pethidine recognized as analgesic	Otto Schaumann at IG Farben in Germany
1937	Methadone developed	in Germany - (patents & records expropriated by Allied Forces post-war) (see 1947)
1937	First antihistamine produced (see 1907, 1910, 1942, 1943 & 1953)	Daniel Bovet and Anne-Marie Staub, Pasteur Institute, Paris. The first attempt was a substance too toxic for humans but they eventually produced pyrilamine for public consumption in 1944. Bovet won the Nobel Prize for Medicine or Physiology in 1957
1937	Ayre's T-piece developed - first designed for use with neurosurgical patients	Dr Thomas Philip Ayre at Newcastle General Hospital in Newcastle upon Tyne. This was developed, as an adaptation of a Clausen-Evans airway, after difficulties arose when trying to use a Magill circuit for cranio-facial surgery on babies. He attached it directly to a Magill endotracheal tube. The T-piece was manufactured by Charles King in London
1937	Leech "pharyngeal bulb gasway" marketed	Dr Beverley Leech, Canadian anesthesiologist. He started designing this supraglottic airway in 1935 by making wax casts of cadavers' pharynxes. He did this for the specific purpose of providing a safe closed circuit system when using cyclopropane in head and neck surgery. The moulds were used to manufacture soft rubber bulbs that fitted on the ends of metal Connell oropharyngeal airways

1937	First report of combined spinal & epidural (CSE) anaesthesia (see 1979, 1981, 1982 & 1984)	Dr Angelo Luigi Soresi, Italian-born anesthesiologist, surgeon & Editor of Journal of Gastro-Enterology, based in New York. He called the process "episubdural anesthesia" and used a single needle technique. He invented the "hanging drop" method of locating the epidural space and injected Novocaine there before advancing the needle into the subarachnoid space for injection there. He performed over 200 cases. Fluid loads needed were given by sub-dermal infusions
1937	First Professorial Chair in Anaesthetics in Britain founded (key word: Macintosh) (see 1943)	Nuffield Department of Anaesthetics at the Radcliffe Infirmary, University of Oxford. This was coincidental with the establishment of the Department and involved Dr (later Sir) Robert Reynolds Macintosh filling the Chair despite his not having been granted a Diploma of Anaesthetics in the "grandfather" system (for those involved in anaesthesia for at least 10 years) until he obtained that qualification officially by examination in 1939 (see 1962). The department was in many ways modelled on Water's department in Wisconsin as both men were well-acquainted with each other. Macintosh was born in New Zealand (Rewi Rawhiti Macintosh), spent some of his youth in Argentina (where he learnt fluent Spanish), moved to Britain during WWI to become a fighter pilot, spent time as a German POW (where he learnt fluent German) after being shot down, gained his medical degree in 1924, surgical FRCS in 1927 but subsequently became interested in anaesthesia. He obtained the rank of Air Commodore during WW2 during which he helped to train military anaesthetists and was also involved in designing self-righting life vests
1938	First large amount (11kgs) (i.e. sufficient for research and development) of Chondrodenron tomentosum brought from Ecuador (Also see 1743, 1804, 1825, 1855, 1858, 1900, 1935, 1938, 1939, 1942, 1943, 1945* & 1949)	Mr Richard Gill, a former Cornell University medical student turned adventurer. He had developed spasticity after falling from a horse in Ecuador and for which he was being treated by a neurologist, Dr Walter Freeman (famous for trans-orbital "ice-pick" lobotomy). Freeman mentioned the possibility of using curare to treat muscle spasms. That inspired Gill to rehabilitate himself through intensive physiotherapy so that he could return to Ecuador as head of an expedition to collect curare in large amounts as vines and paste. The Squibb Institute for Medical Research bought his supplies. Oskar Wintersteiner & James D Dutcher from the Squibb Institute, together with Professor A R McIntyre, Chair of Pharmacology at the University of Nebraska, produced the extract subsequently named "Intocostrin" (vide)
1938	Electroconvulsive Therapy (ECT) first used on humans	Drs Ugo Cerletti & Lucio Bini in Rome where Cerletti was Chair of Department of Mental & Neurological Diseases at University of Rome. Cerletti had noticed the effect on pigs anaesthetized by shocks before slaughter. Hippocrates was the first to connect epileptiform fits to improved mental outcome after observing malaria-induced fits in mental patients
1938	First use during surgery of a mechanical ventilator - the Frecken 'Spiropulsator'	Dr Clarence Crafoord in Sweden. He later became the Professor of Thoracic Surgery at the Karolinska Institute and was also responsible for introducing the use of heparin for the prevention of deep venous thrombosis (DVT) during surgery. He performed the first successful repair of coarctation of an aorta
1938	National qualifications in Anesthesia introduced in the USA	
1938	Anesthesiology officially recognized as a medical specialty by the American Medical Association	
1939	Impure form of curare (Intocostrin) prepared and began to be used with electroconvulsive therapy (ECT). (Also see 1743, 1804, 1825, 1855, 1858, 1900, 1935, 1938, 1942, 1943 & 1945*)	Prepared by E R Squibb and Sons from crude curare paste purchased from Richard Gill (vide) for use by Dr Abram E Bennett, a psychiatrist in Nebraska, to reduce injuries occuring during electroconvulsive spasms clinically induced by metrazol (pentamethylenetetrazol)
1939	Continuous spinal (subarachnoid) anaesthesia re-introduced (see 1906)	Dr William T Lemmon, Jefferson Medical College, Philadelphia. This time the technique did catch on but his technique was very complicated requiring a special operating table and mattress with a hole cut into each of them to allow the malleable needle, made of 17G or 18G nickel/silver alloy and bent at the skin, to remain in place
1939	Australian Army establishes "Blood Units"	in 5 States

1939	The first large-scale blood bank in the USA (see 1932, 1935, 1940 & 1950)	In response to WWII, surgeon Dr Charles Drew (having researched the banking of blood under a Rockefeller fellowship) conceived, established and ran this facility in Washington DC. His techniques of dehydrating and reconstituting plasma allowed for the large-scale storage and transporting of blood supplies. He was appointed the director of the "Blood for Britain" campaign as well as the first blood bank to be run by the Red Cross. However, when the Red Cross decided to store the blood of his fellow African Americans separately, he resigned. He also refused to take up Membership of the American College of Surgeons because, at the time, it would not allow African Americans to be Fellows
1939	First use of a double-lumen endobronchial tube for one-lung anaesthesia and surgery (see 1889 & 1949)	Dr P W Gebaur, a thoracic surgeon in Hawaii. His design was for a left-sided tube
1939	The first "Fellow in Anaesthesia" in Australia appointed (the equivalent of today's Registrar (Trainee))	Dr Leonard Thomas Shea when appointed to Prince Henry Hospital, Sydney. Dr Shea went on to have a distinguished career, including becoming the President of the Australian Society of Anaesthetists (1962-63) and the Dean of the Faculty of Anaesthetists of the Royal Australasian College of Surgeons (1964-65). He was charismatically known as "Uncle Len" to many who trained under him
1930s	Clausen's head harness and ring developed	Dr R J Clausen ("Joe"), England. Invented to free-up the hands of the anaesthetist in order to take into account the attention required to be paid to all the new patient-monitoring developments. To quote the man himself though: "*But a protest against its too routine use may not be out of place, for it has dangers……the student and the beginner should not be permitted to use any harness until they have mastered the art of holding the mask and the jaw by hand* ." He also spent the whole of WW1 in France as a medical member of the RAMC where he was awarded the Military Cross for "conspicuous bravery in rescuing wounded men under enemy fire".
1930s	The "E&J (Ericson and Johnson) Resuscitator, Inhalator & Aspirator" developed and marketed	This could toggle between positive and negative pressure via a mask or just simply be used to provide a steady flow of oxygen from its cylinders if the patient was breathing. The instruction was to start with the patient prone and apply a method such as the Schäfer while the equipment was sourced and readied. It came in a hard suitcase and weighed 50lb (20kg). Its marketing and use persisted for up to 30 years but it was not without complications such as barotrauma, including even pneumocephalus.
1930s	Origin of "French" (aka Charrière) gauge for measuring external diameters of instruments	Joseph-Frédéric-Benoît Charrière, Swiss-born Parisian-based instrument maker who started working as a cutler at the age of 13 but eventually developed his own factory employing over 400 people. He developed a gauge mould-plate with 30 holes, starting at ⅓ mm (= 1 Fr or Ch) and ending with 10 mm (= 30 Fr or Ch) mainly for the production of urological dilating instruments. Charrière was inducted into the "Légion d'Honneur" in 1851. NOTE: This French gauge was in contrast to the Weiss gauge of instruments that progressed in ½ mm diameters and came from the London-based instrument-maker, John Weiss & Son, a company founded in 1787 and run by Austrian-born cutler John (Johann Jacob Daniel) Weiss
1940	Rhesus blood group discovered (see 1901)	Professor Karl Landsteiner & Dr Alexander Wiener discovered these in Rhesus monkeys & identified them as being the factors postulated by Drs Philip Levine & R E Stetson as the cause of death of a still-born baby in 1939
1940	Australia's first Blood Bank established (see 1932, 1935, 1939 & 1950)	by Red Cross at Royal Perth Hospital
1940	Bennett ventilator invented (see 1967)	V Ray Bennett, founder of the Puritan Bennett Company, who had been in the medical gas industry since 1913. This was the first mechanical ventilator to start replacing the "Iron Lung"
1940	The Alfo-Blease all-purpose portable anaesthetic machine produced	Alexander & Fowler, a Liverpool surgical instrument company with which John Blease was working at the time
1940	First long-term intravenous cannula described (see 1945, 1950 & 1962)	Developed by Dr Thore Olovson, surgeon at St Göran Hospital in Stockholm, in concert with an instrument maker, Helge Meyer. The necessity for repeated injections and hence more permanent venous access came from treatment of cases of deep vein thrombosis (DVT) with repeated injections of heparin. It became known as the "Heparine needle". Dr Torsten Gordh (see 1948) described his modification of this needle in 1945 and it then became known as the "Gordh needle" for anaesthesia and infusions
1940	The journal "*Anesthesiology* " first published	

1941	Miller laryngoscope blade produced (see 1946)	Dr Robert Arden Miller (San Antonio, Texas)
1941	Australian Red Cross takes over all civilian transfusion services in Australia	
1941	Anaesthesia recognized as a "specialty"	American Medical Association
1941	Some steroids noticed to produce anaesthesia	Dr Hans Hugo Bruno Selye, Canadian endocrinologist of Hungarian extraction
1941	"Murphy's eye" recommended for endotracheal tubes	Dr Francis John Murphy, an American graduate of the Magill University in Montreal, while working in Detroit. This was one of apparently 9 recommendations he listed that should be included to make the "ideal" endotracheal tube
1941	Suxamethonium found to be hydrolysed in the blood stream by 'non-specific' esterase enzymes (see 1949)	David Glick, Carlsberg Laboratory, Copenhagen, when studying the action of horse cholinesterase on suxamethonium
1941	Oxford Ether Vaporizer produced	Nuffield Department of Anaesthetics at the Radcliffe Infirmary, University of Oxford. According to Dr (later Sir) Robert Macintosh, it was introduced for the sake of "providing simple safe anaesthesia, particularly in war conditions". It worked on the principle of the generated latent heat of crystallization of hydrated calcium chloride to vaporize the ether. Hot water was used to melt the calcium chloride (melts at 29˚C). It was economical to run as ether was only delivered during inspiration. Compressed gases were not needed. Ventilation could be either spontaneous or controlled. Lord Nuffield provided engineers and his Morris Motors factory to ramp up production of this unit which became particularly popular through its use by the armed forces in the then current war
1941	Gillies anaesthetic machine produced	Prototype developed by Dr John Gillies and hospital plumber, Mr John Morrison, Royal Infirmary of Edinburgh. Prototype hence called the "Gilmor" machine. Formal manufacture by A Charles King & Co. of London. It was portable and featured a true closed-circuit "circle" system. It was also able to be used with a Water's canister in a "to-and-fro" arrangement
1941	Coxeter-Mushin Circle Absorber system designed	Mr Coxeter of Coxeter & Sons and Dr (later Professor) William Mushin. This was introduced into the Emergency Medical Service in 1942. This system differed from others of the time by having a bellows (with 2.5 litre capacity) instead of a reservoir bag. The bellows arm, to which was attached a luminous knob so breathing could be observed in a darkened room, enabled measurement of tidal volume with both spontaneous breathing and positive ventilation of a patient. The absorber function was "double phase" that absorbed during both inspiration & expiration - a bit like Waters' "to-and-fro" mechanism, but it had a lever that permitted control of the amount of absorption from 0%-100%. The vaporizer was in the circle - suitable for ether but not for halothane when it became available due to the potential for lethal concentrations. An inspiratory relief valve, that allowed for air intake in the case of gas supply failure, was built into the circle. It was added to the Boyle machine this year

1941	Introduction of the ASA's physical status/risk classification. This was modified in 1963 with the deletion of Classes 5 & 6, which were substituted by the single E for emergency (further modifications - see 2014)	The American Society of Anesthesiologists established a committee of 3 doctors (Meyer Saklad, Emery Rovenstine and Ivan Taylor) to classify "operative risk". Having decided they could not do that specifically - "*No attempt should be made to prognosticate the effect of a surgical procedure upon a patient of a given Physical State* " (Saklad), the trio developed a system based on the physical status of the patient at the time of surgery, viz: **Class 1** - No organic pathology or patients in whom the pathological process is localized and does not cause any systemic disturbance or abnormality; **Class 2** - A moderate but definite systemic disturbance, caused either by the condition that is to be treated or surgical intervention or which is caused by other existing pathological processes, forms this group; **Class 3** - Severe systemic disturbance from any cause or causes. It is not possible to state an absolute measure of severity, as this is a matter of clinical judgment; **Class 4** - Extreme systemic disorders which have already become an eminent threat to life regardless of the type of treatment. Because of their duration or nature there has already been damage to the organism that is irreversible. This class is intended to include only patients that are in an extremely poor physical state. There may not be much occasion to use this classification, but it should serve a purpose in separating the patient in very poor condition from others; **Class 5** - Emergencies that would otherwise be graded in Class 1 or Class 2; **Class 6** - Emergencies that would otherwise be graded in Class 3 or Class 4
1942	The muscle relaxant curare (as Intocostrin) first used in the North Americas during surgery (had previously been used on more than 30,000 patients elsewhere for ECT (by Dr A E Bennett, Nebraska), epilepsy, hydrophobia & muscle spasm cases, including tetanus as suggested by Benjamin Brodie in 1811). (Also see 1743, 1804, 1825, 1845, 1855, 1858, 1900, **1928 in particular**, 1935, 1939 & 1945*)	Dr Harold Randall Griffith, an anaesthesiologist, and his resident, Enid Johnson, working at the Homeopathic Hospital (later the Queen Elizabeth Hospital) in Montreal after being urged by Dr Lewis H Wright of the pharmaceutical company, Squibb and Sons. This occurred on January 23 with the patient being a young man undergoing appendicectomy. Griffith had also been responsible for introducing both ethylene and cyclopropane (the latter at the urging of Ralph Waters) into Canadian anaesthesia in 1923 and 1933 respectively
1942	Nalorphine (N-allylnormorphine - first effective narcotic antagonist) synthesized (see 1914 - Pohl) (also see 1960)	Weijland and Erickson, Burroughs Wellcome. Marketed in 1952 as "*Lethidrone"*
1942	Phenbenzamine (an antihistamine) produced (see 1907, 1910, 1937, 1943 & 1953)	Dr Bernard N Halpern, research biologist and physician, France
1942	Original oximeter machine produced (see 1972 & 1980)	Robert Andrews Millikan - American physicist and Nobel Laureate
1942	Continuous caudal (epidural) anaesthesia developed - (see 1909)	Drs Robert Andrew Hingson, Waldo B Edwards & J L Southworth at the US Marine Hospital, Staten Island. This was first used with a rigid needle for a varicose vein operation and then the technique was used for control of labour pains and comfortable delivery (as reported in 65 patients) using a malleable needle kept in situ in the sacral canal that was connected to a 135ml bag of 1.5%piperocaine. A 5ml syringe was in the line via a 3-way tap - this was used for 'top-ups'
1942	First disposable syringe	Ralph L Huber, a Seattle dentist & inventor. Many of his inventions, including this syringe, were given to the American Army during World War II (see 1945)
1942	First diagnostic use of ultrasound	Karl T Dussik, a neurologist at the University of Vienna. He termed it "hyperphonography" and used it to assess brain tumours and cerebral ventricles (see 1958)
1942	Further recognition that assuming the lateral position during late pregnancy prevented the fall in blood pressure often seen in the supine position (key words: postural supine hypotension) (see 1669, **1893**, 1932, 1950, 1953, **1960** & 1968)	Dr Rolf Hansen, German obstetrician. He did not, however, associate the idea with compression of the vena cava
1942	National qualifications in Anesthesia introduced in Canada	
1943	Macintosh laryngoscope blade produced (key word: Macintosh) (see 1937)	Professor Sir Robert Reynolds Macintosh (Oxford University) - first professor of anaesthesia outside USA (he was a New Zealander, baptized Rewi Rawhiti Macintosh). The idea arose when he observed the vocal cords on view after a surgeon he was working with inserted a Boyle-Davis gag prior to a tonsillectomy. Mr Richard H Salt, Senior Chief Technician of the Nuffield Department of Anaesthetics, that same day soldered a gag blade onto a laryngoscope handle and subsequently helped to fully develop the blade. Initially it was only manufactured in adult size 3 by Medical and Industrial Equipment Ltd

1943	d-Tubocurarine isolated and purified from the bark of Chondrodendron tomentosum	2 chemists at the Squibb Insititute for Medical Research. Although d-Tubocurarine had been identified by Harold King in 1935 (vide), he did not know where the original compound he was working with actually came from
1943	Lignocaine (Xylocaine) first synthesized (see 1948)	Nils Lofgren & Bengt Lundqvist - chemists at Institute of Chemistry at Stockholm University. They sold the rights to Astra AB in Sweden for 15,000 Swedish crowns plus 4% royalties for 17 years. Astra patented the name 'xylocain'. Its laboratory name was "compound LL30". Both developers died early in tragic circumstances
1943	First modern apparatus for measuring carbon dioxide (CO_2) by infra-red introduced	Karl Friedrich Luft in Germany. Having been asked to develop a method of measuring butane in 1937 by the Badische Anilin- & Sodafabrik (BASF) chemical company, he produced the "Luft cell" - the principle of which forms the basis of modern carbon dioxide (CO_2) measurement
1943	Pseudocholinesterase (butyrylcholinesterase) discovered (see 1952, 1953 and 1956)	Bruno Mendel, biochemist, a German Jew who had migrated from Holland to escape the Nazis, working in the Department of Pharmacology (Banting & Best Department of Medical Research) at the University of Toronto
1943	Diphenhydramine (Benadryl) antihistamine produced (see 1907, 1910, 1937, 1942 & 1953)	George Rieveschl, lecturer at the University of Cincinnati
1943	The Canadian Anesthesiologists' Society (CAS) founded (originally called Canadian Anaesthetists' Society)	Dr Harold R Griffith (first President) et al. This was preceded by the Canadian Society of Anaesthetists, which was founded in 1920 (Dr Samuel Johnston first President) but was subsumed into the Section on Anaesthesia of the Canadian Medical Association in 1928. The CAS's original shield shows Hypnos, the Greek god of sleep, dripping liquid from cornucopia (the horn of abundance and nourishment) and holding a poppy. Its motto was "We watch closely those who sleep". In 1993, the logo changed to a maple leaf with Caduceus and the motto changed to "Science Vigilance Compassion". Among many other honours he received, Griffith was honoured by Canada Post with the issue of a 40 cent stamp in 1991
1943	The South African Society of Anaesthetists established	The prime mover was Major RA Moore-Dyk. Of the 26 Medical Practitioners then registered as anaesthetists, 25 formed the Society. It was the first such Society in Africa and the ninth in the world. They have since adopted the term "Anaesthesiologists"
1944	Safer continuous (spinal) subarachnoid anaesthesia proposed (see 1942 & 1947)	Dr Edward Tuohy, Mayo Clinic. He introduced the idea of threading a fine (No. 4) nylon ureteral catheter into the subarachnoid space through a Tuohy needle (15G), which, it has been assumed, he saw while serving in the American military. The Tuohy needle was actually designed by Ralph L Huber, a Seattle dentist & inventor. Huber had designed the curved needle at least by 1942, thereafter it had been adopted for use in the American Army, but did not apply for a patent until 1946! He had specifically designed the needle to reduce the pain of penetration and prevention of tissue plugs forming inside needles. Huber also invented the first disposable syringe (which he also let the Army have)
1944	Associacion Argentina de Anestesiologia established	
1944	The first formal group of practising anaesthetists in Australia established	This was formed by Drs Harry John Daly and Stuart Vance Marshall in Sydney with an office in Macquarie Street. It was called "Shanaway" after the region in County Cork, Munster, Ireland from where Daly's family originated; although he himself was born in Glebe, Sydney. The group eventually changed its name to "General Anaesthetic Services", also known as the "GAS Company", and headquartered in Edgecliff
1944	First Australian Diploma in Anaesthesia (DA) awarded by the Post-Graduate Committee in Medicine of Sydney University (see 1935)	The recipient was Dr Basil Diethelm, an anaesthetist at St Vincent's Hospital in Sydney. He unfortunately collapsed and died from a cerebral haemorrhage at the age of 29 years while in the surgeons' room at the hospital. [The first publicised course for the DA was held in 1945 and Dr Gwen Wilson, the eminent historian, was amongst those who obtained a DA that year]
1945	Curare (as Intocostrin) first used in Australia	Dr Harry John Daly and Dr Stuart Vance Marshall at St. Vincent's Hospital, Sydney on a female patient with a fractured mandible. The Intocostrin had been supplied to Daly by Lewis H Wright (a graduate in both Veterinary & Human medicine) from E R Squibb & Sons in 1942 but it had taken 3 years for Daly to persuade any surgeon to allow him to try it. The dentist, Dr Frank Carberry, was the one who eventually obliged

1945	Zimmerman's and Meyers' intravenous infusion technique developed (see 1940, 1950 & 1962)	Drs B Zimmermann and L Meyers developed this technique independently of each other. It involved obtaining venous access via a metal needle and then feeding a plastic catheter through the needle's lumen into the vein. Major drawback was leakage back from the vein having been punctured by a needle larger than the indwelling catheter
1945	The Blease Pulmoflator was born	Mr John Blease (refer). This started as an intermittent positive pressure ventilator used around Liverpool but was then developed into the first British commercially-produced positive pressure ventilator
1945	The British Association of Operating Theatre Technicians was formed on December 13	Stan Warner (from University College Hospital), David Crowley (from the Brompton Hospital) were the prime movers following a suggestion from Dr (later Sir) Ivan Magill who knew them both from work and was very impressed by their standards. These men, together with many others, had been trained by the army in WWII. The first formal training course for technicians began in 1947 at St Thomas' Hospital. It should be noted that, with the advent of anaesthesia 100 years before, surgical "holders" were no longer required and many of them became assistants to anaesthetists; this Association can be said to have formalized the relationship of anaesthetic assistant.
1946	Human trial of effects of d-tubocurarine (see particularly 1951, et al)	Dr Frederick Prescott, the Research Director of the Wellcome Physiological Research Laboratories based at "Langley Court" in Beckenham, Kent, England, allowed himself to be injected while awake and monitored by anaesthetists in attendance. Two minutes after a dose of 30mg, Prescott found himself totally paralysed. Unfortunately, his colleagues were all momentarily distracted by attention to the monitors. Just as he lost consciousness, one of the attendants happened to notice his cyanotic predicament and ventilation and chest compressions were commenced. Seven minutes later, Prescott started breathing by himself. Thirty minutes later he started to get general muscle power and six hours later he was fully recovered except for some chest tightness that lasted a few days. To test if the drug had any anaesthetic effect the team applied sticking plaster to the hairy parts of his body and then ripped them off - when recovered he confirmed the drug did not prevent pain sensation! He also stated " To be conscious yet paralysed and unable to breathe is a very unpleasant experience"
1946	Curare (as tubocurarine) first used in clinical anaesthesia in the United Kingdom	(Later Professor) Thomas Cecil Gray in Liverpool
1946	Noradrenaline (norepinephrine) discovered	Professor Ulf Svante von Euler, Swedish Professor of Physiology at the Karolinska Institute. He is also responsible for discovering Substance P (1931) (this with Fellow of the Royal Society, Pharmacologist, (later Professor) Sir John Henry Gaddum), Prostaglandin (1935) and Piperidine (1942). He also helped describe the "Euler-Liljestrand mechanism" for the arterial-shunt mechanism in the lungs secondary to local hypoxia. He shared the Nobel Prize in Physiology or Medicine 1970 with Sir Bernard Katz and Julius Axelrod "for their discoveries concerning the humoral transmitters in the nerve terminals and the mechanism for their storage, release and inactivation".
1946	First artificially and purposefully produced intra-operative hypotension	Dr W J Gardner - this was haemorrhagic - produced by arteriotomy during neurosurgery
1946	Mendelson's syndrome (aspiration pneumonitis)described (see 1848, 1853 & 1961)	Dr Curtis Lester Mendelson, Obstetrician & Gynaecologist in USA, reported in the American Journal of Obstetrics & Gynaecology 66 cases occurring in a total of 44,016 deliveries which occurred between 1932 and 1945 and where Oxygen, Nitrous Oxide & Ether had been used. There were only 2 deaths and these occurred in the group of 5 patients who had inhaled solid food material. Mendelson was not the first to report such cases (others being J Burns Amberson (1937), Charles C Hall (1940) and Kaye), nor was he the first to describe the effects of acidic fluid in the lungs but the syndrome became eponymous after his journal article was published
1946	First continuous brachial plexus block performed	F Paul Ansbro, Brooklyn
1946	Miller laryngoscope blade for paediatric use produced (see 1941)	Dr Robert Arden Miller, Texas. This is a straight bladed laryngoscope
1946	"*Anaesthesia* " - the official journal of the Association of Anaesthetists of Great Britain & Ireland (AAGBI) founded	

1946	The BMA's third "Anaesthesia Committee" formed (see 1831, 1875, 1891 & 1901)	This was in response to the impending formation of the British National Health Service in 1948. Its ambit was quite broad. Of 424 physicians who responded to the BMA's request for expressions of interest in forming an anaesthesia group, 90 attended a meeting where 10 were elected as a committee. One member from each of the AAGBI and the Anaesthetic Section of the Royal Society of Medicine (ASRSM)were appointed to the committee as well. Over time, the ASRSM representative withdrew claiming the appointment to be against the RSM's constitution and was replaced by a representative from the Faculty of Anaesthetists of the Royal College of Surgeons. The Committee was disbanded in 1972
1946	Narkoslikar Klubben established in Sweden	
1947	Patients Albert Woolley & Cecil Roe rendered paraplegic after spinal anaesthesia on the same operating list on October 13 at Chesterfield Hospital in England. (The resulting loss of popularity in spinal anaesthesia across the world following this incident began to change after R D Dripps & L D Vandam reported in JAMA in 1954 on the safety seen in 10,098 cases)	Initial court case held 1953. These patients were 2 of 3 who had spinal anaesthesia on that day. The other patient, who died several days post-operatively from his surgical illness (had laparotomy for bowel obstruction), had also displayed some signs of neurological impairment. Anaesthetist was General Practitioner Dr J M Graham. Local anaesthetic used was 10 ml cinchocaine 1/1500 (Nupercaine, Ciba). Effect was early onset of acute myelopathy of the lower spinal cord and, later, permanent spastic paresis. Court case concluded that the phenol, used to soak/sterilize the ampoules of LA, had leaked into them through microscopic cracks. Court appeal in 1954 (Lord Justice Denning) dismissed pleas of negligence and decided misadventure. The patients were never compensated. According to the hospital pharmacist involved at the time, a Mr Swallow, (when interviewed at the age of 91 years), these 2 patients were looked after in chronic care facilities at Lodgemoor Hospital until their deaths within 5 years of the event and eventually apologised to Dr Graham for putting him through the trauma of the legal processes. Dr C D D Hutter (surgeon, Nottingham), in 1990, postulated (based on known pH effects) actual cause to have been residue from syringe descaling with phosphoric and hydrochloric acids when the usual system of sterilizing syringes was not supervised by the usual personnel.
1947	Methadone first marketed	Eli Lilly & Co in US after bidding for patent post-war (see 1937)
1947	Gallamine triethiodide (Flaxedil), the first successful synthetic competitive muscle relaxant, synthesized (see 1949)	Daniel Bovet while working at the Pasteur Insitute (see other entry for Bovet 1951)
1947	Continuous epidural anaesthesia introduced (see 1942 & 1944)	Dr Manuel Martinez Curbello, Havana, Cuba after visiting the Mayo Clinic in 1946 and observing the use of the Tuohy needle and ureteral catheter to deliver continuous spinal (subarachnoid) anaesthesia. He used a lumbar-placed, small ureteral catheter threaded through a Tuohy needle into the epidural space. His initial report was of 59 successful cases and, in one case, the catheter was left in situ for 4 days without complication
1947	Plastic (PVC) blood storage bags invented	Professor Carl W Walter at the Harvard Medical School but it was not until 1962 that he was allowed to manufacture them resulting in the discontinuance of using glass bottles
1947	Soper laryngoscope blade produced	Wing-Commander Robert L Soper, Senior Anaesthetist in the British Royal Air Force. This was a modified Macintosh blade in both adult and paediatric sizes. Manufactured by Longworth Scientific Instrument Company
1947	First open/exposed defibrillation of a human (see 1788 et al) (key word: CPR)	Professor Claude Beck, a Cardiothoracic surgeonat the Case Western Reserve University in Cleveland, Ohio. This successful event was performed on a 14 year old boy who suffered a cardiac arrest just as his chest was being closed after surgery for a congenital chest defect. Beck used his own design of a defibrillator, which was actually only suitable for "open" hearts. It took 45 minutes to obtain the defibrillator and, in the meantime therefore, open heart massage was performed. The antiarrhythmic drug, procainamide, was also administered

1947	The celebrated book "*A Synopsis of Anaesthesia* " first published	Dr John Alfred Lee, who became a General Practitioner in Southend-on-Sea after graduating in 1927. At the outbreak of war in 1939 he became a full-time specialist at Runwell Hospital. He became a Consultant Anaesthetist in 1948 with the institution of the NHS. His book made it to 13 editions, the last in 2006. He was personally involved in 11 of those being the sole writer for the first 4. It was translated into Italian, Spanish, French, Portuguese, German, Greek & Polish. Lee is also credited with introducing the first post-operative/anaesthesia ward system - his ward allowed patients to recover there even if it took several days. Another credit to Lee is the introduction of centimetre (cm) markings on epidural cannulas. He became the President of the AAGBI from 1971-73 and the first President of the History of Anaesthesia Society from 1986-88. He received many awards, including: the Hickman Medal of the Royal Society of Medicine in 1975; the Faculty of Anaesthetists Medal 1976; the first Carl Koller Award of the European Society of Regional Anaesthesia inn 1984; and the Gaston Labat Award of the American Society of Regional Anesthesia
1947	Section d'Anesthésiologie de la Société Belge de Chirurgie established	
1947	Sociedad de Anestesiologia de Chile established	
1947	Indian Society of Anaesthesiologists established	The concept began in 1940 when anaesthesiologists attended a surgical conference in Bombay (now Mumbai)
1948	Lignocaine introduced into clinical practice (see 1943)	Dr Torsten Gordh (1st Specialist anaesthetist in Sweden having trained with Ralph Waters in the USA) at Karolinska University Hospital
1948	Methoxyflurane synthesized (see 1959 & 1960)	William T Miller et al (chemists) who previously worked on the "Manhattan Project"
1948	Decamethonium described	Richard B Barlow & Harry R Ing (Oxford University) and also by William D M Paton & Eleanor Zaimis (National Institute of Medical Research, Hampstead). The latter pair were actually studying histamine-releasing drugs and noticed the muscle relaxing properties by chance
1948	Advocation of the addition of hyaluronidase to local anaesthetics for eye blocks	Dr W S Atkinson. Not only did this help the onset and quality of the block but it allowed bigger volumes of local anaesthetic agent to be used
1948	Gum-elastic bougie introduced	Drs Robert James Minnitt & John Gillies, Liverpool, England. In 1949, Professor Sir Robert Reynolds Macintosh (Oxford University) - first professor of anaesthesia outside USA (he was a New Zealander, baptized Rewi Rawhiti Macintosh), reported on his extensive experience with the device, which was 60cm long, 15 French gauge with a 40° J tip, specifically called an Eschmann Tracheal Tube Introducer made by Portex Limited, Hythe, United Kingdom. This was the first report of intubation assisted by an introducer
1948	Recognition that there were two types of "adrenoceptors"	Professor Raymond P Ahlquist Carbonnier Professor of Pharmacology at the Medical College of Georgia, Augusta. He shared the Albert Lasker Award for Clinical Medical Research with Sir James Whyte Black, Scottish doctor & pharmacologist, for their work on adrenoceptors
1948	First published description of hypotension associated with a high spinal block	Harold William Charles Griffiths and John Gillies in the journal *Anaesthesia* . This described 44 cases of purposefully induced high spinal anaesthesia for thoracic surgery performed for sympathectomies at the Royal Infirmary of Edinburgh. The patients were also under general anaesthesia and the purpose of the spinals was to minimize blood loss. By 1953, the number of cases using this technique reached 802. These reported cases led to much discussion in various British medical organizations and provided the impetus to research and develop pharmacological substances that could better provide the hypotension (see 1953, 1955, 1977)
1948	The Faculty of Anaesthetists of the Royal College of Surgeons of England founded	There were 170 Fellows elected initially. The Faculty formed its own College of Anaesthetists in 1988 when it split from the surgeons' College and later became the Royal College of Anaesthetists when it received its own royal charter in 1992
1948	The first Director of the Department of Anaesthetics at Royal Melbourne Hospital appointed (see 1950 (x2), 1953 & 1957)	Dr Norman Reynolds James, an Australian-born Melbourne University medical graduate who had worked in the Nuffield Department of Anaesthetics in Oxford and then served in the London Emergency Medical Service during WWll. During the latter service, he earned the title of "England's foremost exponent of regional anaesthesia".

1948	The first "Post-graduate Course in Anaesthesia" in the United Kingdom developed	Professor Thomas Cecil Gray, Head of the Department of Anaesthesia in the University of Liverpool, England, by negotiating with the Dean of the Liverpool Medical School and the Board of Clinical Studies
1948	The National Health Service (NHS) of the United Kingdom instituted	Its official start date was the 5th of July
1948	Dutch Association for Anesthesiology (Nederlandse Vereniging voor Anesthesiologie (NVA)) founded	
1948	Sociedade Brasileira de Anestesiologia established	
1948	Nederlandse Anaesthesisten Vereniging established	
1948	New Zealand Society of Anaesthetists established	Dr Jim Church was the prime mover of this in 1939 but the onset of World War II delayed the inception. The formation of a Section of Anaesthesia in the New Zealand Branch of the BMA was made in 1930 but, despite a meeting in 1932, both interest and the concept lapsed
1948	Sociedad de Anestesiologia del Uruguay established	
1949	The "rabbit head-drop test" patented. This had been used to standardize the potency of curare preparations (see 1938 & 1943)	Horace A Holaday Ph.D., Director of Biological Sciences for Squibb Pharmaceuticals, with Roger F Varney and Charles R Linegar. Horace Holaday is also responsible for the name "Intocostrin". One Unit was the amount that caused the head to drop and Intocostrin was marketed with 20 Units /ml
1949	Decamethonium first used	Organe and also by Hewer, Lucas, Prescott & Rowbotham
1949	Pseudocholinesterase (butyrylcholinesterase) found to be the actual enzyme responsible for the breakdown of suxamethonium in humans(see 1941)	Bovet, Bovet-Nitti, Guarino, Longo & Marotta. A similar observation had previously been made by Glick in 1941 while studying the action of horse cholinesterase on suxamethonium
1949	Gallamine triethiodide (Flaxedil) first used clinically (see 1947)	Professor William Woolf Mushin et al at the Welsh National School of Medicine at the University of Wales in Cardiff. A Sydney-based anaesthetist, Dr Anthony Pierre (Tony) Balthasar (also a Founding Member of the Faculty of Anaesthetists of the Royal Australasian College of Surgeons), is said to have introduced the use of gallamine into Australia (currently indeterminate year!). Following his death in 1979, a large donation from his estate resulted in the establishment of a Scout Lodge, named after him, in the Snowy Mountains in 1980 and a bequest to Sydney University of $50,000 established a Scholarship in Anaesthesia Research. **It should be noted also that Flaxedil was widely used with crocodiles (Loveridge & Blake 1972) until it became no longer available ("Code of Practice on the Humane Treatment of Wild & Farmed Australian Crocodiles" - Australian Government Natural Resource Management Ministerial Council 2009)**
1949	Apgar neonatal score conceived (see 1953 & 1962)	Virginia Apgar, America's first ever female full Professor of Anesthesiology, working at Columbia University in New York City. She allegedly developed the score while having breakfast with medical students who asked her how to assess a newborn. She proceeded to write her response on a table napkin listing the 5 factors (heart rate, respiratory effort, muscle tone, reflex irritability and colour and allocating 0, 1 or 2 to a possible total score of 10 for a baby doing well). Having drawn this table up, she immediately tested the hypothesis in the labour ward. She was also an expert violinist and cellist, playing in 3 different orchestras and making her own stringed instruments. In 1996, she became only the second of two anesthesiologists to be honoured by USA postage stamps - the other being Crawford Long in 1978
1949	First American mechanical ventilator that was designed specifically for "anaesthesia" produced. This was a positive pressure device triggered by the patient's respiratory effort	John Haven Emerson in concert with the Harvard anaesthesia department. He was a highly productive medical device inventor who developed an association with Harvard Medical School and who had earlier (1931) also made beneficial modifications to the original Drinker "Iron Lung" - his modified machine was called "Old Number One" and is displayed in the Smithsonian Institute
1949	The Emotril 'draw-over' inhaler, using trilene, introduced for use by midwives for analgesia during labour	Designed by Hans G Epstein & Robert Macintosh at the Nuffield Department of Anaesthesia. It gained official approval for use in 1950 by the Medical Research Council and the Central Midwives Board. Further trials gained formal approval for its use by midwives from the Ministry of Health in 1954
1949	Carlens double-lumen endobronchial tube designed for humans (see 1889, 1939 & 1950)	Dr Eric Carlens at the Sabbatsberg Hospital in Sweden for use in bronchospirometry (under local anaesthesia, using 2% pantocaine spray!). This is a left-sided tube with a carinal hook. In 1957 he moved to the Thoracic Clinic of Karolinska Hospital in Stockholm, Sweden, where he became a Professor in 1960. Carlens also invented mediastinoscopy in 1959

1949	The Berman Airway introduced	Dr Robert Alvin Berman, New York, **with the help of a plastic fabricating neighbour by the name of Meyer Moch.** An oral airway like a Guedel airway but **it was translucent** with a slit down one side designed initially to **ensure there were no foreign objects inside it and to also** prevent **the** collection of obstructing mucus in the air channel. Later, **in 1977, he modified it to be** used to guide flexible videolaryngoscopes with endotracheal tubes into place through the air channel and then provide the ability to remove the airway by sliding it off the tube using the lateral slit - **(the Berman Intubating Airway)**
1949	Dansk Anaesthesiologisk Selskab established	
1949	Norwegian Association of Anaesthesiologists established	
1949	Turkish Society of Anesthesiology established	
1950	Double-lumen endobronchial tube first popularized for use in humans for one-lung anaesthesia (see 1939 & 1949)	Drs Eric Carlens & Viking Olov Björk (Thoracic surgeon)
1950	Jackson-Rees' modification of Ayre's T-piece described (by addition of open-ended bag)	Dr Gordon Jackson-Rees writing in the British Medical Journal. He designed this system after being asked by paediatric surgeon, Isabella Forshaw, to advance the cause of paediatric and neonatal anaesthesia. It enabled him to demonstrate that anaesthesia could be administered for this young age group in a fashion similar to that for adults with manual controlled ventilation
1950	The Engstrom ventilator patented	Dr Carl Gunnar Engstrom, a Swedish physician. The polio outbreak spurred his efforts, especially to relieve students and residents who were hand-ventilating patients for 24 hours non-stop. It was introduced into clinical practice in 1951. It produced both positive and negative pressures on the lungs
1950	The "James Autohand Ventilator" developed (see 1948, 1953 & 1957)	Dr Norman Reynolds James, Melbourne after he saw a need following the introduction of muscle relaxants into routine surgery. This intraoperative device was electrically powered and able to squeeze the manual bag about 20 times/minute. It was used in Australia and Dallas, USA - the latter after its introduction there by the inventor. Its use persisted until the introduction of blood gas analysis showed that it caused marked respiratory alkalosis.
1950	The Royal Melbourne Hospital Resuscitator developed (see 1948, 1950, 1953 & 1957)	Designed by Dr Norman Reynolds James after being approached by the Secretary of the Elwood Life Saving Club (ELSC). The latter was concerned that there was only the bulky "Iron Lung" to take over the resuscitation of victims of drowning. At that time also, the club could not afford expensive overseas machines. This new manual device was very portable, simpler than overseas alternatives and could be used on all age groups. It was manufactured by Commonwealth Industrial Gases Ltd (CIG) and marketed as the "RM Resuscitator". Coincidentally, it was first used successfully in 1951 to resuscitate a man who had capsized his yacht off the beach at ELSC! It was used widely by the ambulance service and even the air-ambulance (Royal Flying Doctor Service) until it failed to meet the standards required by the Australian Standards Association in 1981
1950	Chlorhexidine synthesized (synthetic cationic bis-biguanide) (see 1954 & 2000 also)	Imperial Chemical Industries (ICI)
1950	First human kidney transplant from a deceased donor (see 1954)	Little Company of Mary Hospital in Illinois. Recipient was Ruth Tucker
1950	The external cardiac pacemaker invented (see 1921 & 1958)	John Alexander Hopps, a Canadian electrical engineer, working with Drs Wilfred Gordon Bigelow & John Callaghan at the University of Toronto. Development had taken two years & started with his interest in and pioneering of hypothermia as a medical protectant for the heart & defibrillating the cold (dog) heart. Transvenous electrodes were required due to the bulk of the machine
1950	First report of awareness during anaesthesia	The case, reported by Dr E H Winterbottom in the British Medical Journal, was that of a 46 year old woman undergoing partial pancreatectomy who experienced severe pain and heard the surgeons' conversation for up to 30 minutes, 3 hours into the procedure, when nitrous oxide was discontinued and before cyclopropane was added. The risk of awareness had previously been raised in an editorial in *The Lancet* following the introduction of a method called the "Liverpool Technique" comprising light anaesthesia, hypocapnoea (from hyperventilation) and profound muscle relaxation as advocated by Thomas Cecil Gray et al in the late 1940s

1950	Discovery that red blood cells could be frozen, stored and later thawed while remaining useful for transfusion (see 1914)	Dr Audrey Ursula Smith, Pathologist and Cryobiologist working at the National Institute for Medical Research in London. Her discovery followed a laboratory accident that led to the use of glycerol in the preservation process. The cells are stored at -85°C (the temperature has to be less than -65°C to prevent the cells from ageing). The Netherlands Military Blood Bank has since shown that, using these temperatures, platelets can be stored for 2 years and are then usable for 6 hours when thawed to 22°C; plasma can be stored for 7 years and then be used for 7 days after thawing to 4°C; and red blood cells can be stored for 10 years and then be used for 14 days after thawing to 4°C. (Dr Smith is also responsible for the successful frozen preservation of bull semen and the subsequent impact on cattle breeding)
1950	First plastic intravenous cannula developed (aka "Rochester plastic needle") (see 1940, 1945 & 1962)	Dr David J Massa, Resident in Anesthesiology in the cardiac catheterization laboratory at the Mayo Clinic. The 3 inch, plastic tubing was manufactured by the Irvington Varnish and Insulator Company, New York. The needle used as the stylet was a 3 inch No. 19 Becton Dickinson needle and the cannula was mounted on the hub of a shortened No. 16 Becton Dickinson needle. The product was sold through the Rochester Medical Products Company, with some claiming that they were originally manufactured/assembled by local pharmacists, Weber & Judd. Prototypes, with some help from fellow Residents, were developed in Massa's home basement and sterilized in his oven. The end of the plastic tubing was buffed to a tapered finish. This invention virtually ended the frequent need for venous cut-downs
1950	Ultimate recognition that compression of the vena cava by the pregnant uterus was the definitive cause of the postural supine hypotension of pregnancy (see 1669, 1893, 1942, 1953 & 1968)	Cardiologists and research physiologists Dr Wallace William Brigden, Dr Sheila Mary Howarth and Professor Edward Peter Sharpey-Shafer (then husband of Howarth) at St Thomas' Hospital, London
c1950	External Cardiac Massage (ECM) developed (key word: CPR)	An engineer, Guy G Knickerbocker, who was a member of William Kouwenhoven's (*vide 1930*) team. He noticed a small rise in aortic blood pressure while pressing monitoring electrodes on a dog's chest and so developed the idea and benefits of chest compression from that observation. The development was eventually written up in the JAMA in 1960 by Knickerbocker, Kouwenhoven and James R Jude
1950s	Propanidid developed (but not introduced until 1964)	Farbenfabriken Bayer AG
1951	Introduction of technique of "apnoeic oxygenation"	J J Jacoby, William Hamelberg, J P Reid, B Gillespie & F A Hitchcock, USA. They used a percutaneous, trans-tracheal approach with a 14 Gauge needle and oxygen flow rate of 4-5 L/min
1951	Description of pencil-point adaptation for dural puncture (spinal) needles	Drs Haroldson (Sweden) & James Hart and Rolland John Whitacre. The introduction of this 20G needle by Becton Dickinson Company (and which the company named the Whitacre needle) saw the incidence of post-dural puncture headache drop from between 5% & 10% to just 2%. The idea was modelled on work published in 1926 by H M Greene, Portland, Oregon, who had rounded the tip of an ordinary 22G needle resulting in an incidence of only 2 spiinal headaches out of 250 cases
1951	Muscle relaxants classified into 'leptocurares' and 'pachycurares'	Daniel Bovet (born in Switzerland) while Chief of the Laboratory of Therapeutic Chemistry of the Instituto Superiore di Sanità in Rome) (Including the Nobel Prize in 1957 for 'Physiology or Medicine' he is one of the most awarded scientists in the world (& still alive in 2011))
1951	Progressive relaxation of different muscles by muscle relaxant drugs further elucidated (see 1855 Claude Bernard)	Irishman, Professor Richard I Bodman (et al), while working at St Thomas' Hospital. Using themselves as wide-awake volunteers, they gradually increased intravenous dosages of curare noting the effects personally and by observation. They determined the sequential muscle effects to be (first to last): oculomotor; eyelids; facial; finger flexors; tongue & pharyngeal; masseters; abdominal; intercostal; laryngeal; and lastly, diaphragm
1951	Laudexium metilsulphate (aka Laudolissin) marketed as a non-depolarising muscle relaxant	Developed by Harry O Collier of Allen & Hanbury General Pharmaceutical Laboratory (taken over by Glaxo Laboratories in 1958) as a derivative of laudanosine. Experimentally known as Compound 20 (C20). It was used on humans for about 10 years but fell out of favour due to reports of late re-curarization. Pharmacologists continued to use it for several years in experiments on animals
1951	Halothane synthesised (see 1956)	Charles W Suckling (British chemist) of Imperial Chemical Industries. Its anaesthetic properties were first tested on mealworms and flies then mice, rats, dogs, cats and monkeys by Suckling and Dr James Raventos. (suggest refer to relevant articles by Dr H D O'Brien)

1951	The "Iron Heart" introduced - first mechanical heart-lung bypass machine - (patient succumbed) (see 1925, 1953 & 1957)	Dr Clarence Dennis at University of Minnesota Hospital
1951	Parrott laryngoscope blade produced	Modified Macintosh blade, which was longer and less curved and said to be useful in large adults. Manufactured by Longworth Scientific Instrument Company
1951	Special report on pulmonary aspiration by the Association of Anaesthetists (see 1853)	The committee, formed due to the hitherto general lack of uniform guidance on the subject, spent 18 months investigating 43 deaths under anaesthesia due to aspiration. Members, Drs H J V Morton & W D Wylie, reported that most deaths (i) were preventable; (ii) involved inexperienced anaesthetists; & (iii) followed a lack of precautionary measures. They listed cases of (i) trauma; (ii) gastro-intestinal obstruction; & (iii) obstetrics, as being the most dangerous and needing preoperative precautions. They also stated that non-urgent operations should be postponed if general anaesthesia was indicated and that urgent operations should be preceded by stomach emptying by gastric lavage
1952	The Faculty of Anaesthetists of the Royal Australasian College of Surgeons founded	69 founding members. The first Final examinations were held in Melbourne in 1956 with 7 candidates. The first Primary examinations were held in Melbourne in 1957 with 5 candidates
1952	Intermittent Positive Pressure Ventilation (IPPV) proposed and the beginning of Intensive Care Units (ICU) (see 1962)	Dr Bjørn Aage Ibsen, anaesthetist at the Blegdam Hospital for communicable diseases in Copenhagen, Denmark during the world polio epidemic that overwhelmed the then current ventilators and facilities - the hospital had one Drinker Respirator or "Iron Lung" and six Chest Cuirass Respirators. He is said to be the "father" of the modern Intensive Care Unit (ICU) because of his efforts in arranging for a special area and facilities that would eventually deal with over 2700 polio victims, of whom 316 needed tracheotomy and ventilation. Believing that an observed rise in plasma bicarbonate in these patients was secondary to hypoventilation and secretion-retention hypercapnia from the old machines, he began by organizing the continuous manual ventilation, using a cuffed endotracheal tube via a tracheotomy and tracheal suctioning, by students & interns rostered for 8 hour shifts (paid the equivalent of 30 cents/hour) of a 12 year old girl dying from the disease - she improved dramatically. The introduction of IPPV, instead of relying on the negative pressure ventilators available, reduced the mortality of polio respiratory paralysis from 87% to 26%
1952	Manley ventilator produced	Dr Roger Manley of Westminster Hospital London. This was the first ventilator powered entirely by gas from the fresh gas supply of the anaesthetic machine
1952	Pin-Index Safety System and Diameter-Index Safety System for gas cylinder mountings on anaesthetic machine yokes introduced	Developed by Wayne Hay & Harold May of the Ohio Medical & Surgical Equipment Company. These men donated the patents (granted in 1963) to the Compressed Gas Association with the result that all manufacturers world-wide could produce safe equipment
1952	The E.M.O. drawover ether inhaler began to be designed	**E**pstein/**M**acintosh/**O**xford - Dr Hans G Epstein, Dr (later Sir) Robert Macintosh and their Nuffield Department of Anaesthetics technician Mr Richard Salt. It did not reach commercial production until 1956. It did not require a special heat source, which gave it an advantage over the Oxford vaporizer
1952	"Copper Kettle" vaporizer introduced	Dr Lucien E Morris, University of Wisconsin. While a Resident under "The Chief" (Ralph Waters), Morris made a comment that "any fool could make a better device than this" when using chloroform in a vaporizer designed for use with Vinesthene that had a lever mechanism delivering gross changes in concentration. A month later, while on holidays, Waters wrote a postcard to his department and included the question "Has Morris made a new vaporizer yet?". This stung Morris into action and he soon developed the prototype for the vaporizer that was eventually named the "Copper Kettle". It was capable of being used not only with chloroform but with other agents as well and was the first vaporizer to allow fine control of agent concentrations.
1952	Suxamethonium (Scoline) muscle pains first reported	Dr J G Bourne, Anaesthetist at St Thomas' Hospital, London & Salisbury Hospital Group
1952	Prolonged paralysis with suxamethonium first reported	Separately by J G Bourne (who also in this year reported low levels of pseudocholinesterase in these patients) and Evans et al

1952	Bryce-Smith laryngoscope blade produced	Dr Roger Bryce-Smith, Nuffield Department of Anaesthetics, Oxford. Also called the Oxford Infant Laryngoscope. It was for neonates (including those premature) and babies up to 3 months old. The C overhang prevents the lips from blocking the view and the flat surface below is wide enough to make it useful for a child with a wide cleft palate
1952	Bowen-Jackson laryngoscope blade produced	Drs Ronald A Bowen and Ian Jackson, St Bartholomew's Hospital, London. A long and mostly straight blade with a marked distal curve and a split distal end that straddled the epiglottis. It formed an angle of 100° with the handle
1953	Prolonged paralysis with suxamethonium first reported as being an inherited problem (see 1957)	A Forbat, H Lehmann & E Silk
1953	Acetaminophen first marketed as "paracetamol" (see 1877 & 1887)	Sterling-Winthrop Co (USA)
1953	Trimetaphan camphor sulphonate (Arfonad) introduced into clinical practice (see: Sternbach) (see 1948)	By Drs I W Magill, C F Scurr and J B Wyman (published in the *Lancet*). Introduced following research into the provision of pharmacologically controlled hypotension as opposed to that provided by controversially purposeful high spinal anaesthesia
1953	Cyclodextrins first patented for use in drug formulations (see 1891, 1903, 1935, 2001, 2005 & 2008)	K Freudenberg, F Cramer & H Plieningen in Germany
1953	Mast cells (themselves discovered by the German scientist Paul Ehrlich) shown to be source of histamine (see 1907, 1910, 1937, 1942 & 1943)	J F Riley & G B West, Great Britain. This was assisted by the discovery in 1949 of histamine-liberators by F C MacIntosh & W D M Paton
1953	Apgar score published (see 1949)	Virginia Apgar, Professor of Anaesthesiology, Columbia University in New York City
1953	"Supine hypotensive syndrome" of late pregnancy named thus (key words: postural supine hypotension) (see 1669, **1893**, 1932, 1942, 1950, **1960** & 1968)	Drs B K Howard, J H Goodson and W F Mengert, obstetricians in Texas, USA. The name arose when one woman presented with fainting/hypotension, was diagnosed with a ruptured uterus and underwent an emergency Caesarean section at which a normal baby and no maternal pathology was found. The following day, another woman presented similarly but refused to undergo Caesarean and found her symptoms were relieved by lying on her side instead of her back
1953	First successful use of extracorporeal membrane oxygenation (ECMO) (heart-lung machine) on a human (see 1925, 1951, 1957, 1969 & 1972)	Dr John Heysham Gibbon Jr. et al at Jefferson Medical College Hospital, Philadelphia. The first patient was an 11lb (5kg) 1 year old infant, in cardiac failure since birth, who was diagnosed incorrectly as having an atrial septal defect. The infant died on the operating table and was later discovered to have had a patent ductus arteriosus, which had not been diagnosed because of difficulty with cardiac catheterization. The second patient was an 18 year old girl who was seriously ill with a large atrial septal defect - this was an entirely successful event. This was also the first occasion where pervascular cooling was used to produce controlled hypothermia. The concept of ECMO had allegedly occurred to Dr Gibbon in 1931 (see 1925) when he was Surgical Fellow at Harvard and had been tasked to sit by and monitor a young woman suffering from a massive pulmonary embolus. He monitored her for 16 hours until she arrested. Despite an immediate thoracotomy & embolectomy, she died. Many years of experimentation on animals followed, interrupted for 5 years by WWII. Post-war, he received special help from IBM Corporation who donated the services of 5 of its engineers for free!
1953	First successful use of body surface cooling (hypothermia) for modern surgery in humans (see 1603, 1611, 1868, mid-1950s, 1956 & 1961)	Drs F John Lewis, Mansur Taufic, R L Varco & S Niazi, Northwestern University Medical School, Chicago. Initially used to close Atrial Septal Defects (ASDs). After the induction of general anaesthesia, they wrapped the patients in refrigeration blankets filled with anti-freeze solution at minus 4 degrees centigrade which, after about 3 hours of cooling, would render the patient's temperature to a desirable 30 degrees centigrade. Providing anaesthesia for surgical procedures using cold had, of course, been recognized even from the time of Hippocrates who reported using snow to cool limbs for amputation
1953	The "Seldinger technique" developed	Dr Sven Ivar Seldinger, Radiologist, Sweden. The technique was introduced to avoid significant trauma when accessing blood vessels with large bore cannulas. It involves the puncture of a vessel, or hollow organ, with a small bore needle (with or without a corresponding catheter/sheath), feeding a wire through the needle or sheath and then, using the wire as an in-situ directional guide for sequential dilation, a desired large bore cannula is introduced also over the wire without undue trauma to the vessel/organ. The technique revolutionized vascular access enabling the development of numerous, invasive vascular procedures
1953	The Atkinson block to produce akinesia of the orbicularis oculi muscle introduced	Dr W S Atkinson

1953	Echocardiography developed	Dr Inge Edler & physicist Carl Hellmuth Hertz at the Lund University, Sweden. Edler is known as the "Father of Echocardiography". He developed M-mode echocardiography, which he first used to assess mitral valve disease pre-operatively. It is interesting to note, firstly, that Lazzaro Spallanzani, in the 1700s, discovered that the echo reflection of ultrasound waves was used by bats to navigate and, secondly, it was not until much later, in 1880 when the Curies discovered piezoelectricity, that humans became able to create ultrasonic waves. It should be noted however that, in 1946, André Denier, a French physiotherapist, was the first person to propose using ultrasound to visualize human organs
1953	The first publication to mention the metabolism of inhalational anaesthetics in humans (Specific acknowledgement is made to a paper, *A Kuhnian Revolution in Anaesthetics* , by Dr David Zuck, a Past President of the History of Anaesthesia Society, discussing Kuhnian paradigm shifts in anaesthesia)	A monograph titled "*Trichlorethylene Anaesthesia*" by Gordon Ostlere. Although a study had been done in Oxford by Joan Powell in 1945, using dogs and later humans, had noted trichloroacetic acid in the blood after exposure to Trilene (now referred to as trichloroethylene), and was quoted in the journal *Anaesthesia* in 1950 by P J Helliwell & A M Hutton in their article also titled "*Trichlorethylene Anaesthesia* ", no one had previously addressed the possibility of volatile/inhalational anaesthetic agents being metabolized by the body. Perhaps this was because of a mis-assumption represented by the words of John Snow when talking about ether: "*An appearance is met that would be truly alarming, if we did not know that it was only due to an agent which is flying away every moment in the breath, to leave the patient, in a few minutes, without any permanent trace of its having been there* "
1953	The Diploma of Anaesthetics of a Fellow of the Faculty of Anaesthetists of the Royal College of Surgeons (F.F.A.R.C.S.) introduced	This was introduced to take over from the original diploma - its endowment required a 2 part examination, which subsequently became a 3 part examination in 1985. The College of Anaesthetists assumed responsibility for examinations in 1988, granting an F.C.A. In 1992 the College of Anaesthetists gained its Royal charter, hence F.R.C.A. This latter body converted the examination to a 2 part one (Primary & Final) in 1997
1953	The first officially dedicated Recovery Room established in Australia (see 1858 Snow, 1948, 1950 (x2) & 1957)	By Dr Norman Reynolds James at the Royal Melbourne Hospital
1953	The "Midget" Mark 1 portable anaesthetic machine produced	Medishield, the medical arm of Commonwealth Industrial Gases (CIG). The company eventually made Mark 2 and Mark 3 versions
1953	The Faculty of Anaesthetists of the Royal College of Surgeons (Ireland) founded	
1954	The Society of Anaesthetists of Hong Kong founded	Drs Zoltan Lett, H P L Ozorio and George Thomas
1954	Existence of opioid receptors first proposed	(Later Professor) Arnold Heyworth Beckett & Alan F Casy, from The Chelsea School of Pharmacy, Chelsea Polytechnic, London, in an article in the Journal of Pharmacology. Between then and 1995, numerous researchers identified the many different known types of opioid receptors
1954	The PCO_2 electrode for measurement in blood developed (carbon dioxide)	Richard W Stow and Barbara F Randall, physiologists at Ohio State University. This differed from an electrode described by Gesell, McGinty and Bean at the University of Michigan in 1926 that they developed to measure only gases, not liquids. Stow's electrode, which was the first 'membrane electrode' invented, had a rubber membrane that was permeable to CO_2 and that separated a wet pH and reference electrode from the blood. Dr John Wendell Severinghaus further developed Stow's electrode with a stabilizing bicarbonate solution. The development of this electrode made previous "bubble" methods, the Van Slyke interpolation methods (one of which includes using the Henderson-Hassellbach equation) and the Poul B Astrup method obsolete
1954	The O_2 electrode invented (oxygen)	Professor (of chemistry) Leland C Clark, Ohio. Having invented the bubble oxygenator for cardiac surgery, his paper was refused by a journal editor because there was no way of measuring the oxygen in the outflow - so Clark invented the electrode (also see 1962)
1954	Chlorhexidine introduced for skin antisepsis (see 1950 & 2000 also)	Imperial Chemical Industries (ICI)
1954	Oesophageal stethoscope first recorded as being used during anaesthesia (see 1893 & 1896)	Dr Code Smith at the Hospital for Sick Children, Toronto
1954	Prototype for "Ambu Bag" invented with sprung bicycle spokes to aid automatic re-expansion (key word: CPR)	Dr Henning Ruben, anaesthetist in Denmark. This was refined with the help of Dr Holger Hesse (Testa-Laboratorium (later Ambu)) and marketed in 1957 as the *Ambu Resuscitator.* Ruben, with the help of a model-making Red Cross member, produced a manikin with a tilting plaster head and "lungs" to demonstrate the correct use of his bag

1954	Mapleson's classification of semi-closed anaesthetic circuits introduced	Professor William W Mapleson, Cardiff, Wales (see 1961)
1954	Cross-circulation technique first used (key word ECMO)	Professor Clarence Walton Lillehei, University of Minnesota. This involved using adults volunteering to act as live cardiopulmonary bypass machines during the repair of some congenital heart defects (see Gibbon 1953)
1954	First human kidney transplant from a living donor (see 1950)	Dr Joseph Murray et al at the Peter Bent Brigham Hospital in Boston. Richard Herrick was the recipient and the donor was his identical twin brother Ronald. Dr Murray received the Nobel Prize in 1990
1954	"Polio" laryngoscope blade produced	Foregger Company of New York. The Macintosh-type blade on this instrument came off the handle at a 135° angle. It was specifically introduced for polio victims confined to an iron lung
1954	Gould laryngoscope blade produced	This was a modified Soper blade manufactured by Medical Pneumatics Ltd in London
1954	Warfarin approved for human use & marketed as "Coumadin"	An involved story starting in the 1920s with "sweet clover disease" in Canada & northern USA when cattle were dying of a haemorrhagic disease after eating mouldy clover hay. In the early 1930s, Karl Paul Link began analysing a milk can of non-clotting blood brought to him at the University of Wisconsin by a distraught farmer. In 1940, Link & H A Campbell isolated only a small amount of coumarin from the clover, which oxidised in mouldy hay to an active anticoagulant, dicoumarol. Biochemistry Professor Mark Stahmann managed to produce dicoumarol on a large scale with work funded & patented by the **W**isconsin **A**lumni **R**esearch **F**oundation. In 1948, Link produced 150 variations of coum**arin** as a rodenticide - he chose #42 as the most potent and named it "warfarin". (NB: coumarin is responsible for the sweet smell of freshly cut hay)
1954	The Japanese Society of Anesthesiologists (JSA) formed	Under the auspices of the Department of Anesthesiology of the University of Tokyo School of Medicine
1955	Mortality reports of early experience with thiopentone (Pentothal) in shocked patients (particularly in the hands of inexperienced anaesthetists)	Dr Henry Knowles Beecher (né Unangst), an anesthesiologist and pharmacologist at Massachusetts General Hospital, in his chapter, titled "Anaesthesia for men wounded in battle" in an official war account titled "Surgery in World War 2". He himself had served in the war but was reporting on barbiturate anaesthesia mortality in North African campaigns and Pearl Harbor victims. His analysis revealed a mortality of 1 in 450 cases. The Mayo Clinic subsequently issued a "how to" paper. Beecher is also responsible for introducing the concept of the "placebo effect" and placebo-controlled trials.
1955	Bird Universal Medical Respirator (known as the Bird Mark 7 Respirator) released.	Forrest M Bird - an American inventor, biomedical engineer and renowned aviator. He has received numerous medals and awards over the years for his many contributions. This was the first ventilator that was powered entirely by gas. The first of its six prototypes was partially made from biscuit tins and a doorknob
1955	Oxford endotracheal tubes developed	A Alsop et al in the Nuffield Department of Anaesthetics, Oxford University. These tubes were made of red rubber and incorporated a right angle specifically designed to reduce the incidence of kinking, especially during head and neck surgery
1955	Beaver laryngoscope introduced	R Atwood Beaver of the Anaesthetic Department at The National Hospital for Neurology & Neurosurgery, Queen Square and the London Chest Hospital. This was another laryngoscope introduced specifically for use on polio patients confined to an iron lung ventilator. The blade came off the handle at a 155° angle. Manufactured by the instrument maker A Charles King
1955	World Federation of Societies of Anaesthesiologists (WFSA) founded	During first World Congress of Anaesthesiologists, at Scheveningen, The Netherlands with 26 founding Societies and 16 "observers". By 2020, there were 136 Societies, from 150 countries, as members. Earliest movement for an 'International Society of Anaesthesiologists' came from Dr Marcel Thalheimer, the Treasurer of the Société Française d'Anesthésie et d'Analgésie in 1951, with preliminary work having been done by a committee comprising representation from Belgium, Denmark, Norway, Sweden, United Kingdom, Holland, Italy, Switzerland and Argentina. Proposal eventually modified to become a Federation of National Societies with an international Executive Council. During the International Congress of Anaesthetists in Paris in 1951, a committee to establish this World Federation was set up, comprising: Drs J Gillies (Scotland), H Griffith (Canada), T Gordh (Sweden), A Goldblat (Belgium) and P Huguenard (France). The Australian Society was a Foundation Member

1955	Povidone-Iodine first sold (polyvinylpyrrolidone with 10% elemental iodine)	Industrial Toxicology Laboratories in Philadelphia by Shelanski & Shelanski
1955	Chlordiazepoxide (Librium) - first benzodiazepine - discovered by accident during work on chemical dyes (quinazolone-3-oxides) (see 1957)	Leo Sternbach (at Hoffmann-LaRoche, the company where he worked for a total of 60 years, retiring in 2000 at the age of 92). He had already synthesized Biotin and Arfonad (trimetaphan - see 1953). He was responsible for 240 patents. (see 1957, 1959, 1960 & 1963)
1955	Insulin amino acid sequence determined (see 100, 1889, 1909, 1921 & 1926)	F Sanger
1955	Pralidoxime discovered	Irwin B Wilson & S Ginsburg. It was a "designer drug" developed as a cholinesterase reactivator for use as an antidote in cases of organophosphate and nerve gas poisoning. It acts on both muscarinic and nicotinic systems but, because it works slowly and has poor penetration of the central nervous system, it was found to work better with the adjunct of atropine
1955	Sodium nitroprusside (SNP) introduced into clinical practice (key word: hypotension)	I H Page, A C Corcoran, H P Dustan and T Koppanyi
1955	Boyle's machine, originally designed with a simple glass top, was re-designed with a storage drawer added under the top of the table	Dr J A McNeilly & Mr Young, Belfast. A pin-index system for attaching specific gas cylinders was also added separately this same year
1955	Percutaneous tracheostomy developed (see 3600 BC, 2000 BC, 1546, 1620, 1625, 1909, & 1985)	Dr C Hunter Shelden (neurosurgeon) et al (USA)
1955	Insulated nerve stimulation needle developed	R B Pearson. This enabled more precise location of a nerve
1956	First successful Western human external cardiac defibrillation (key word: CPR)	While a lot of research on external human defibrillation occurred in the early 1950s, particularly by V Eskin and A Klimov in the USSR, the first Western successful use took place by Dr Paul Maurice Zoll, a cardiologist in Boston. Zoll also helped pioneer emergency cardiac pacing. He founded the present Zoll Medical Company
1955	Ultrasound first used for gynaecological diagnosis	Professor Ian Donald, Glasgow. He used it for "finding flaws in women" after his naval experience where it had been used to find flaws in the metal hulls of ships
1956	Methohexitone produced	Lilly Research Laboratories
1956	Halothane first used clinically (see 1951)	Dr Michael Johnstone, Manchester Royal Infirmary, after James Raventos (ICI Pharmacologist) gave him samples. After Johnstone wrote an evaluation of halothane in the British Journal of Anaesthesia in 1956, ICI sent every British anaesthetist a sample of the drug
1956	The first specific halothane (Fluothane) vaporizer, Fluotec Mark I, developed	Cyprane Ltd (after cyclopropane). This was a company in England, set up by William Edmondson & Wilfred Jones (both ex-Coxeter), that had already produced the first temperature compensated vaporizer (for Trilene). The Fluotec Mark I was developed after a request from Drs Johnstone & Brennan from Manchester for the provision of accurate concentrations following several disasters in the world where existing vaporizers had been used. Mr Fraser Sweatman (in U.K.) devised the Fluotec vaporizer with temperature compensation. This had been preceded in the U.S. by the F-N-S vaporizer (which lacked temperature compensation) devised in 1956 by engineer Mr George Newton. In 1958, all Mark I vaporizers were recalled to fix a sticky valve problem and were then released as Mark II vaporizers
1956	Variants of pseudocholinesterase (butyrylcholinesterase) discovered (see 1943, 1952 and 1953)	Werner Kalow, scientist, University of Toronto
1956	Cyclic AMP (adenosine monophosphate) discovered	Earl Wilbur Sutherland, American pharmacologist & physiologist. He received the Nobel Prize for Physiology or Medicine in 1971 for his work on the mechanisms of hormones
1956	Grading of therapeutic hypothermia defined (see 1603, 1611, 1868, 1953 & 1961)	Dr E J Delorme, Department of Surgery, University of Edinburgh: Light (30-35^{o}C) for hyperpyrexias; Intermediate (25-28^{o}C) permitting up to 13 minutes of surgery with anaesthesia & muscle relaxants; Deep (15-20^{o}C) and (after Dr Charles E Drew) Profound (4-6^{o}C) permitting cardiac surgery
1956	Siker laryngoscope blade produced	E S Siker. This had a mirror placed in the middle of the blade, at which point the blade angled at 135°. Copper casing around the mirror enabled it to reach body heat quickly and avoid fogging. The mirror drew some criticism as it produced an inverse image of the larynx making intubation just that touch more difficult. Manufactured by the Foregger Company
1956	Wright's Peak Flow Meter developed (introduced into practice in 1959)	Dr Basil Martin Wright, Britain, working as an experimental pathologist with dust-induced chest diseases
1957	Bupivacaine synthesized (see 1965)	Bo Thuresson af Ekenstam in Sweden

1957	Mepivacaine (Carbocaine) synthesized	Bo Thuresson af Ekenstam & Börje Per Harald Egnér in Sweden and patented in the USA. First used clinically by Dhunér in the same year
1957	Chlordiazepoxide (Librium) - clinical effects recognized (see 1955)	Lowell O Randall as member of Leo Sternbach's team (Hoffmann-LaRoche)
1957	Bolam principle in English Tort Law - a doctor "is not guilty of negligence if he has acted in accordance with a practice accepted as proper by a responsible body of medical men skilled in that particular art." Judge J McNair; additional description given by the House of Lords case where Lord Scarman in 1985 in Sidaway v Governors of Bethlem Royal Hospital - "The Bolam principle may be formulated as a rule that a doctor is not negligent if he acts in accordance with a practice accepted at the time as proper by responsible body of medical opinion even though other doctors adopt a different practice. In short, the law imposes the duty of care: but the standard of care is a matter of medical judgment." (see 1992 Rogers v Whitaker)	Bolam v Friern Hospital Management Committee - Mr Bolam was a patient in a mental institution & received ECT without muscle relaxants or restraints resulting in significant skeletal fractures
1957	Glucagon amino acid sequence determined	W W Bromer et al
1957	First heart-lung machine in Australia (used successfully on a small child for a "hole in the heart") (see 1925, 1951 & 1953)	Built by Dr Jeanne Collison (anaesthetist) at the Alfred Hospital in Melbourne following experience at the Mayo Clinic. That same year she set up the cardiopulmonary bypass department at the Royal Prince Alfred Hospital in Sydney, again using makeshift materials (see Ebsary 1959)
1957	The first hospital centrally-stored piped oxygen supply system designed (see 1948, 1950 (x2) & 1953)	By Dr Norman Reynolds James at the Royal Melbourne Hospital. Its installation was also supervised by him
1957	"Dibucaine Number" test introduced to analyse inherited atypical pseudocholinesterase (see 1911, 1929 & 1953)	Werner Kalow, Genest et al, Department of Pharmacology at the University of Toronto
1957	Concept of "nothria" (classical Greek = torpor or sluggishness) suggested to measure depth of anaesthesia (see also 1846)	Dr P D Woodbridge et al. It was based on mental & motor inactivity plus insensibility looking at 4 components of anaesthesia: sensory blockade; motor blockade; autonomic reflex blockade; and loss of consciousness. The concept was to describe the whole process from pre- to intra- to post-anaesthesia. Had the term "nothria" caught on, it would have replaced the word 'anaesthesia', as intended, and anaesthetists would now be known as "nothrotists". In modern Greek, however, "nothria" means stupidity or dullness and in classical Greek it was discovered that it could also describe post-coital languor. Understandably, "nothria" failed to catch on!
1957	Seward laryngoscope blade produced	E H Seward. This was initially produced as an adjunct to the resuscitation of the newborn but later extra sizes were added to cater for ages up to 5 years. Said to be useful with naso-tracheal intubations as it allows easy access of Magill's forceps due to a low-profile flange
1958	Toxiferine (and other alkaloids) isolated from Calabash curare (see 1958 & 1961)	Karrer & Schmid in Zurich
1958	Toxiferine investigated for clinical use (see 1958 & 1961)	Waser & Dr Harbeck in Zurich
1958	The first neuromuscular monitor devised (see 1970)	This was the St Thomas' Hospital Nerve Stimulator devised by anaesthetists T H Christie and Harry Cunningham Churchill-Davidson. It allowed for the assessment of prolonged apnoea following the use of muscle relaxant drugs
1958	Development of first intravenous beta-adrenoceptor blocker drug - propranolol (Inderal)	Sir James Whyte Black while working for ICI Pharmaceuticals. He was awarded the Nobel Prize for Physiology or Medicine in 1988 for his development of propranolol. He had already shared the Albert Lasker Award for Clinical Medical Research with Raymond Ahlquist for their work on adrenoceptors (see 1958). He was also responsible for the development of cimetidine while working for Smith, Kline & French. From personal communication from Mr David Graham, a former long-serving employee of ICI, actually the first beta-adrenoceptor blocker was pronethanol (Alderlin)but this only came as an oral form and was withdrawn after a host of precautions and contraindications
1958	Haloperidol synthesized	Jannsen Pharmaceutica, Belgium
1958	The implantable cardiac pacemaker invented (see 1921 & 1951)	Dr Wilson Greatbatch, a prolific inventor. Like many great inventions, this was discovered accidentally when he replicated a human heart pulse after plugging the wrong transistor into an electronic circuit he had designed to record the sound of a heartbeat. He licensed his discovery to Medtronic Inc. and the first device was implanted into a human in 1960
1958	Bizzari-Giuffrida laryngoscope blade produced	Drs Dante V Bizzari & Joseph G Giuffrida, New York. This was basically a Macintosh blade without the proximal flange in order to avoid pressure on the upper teeth

1958	The Bodok seal introduced	This is a washer/seal used to obtain a gas-tight seal for a cylinder attaching to the yoke on an anaesthetic machine. It replaced fibre seals that frayed and expanded under gas pressure. It is made of neoprene and is encircled by a ring of brass or aluminium that prevents expansion of the washer. It was first produced by British Oxygen Company (B.O.C.)
1958	Ultrasound first used for musculoskeletal diagnosis	Karl T Dussik (see 1942)
1959	Fentanyl synthesized (see 1970)	Dr Paul Jannsen - Jannsen Pharmaceutica
1959	Diazepam (Valium) synthesized (see 1960 & 1963)	Leo Sternbach (Hoffmann-LaRoche)
1959	Prilocaine (Citanest) synthesized	Nils Löfgren & C Tegner. First used clinically by S Wielding in 1960
1959	Methoxyflurane produced (see 1948 & 1960)	Abbott Laboratories
1959	Introduction of disposable plastic endotracheal tubes	David S Sheridan (born: Sockolof) in New York. He achieved this by producing a machine capable of extruding plastic tubes with accurate dimensions. Forbes magazine dubbed him the "Catheter King" as he also developed cardiac catheters, Saratoga sump drains and Salem stomach sump drains among others. He left school after 8th Grade and worked in the family wooden flooring business for 11 years before embarking on his ultimate career throughout which he became a pioneer, innovator (with 50 patents) and philanthropist for all of which he was officially honoured by the American Society of Anesthesiologists in 1993 (see next 2 entries)
1959	Line measurement markings introduced for endotracheal tubes	David S Sheridan (see previous and following entry)
1959	Radiopaque paint strip introduced for catheters and endotracheal tubes	David S Sheridan after developing modern disposable rubber urethral catheters (see previous 2 entries)
1959	Bryce-Smith double-lumen endobronchial tube introduced (see 1960)	Dr Roger Bryce-Smith, Nuffield Department of Anaesthetics, Oxford
1959	Ciutiis laryngoscope blade produced	Dr Vincent L de Ciutiis, New York Medical College. This was a modified Macintosh-type blade that had a very wide blade enabling good compression of the tongue
1959	Hyperventilation, producing hypocapnoea, proposed as an essential feature of what became known as "The Liverpool Technique" (aka: "balanced anaesthesia", i.e. to accompany the combined use of N_2O, O_2, opiate and muscle relaxant)	Professor Thomas Cecil Gray & Dr Ian C Geddes, Department of Anaesthesia in the University of Liverpool, England, writing in the *Lancet*
1959	First formally manufactured heart-lung bypass machine (ECMO) in Australia	Vivian Richard Ebsary (see mid-1950s & 1971) at his Ebsray Pumps Pty Ltd (purposefully altered spelling). After observing the death of a child with a VSD (mis-diagnosed as an ASD) during necessarily short hypothermia surgery, Ebsary and Sir Adolph (born Abraham) Basser C.B.E. (optician, jeweller, horse racing identity & philanthropist) sponsored a trip to USA heart hospitals by Dr Douglas Cohen (cardiac surgeon) and Dr Victor Hercus (anaesthetist) from the Royal Alexandra Hospital for Children, Sydney, to learn the requirements for such a machine. Ebsary became the perfusionist (see Collison 1957)
1959	First report of tracheal intubation using transillumination of the neck	Drs H Yamamura, T Yamamoto & M Kamiyama, Japan. They used a lighted stylet (lightwand) during a blind nasal intubation. In 1957, Drs R Macintosh & H Richards had reported using an 18 inch long lighted stylet but only to aid direct laryngoscopic view rather than for transillumination of the neck
1950s	Anaesthetists become involved in giving anaesthetics for electroconvulsive therapy (ECT)	Convulsive therapy, introduced to treat psychiatric conditions such as depression, mania, catatonia and schizophrenia, began in 1933 when Manfred J Sakel started using insulin coma therapy – an innately dangerous procedure. Joseph L von Meduna followed this with pharmacological agents in 1935 using, at first, camphor and then pentylenetetrazole (known as Cardiazol and Metrazol). In 1936, Antonio E Moniz introduced irreversible pre-frontal leucotomy (lobotomy). Electroconvulsive therapy was introduced by Italian psychiatrist and neurologist, Ugo Cerletti (1867-1963) and his pupil Lucio Bini (1908-1964) with their "*Aparato para el ELECTROSHOCK"* in 1938. It was not until the early 1950s, however, that anaesthetists became involved in ECT. They did because of the desire to minimize trauma arising from the convulsions (torn muscles and fractured bones) by the use of small doses of muscle relaxant – particularly suxamethonium – prior to the shock being delivered. Sedation itself was not thought to be essential because the electric shock introduces temporary amnesia.

mid-1950s	First complete hypothermia machine built in Australia (see 1953)	Vivian Richard Ebsary (see 1959 & 1971), biomedical engineer & philanthropist through his company Ebsray Pumps Pty Ltd (purposefully altered spelling). This followed a request from Dr (later The Honourable) Moses (Moss) Henry Cass of the Royal Children's Hospital, Melbourne, together with Dr Alan Harper of the CSIRO Department of Physics based in Sydney. It pumped water through a rubber blanket, provided by Dunlop Rubber, to cool patients so that open heart surgery (only ASD's) and some neurosurgery could be performed in the time allowed (10 minutes) and then to re-warm. The machine was used initially at St Vincent's Hospital, Sydney then the Royal Alexandra Hospital for Children at Camperdown and also the Royal North Shore Hospital
late 1950s	The beginnings of Paediatric Intensive Care	Liverpool Hospital, England. Two Registrars, Drs Nisbet & Wilson, under the guidance of Dr Gordon Jackson-Rees. They trained nurses and medical students to manually ventilate babies and older children, on a 24 hour rostered basis, using the Jackson-Rees modification of the Ayre's T-piece
1960	The Bryce-Smith & Salt (see 1959) and also the White double lumen endobronchial tubes developed (separately)	Dr Roger Bryce-Smith & Richard H Salt (Senior Chief Technician) were from the Nuffield Department of Anaesthetics at Oxford. Dr G Malcolm J White was from Poole Hospital, Middlesbrough, North Yorkshire and produced a left-sided tube with a carinal hook
1960	Kleinsasser laryngoscope for microsurgery of the larynx produced	A suspension laryngoscope designed by Dr (later Professor at Marburg University) Oskar Kleinsasser, ENT surgeon, while in Cologne. Manufactured by Karl Storz Endoscopy Ltd, Tuttlingen, Germany. This laryngoscope had a blade that would split laterally into two parts by turning a screw, thus allowing a gap in the middle providing access for surgical instruments or tracheal intubation
1960	The New South Wales Special Committee Investigating Deaths Under Anaesthesia (SCIDUA) founded - the first such organization in the world	Dr (later Professor) Ross Beresford Holland was the prime mover in its establishment. Submissions to this committee, its deliberations and its subsequent findings/recommendations to its contributors have "legal privilege". In 2015, Professor Holland was awarded an Order of Australia honour (AM) for his numerous contributions to anaesthesia - particularly its safety for patients
1960	Chlordiazepoxide (Librium) marketed (see 1955 & 1957)	Hoffmann-LaRoche
1960	Diazepam (Valium) approved for use (see 1959 & 1963)	Leo Sternbach (Hoffmann-LaRoche)
1960	Methoxyflurane (Penthrane) 1st used clinically (see 1948 & 1959)	Dr Joseph F Artusio, New York
1960	Discovery of neuromuscular blocking activity of aminosteroid "malouetine" from Malouetia bequaertiana Woodson	André Quevauviller & Francoise Lainé (University of Paris Faculty of Pharmacy)
1960	Research on aminosteroid neuromuscular blockers started	Alauddin (pharmacist) & Michael Martin-Smith (medicinal chemist)
1960	The first case to actually trigger investigations into malignant hyperthermia	A 21 year old man, Ronald Evans, was hit by a car outside Royal Melbourne Hospital, Australia, and suffered a fractured tibia and fibula. The anaesthetist, Dr James Villiers, and the surgeon, Dr Kingsley Mills, urgently and seriously noted the family history of 11 relatives of the patient who had died under anaesthesia. Thinking the cause was probably ether, Dr Villiers used the then "new" halothane but had to terminate its use during the procedure due to complications and had to apply ice packs and ensure oxygenation in the Recovery room. The patient survived and Villiers referred the case to the Melbourne University Professor of Medicine whose new research assistant, Dr Michael Antony Denborough, was commissioned to investigate. The latter coined the term "malignant hyperpyrexia" in a letter to the Lancet in 1960 and in 1962 he co-published an article in the British Journal of Anaesthesia titled "Anaesthetic Deaths in a Family". His subsequent years of research at both Melbourne University and Curtin School of Medical Research in Canberra led to the understanding of the calcium channel involvement in the process. In 1992, David H MacLennan at the University of Toronto, identified the gene, RYR1, governing the underlying calcium-release mechanism
1960	Epidural blood patch introduced	Dr J B Gormley

1960	First patient manikin produced - "Resusci-Anne" aka "Resusci-Annie" aka "Rescue Anne" (key word: CPR)	Åsmund Sigurd Laerdal, then a toy maker, now a manufacturer of medical devices, in Norway at the request of Drs James Otis Elam and Peter Safar, Baltimore and a Norwegian anaesthesiologist, Bjørn Lind (who had heard Safar present at the 5th Scandinavian Society of Anaesthesiology). In 1959 Elam wrote a book titled *Rescue Breathing* instructing the public on mouth-to-mouth resuscitation following his and Safar's research in this field but, to enable the public to practise the technique in the absence of critically ill patients, they enlisted Laerdal to make a "doll" with real-life characteristics - Resusci-Anne was the result. Her face was/is based on the death mask of an unknown woman, *L'Inconnue de la Seine,* who had drowned in the Seine at Le Quai du Louvre in the 1880's
1960	Naloxone (Narcan) synthesized (see 1914 & 1942)	Jack Fishman working in a private laboratory owned by Mozes J Lewenstein. The latter was also the head of Endo Laboratories in New York. For this, Fishman received the Jack Scott Award of the American Society for Pharmacology and Experimental Therapeutics in 1982
1960	Pope laryngoscope blade produced	E S Pope. This was a left-handed Macintosh-type blade to cater for left-handed anaesthetists or for cases involving right-sided pharyngeal lesions. Manufactured by Longworth Scientific Company Ltd
1960	The Blease-Manley ventilator produced	Dr Roger E W Manley in concert with Mr John Blease (refer). Manley was a Senior House Officer at Westminster Hospital. This device had 2 bellows and was produced by Blease's Anaesthetic Equipment Manufacturing Co. Ltd., London. It became an extremely widely used piece of equipment
1960	Recommendation to anaesthetists that lateral tilt to the left should be employed to avoid/relieve postural supine hypotension in late pregnancy and during Caesarean section (key words: postural supine hypotension) (see 1669, **1893**, 1932, 1942, 1950, 1953 & 1968)	Dr Frank Holmes, anaesthetist in Edinburgh, in a paper published in *Anaesthesia* , titled "The Supine Hypotensive Syndrome. Its Importance to the Anaesthetist"
1960	Carbon dioxide shown to have 4.4 times the anaesthetic potency of nitrous oxide (see 1824)	Five youthful anesthesiologists at the University of California, including the renowned John Wendell Severinghaus, during experiments on themselves. Severinghaus suffered recurrent schizoid-like episodes for up to 6 months afterwards, offering as a reason his introduction of the antihistamine, meclozine, (in order to prevent nausea from the nitrous oxide part of the experiments) into his personal trials
1960-1971	Enflurane, Isoflurane, Sevoflurane and Desflurane synthesized & developed (see 1973, 1980, 1990 & 1994)	Louise Speers Croix & Ross C Terrell - senior chemists at Ohio Medical Products
1961	Alcuronium (diallyl-nor-toxiferine) introduced clinically (see 1844 & 1958)	R Frey and R Seeger. Semi-synthetic agent obtained from *Strychnos toxifera* by Roche Laboratories
1961	The first fluorinated volatile anaesthetic agent, fluroxene (Fluoromar) (trifluoroethyl vinyl ether) introduced into clinical practice	Developed by Julius Shukys in 1951. First used on a human when John C Krantz (Professor of Pharmacology University of Maryland) anaesthetized Dr M Sadove in 1953. Krantz had requested a fluorinated version of the chemical be produced specifically to reduce its flammability. Several trials started in 1954. Gained FDA approval in 1956
1961	Entonox introduced into clinical practice	Developed by Dr Michael E Tunstall, at Aberdeen University, and mass-produced by the British Oxygen Company (BOC). Production of Entonox is based on the "Poynting Effect". Tunstall had a great interest in labour pain and had also experimented with maternally administered methoxyflurane. Perhaps he had an affinity for mums and bubs because he was born in a bucket in Assam, India (see 1977)
1961	Metoclopramide discovered	Société d'Études Scientifiques et Industrielles de l'Ile de France
1961	Amiodarone developed - initially as treatment for angina	Labaz Group, a pharmaceutical company in Belgium which was sold to Elf Aquitaine, a subsidiary of Sanofi, in 1973. Amiodarone development followed work by Russian physiologist, Gleb von Anrep (son of Vasili), on its precursor, khellin (an extract from the Khella plant of Africa), that he discovered had anti-angina effects. Dr Bramah Singh at Oxford University later showed that Amiodarone also had antiarrhythmic effects and, with this in mind, Dr Mauricio B Rosenbaum in 1976 in Argentina, proved it worked for both supraventricular and ventricular arrhythmias
1961	Ibuprofen developed and patented	Discovered by Andrew Dunlop et al (working at Boots Group). In 1987, Dunlop received the Order of the British Empire (OBE) & the Boots company received the Queen's Award for Technical Achievement as a result of this work

1961	Sellick's manoeuvre (cricoid pressure) described (see 1774, 1848, 1850 & 1853)	Dr Brian Arthur Sellick in the Lancet after experiments in which he used cadavers positioned in steep Trendelenburg tilt after filling their stomachs with water. He admitted at the time that it was not an original idea
1961	Droperidol discovered	Jannsen Pharmaceutica, Belgium
1961	Mapleson's classification of ventilators	Professor William W Mapleson, Cardiff, Wales (see 1954)
1961	Modern paediatric anaesthetic masks developed (Rendell-Baker/Soucek masks)	Professor Leslie Rendell-Baker (British anaesthetist who emigrated to USA) & Dr Donald H Soucek (American dental surgeon). These masks were designed to fit the contours of children's faces by using several materials to make moulds through to the finished latex product. Starting with anaesthetized and intubated children, an initial alginate face mould was made and then dental Plaster of Paris, dental stone and red wax were all used in stages to help arrive at the correct shape for the latex
1961	Onkst laryngoscope blade produced	The proximal part of this Macintosh-type blade was designed to collapse (spring-loaded) if pressed against prominent teeth
1961	First blood-warmer devised for massive transfusion (see 1603, 1611, 1868, 1953 & 1956)	Drs C Paul Boyan and William S Howland, Memorial Sloan-Kettering Cancer Centre, New York, after measuring changes in oesophageal temperature during massive blood transfusion with cold blood. This device consisted of 24 feet of coiled tubing, 4.5mm in diameter, inserted into the infusion line and immersed in a 20 litre water bath where the temperature was maintained at 37 degrees Celsius by the repeated addition of warm water
1962	Ketamine developed but gained FDA approval in 1970 and thereafter first used as an approved anaesthetic agent on American soldiers in Vietnam	Variously reported as being synthesized/discovered/developed by scientist Calvin Stevens of Parke-Davis and/or by Dr Craig Newlands of Wayne State University, Detroit, Michigan. To add credence to the Parke-Davis claim a Parke-Davis scientist (Harold Maddox) discovered the organic "Grignard" reaction that enabled ketamine to be derived from phencyclidine
1962	Tramadol invented (see 1980s & 1998)	German pharmaceutical company - Grünenthal GmbH
1962	Frank L Robertshaw designed and described his versions of double-lumen endobronchial tube (see 1978)	Manufactured by Leyland & Birmingham Rubber Co., England. The range consisted of both left and right sided tubes and came in 3 sizes (see 1889)
1962	First one-piece plastic intravenous cannula (see 1940, 1945 &1950)	Produced by German pharmaceutical company, B Braun Melsungen AG. Company named after Bernhard Braun who took over the company from his pharmacist father, Julius. The cannula was originally called the "Braunule" but, after importation into England by Armour Pharmaceutical Co, it became known as the "Braunula"
1962	The "Lucy Baldwin" apparatus for analgesia during labour introduced (see 1933)	Named after a hospital benefactor, this provided a mixture of nitrous oxide and oxygen with a calibrated lever that enabled choice of inspired oxygen levels from 100% down to a minimum of 30%
1962	Robertshaw laryngoscope blade produced	Dr Frank L Robertshaw. This catered for infants and children. It has a gentle curve over the distal third and lifts the epiglottis indirectly like the MacIntosh blade
1962	Snow laryngoscope blade produced	Dr John C Snow, Boston, Massachusetts. This was like a Miller blade but with a curved flange 2.5cm from the tip and a modified C-shaped groove *à la* Jackson-Wisconsin. It was designed to reduce trauma during intubation. Manufactured by Foregger Company
1962	The first glucose biosensor developed	Professor Leland C Clark and Champ Lyons in Alabama. The basis of this invention came from Clark's invention of the oxygen electrode (see 1954)
1962	First Professorial Chair in Anaesthetics in Australia founded	Endowed by Lord Nuffield (William Morris of the British car fame) (see 1937). Douglas Joseph was the Foundation Professor based at Sydney University
1962	Portable nerve stimulator devised	G M Greenblatt & J S Denson. This was a transistorized device with pulsed & variable output
1962	First European Congress of Anaesthesiology held	Vienna, Austria
1962	First formal guidelines established for intensive care units (ICU) (then called respiratory units) (see 1952)	These were drawn up during a symposium on respiratory units at the First European Congress on Anaesthesiology, which was held in Vienna. Suggestions included that units should be: established in major hospitals (so other disciplines could be involved in treatment when required); 10 beds per million population; no more than 100 miles apart for transport purposes; staffed by specially trained nurses and doctors; staffed 24 hours

1962	The Apgar score became an acronym (see 1949 & 1953)	This was done by paediatrician Dr Joseph Butterfield in Denver when teaching students: **A**ppearance (colour), **P**ulse (heart rate), **G**rimace (reflexes), **A**ctivity (muscle tone) & **R**espiration (respiratory effort)
1963	Diazepam (Valium) marketed (see 1959)	Hoffmann-LaRoche
1963	Naltrexone synthesized	Endo Laboratories, Long Island, New York. This company was later bought by Dupont but it took Government encouragement and finance to promote the drug's development, clinical trials and application. The FDA approved its use for heroin addiction in 1984. Dr Joseph Volpicelli, of the University of Pennsylvania, recognized its usefulness in alcohol addiction in 1981
1963	Concept of Minimum Alveolar Concentration (MAC) defined	Drs Edmond Eger & Giles Merkel - in animal (dog) studies comparing two agents (extended to halothane in man in 1964 - E (Ted) Eger, L Saidman & B Brandstater). It was introduced as the standard measure of potency for volatile anaesthetic agents and was defined as the minimum alveolar concentration (or partial pressure), at sea level, needed to stop 50% of people moving in response to a noxious stimulus (originally a tibial compression screw) (also see 1971)
1963	First prototype of a multi-medication pump produced (see 1963, 1973, 1981 & 2002)	Dr Arnold Kadish, Los Angeles. This delivered both glucagon and insulin but was rather cumbersome because it resembled a military backpack
1963	First ambulatory medication infusion pump marketed (see 1963, 1973, 1981 & 2002)	The United States Catheter & Instrument Corporation (USCI) Chrono-Fusor, developed by E Watkins et al. Described as being chronometric, it was mainly used for continuous infusion of 5-Fluorouracil in cancer patients. It was powered by a wind-up watch motor and pumped the infusion in by rotary peristalsis
1963	First human lung transplant (see 1981)	Dr James Hardy of University of Mississippi. Patient received single lung and survived only 18 days
1963	First human liver transplant	Dr Thomas Starzl at the Veterans Administration Hospital in Denver. The anaesthetist was Dr (later Professor) Jorge Antonio Aldrete (vide). First short term success (1 year survival) by this University of Colorado team did not occur until 1967
1964	Subclavian "perivascular" technique of brachial plexus nerve block introduced	A P Winnie & V J Collins
1964	Metoclopramide marketed	Société d'Études Scientifiques et Industrielles de l'Ile de France
1964	Propanidid first used	Drs Howard et al at Royal Free Hospital in Hampstead also Drs J W Dundee & R S J Clarke Department of Anaesthetics The Queen's University of Belfast Northern Ireland
1964	Etomidate discovered	Janssen Pharmaceutica in Belgium
1964	Pancuronium synthesized	David Savage (Medicinal Chemist), Colin Hewitt (Director of Research) & W Roger Buckett (Head of Pharmacology) Organon in Newhouse, Scotland
1964	Temazepam synthesized (see 1969)	
1964	First H_2-receptor antagonist developed - cimetidine	Sir James Whyte Black et al at Smith, Kline & French. Development took 12 years and it was first marketed in 1976 in England as Tagamet
1964	Report of one of the most deadly operating room explosions of anaesthetic gases ever to have occurred (see also 2009)	Report by Carl W Walter, Clinical Professor of Surgery at Harvard Medical School and Chairman of the Committee on Hospitals of the National Fire Protection Association (NFPA). This involved an explosion and fire originating from a cylinder of cyclopropane (which had been partially filled with oxygen) and subsequently involving other cylinders (cyclopropane, nitrous oxide & oxygen) as well as bottles of ether. Two children were being operated on in the one theatre at the same time. Both patients, the two anesthesiologists and two surgeons died; a third surgeon needed an arm amputated; two nurses each lost a leg; two other nurses were severely injured but did not lose limbs.
1964	The Association of Veterinary Anaesthetists founded	
1965	Nitrazepam (Mogadon) introduced for clinical use	Previously developed by Leo Sternbach et al (Hoffmann-LaRoche)
1965	Bupivacaine marketed	AstraZeneca, having been first used clinically by G B Widman & Leo Telivuo in Sweden
1965	Factor VIII concentrates available for haemophiliacs	
1965	The term "dissociative anaesthesia" introduced to describe the effects of ketamine (see 1962)	Drs Guenter Corssen, Edward Felix Domino & P Chodoff (USA)

1965	Disposable latex surgical gloves first introduced (see 1894 & 1980s)	These were the Gammex range (pre-packaged and gamma sterilized - a process developed by Brian Ansell) produced by the Ansell Rubber Company Pty Ltd, Australia, which had already been manufacturing re-usable surgical gloves since 1941
1965	The Ether Dome in Massachusetts General Hospital declared a Registered National Historic Landmark	
1965	First use of bubble oxygenator (key word: ECMO)	Dr William J Rashkind et al, Children's Hospital, Philadelphia. This was on a neonate with respiratory distress but without success (see 1953, 1954 & 1975)
1965	First flexible fibreoptic laryngoscopy for tracheal intubation performed	This was performed nasally by Dr Peter Murphy, while Senior Registrar in Anaesthesia at the National Hospital for Nervous Diseases (now Neurology and Neurosurgery), Queen Square, London. He conceived the idea after reading an article in the Lancet by J Shore & H N Lippman on the use of a flexible choledochoscope. Following contact from Murphy, American Cystoscope Makers Inc, who manufactured the choledochoscope, provided him with an instrument (possibly worth about £3,000 at the time) and just requested follow up from his experience. Later, at the Brompton Hospital, Murphy used the instrument to confirm placement of double-lumen tubes. ENT surgeons, and not one anaesthetist (apart from Dr Bryce-Smith, the editor who published the report) (!), were the people who showed interest in the technique (see 1972 & 1990)
1966	Flexible bronchoscope invented	Dr Shigeto Ikeda - Japanese physician working in concert with Machida Endoscope Company (later Pentax) & Olympus Optical Company. He also later developed video-bronchoscopy
1966	Pancuronium first trialled on humans	Drs W Leslie Baird & A M Reid in Glasgow Royal Infirmary
1966	Clonidine introduced into clinical practice for the treatment of hypertension	Boehringer Ingelheim. Introduced earlier as a nasal decongestant spray but, after causing a secretary to sleep for 24 hours following nasal administration, the drug was further investigated and developed for its current indications
1966	Investigation by the Subcommittee on the National Halothane Study of the Committee on Anesthesia, National Academy of Sciences (USA) regarding "Halothane Hepatitis" (see 1988)	This was one of the first large-scale clinical studies to use computer analysis. It studied over 850,000 cases involving general anaesthesia in 34 hospitals. The report, delivered in 1969, failed to prove a causal relationship but did prove that halothane had a lower mortality than both ether and cyclopropane. The Committee was led by then Stanford Anesthesiologist Professor John P Bunker and included William H Forrest, Frederick Mosteller and Leroy Vandam
1966	Larson laryngoscope blade produced	Dr Alex G Larson, Portsmouth, England. This Macintosh-type blade had a bridge added at the distal end that helped guide an intubating stylet
1966	Society of Anaesthesiologists-Reanimatologists formed in the USSR	On January 21
1967	A form of "Patient Controlled Analgesia" (PCA) with opioids for post-operative pain relief first reported (see 1847, 1967 & 1969)	Dr Philip H Schezer, while working in New York. His system allowed the patient to press a button that alerted a nurse to deliver a small intravenous dose of either morphine or pethidine. He also contributed to the development of the heart-lung bypass machine while working with Dr Michael DeBakey at Baylor University and he advocated the use of acupuncture in palliative medicine
1967	Introduction of "jet ventilation" (see 1971 & 1977)	Richard Douglas Sanders, while Director of the Department of Anesthesia at the Delaware Hospital. His system (the Sanders injector) attached to a side port of a rigid bronchoscope; was supplied with oxygen attached to wall pressure of 50psi but with a pressure regulator in line and a hand held on/off valve. The bronchoscope also had a side port for entrainment of air and/or anaesthetic gases. The jet nozzle inside the bronchoscope was 0.035 inches in diameter. Degree of ventilation was judged by observing chest movement. (With help from the Delaware Academy of Medicine, Sanders also founded the Anesthesia Research Foundation)
1967	The need for scavenging anaesthetic gases in operating theatres first proposed (see 1985)	Dr A I Vaisman (a Soviet Union anaesthetist) in his article in *Eksperimentalnaia Khirurgiia I Anestheziologiia* where he observed that 18 of 31 female anaesthetists in Russia had had at least one miscarriage. His survey of 15% of Soviet anaesthetists discovered several factors that could have led to poor health, one of which was the inhalation of anaesthetic gases
1967	First human heart transplant (see 1981)	Dr Christiaan Barnard et al at Groote Schuur Hospital Cape Town. Recipient was Louis Washkansky who succumbed to pneumonia 18 days post-operatively
1967	Adult Respiratory Distress Syndrome (ARDS) first described	In the *The Lancet* by David G Ashbaugh, D Boyd Bigelow, Thomas L Petty & Bernard E Levine from the University of Colorado Hospital, Colorado
1967	Bennett MA-1 ventilator produced (see 1940)	This was the first electronically controlled ventilator

1967	Dantrolene sodium discovered (see 1975 & 1982)	Harry R Snyder et al, The Norwich Pharmacal Company, New York. Initially presented as a new class of muscle relaxants, it was used to treat spasticity
1967	The British Group of Anaesthetists in Training ("GAT") founded	
1968	Pseudocholinesterase (butyrylcholinesterase) obtained in purified form (see 2007)	H W Goedde
1968	First commercially available auto-transfuser	Bentley Auto-transfusion System - Dr Gerald Klebanoff, Department of Surgery, University of Texas Health Science Center, San Antonio, Texas
1968	Huffman prism introduced to enhance laryngoscopy (see 1975)	John P Huffman, Nurse Anesthetist & Dr James Otis Elam as reported in the Journal of American Association of Nurse Anesthetists. (Further report in Anesthesia & Analgesia, 1971). It was a Plexiglas prism (acrylic), initially producing 30° refraction - (Harris Calorific Company, Cleveland, Ohio). A later version allowing 80° refraction was subsequently produced (see 1975)
1968	The Pollard microlaryngoscopy endotracheal tube produced	Dr Brian J Pollard, Repatriation General Hospital, Concord, Sydney. This latex tube had its wall reinforced with a nylon coil to prevent kinking. It also had the distal portion narrower than the proximal (diameter reducing at the level of a shoulder) in order to improve visibility of the operative field. Nylon was used to try to avoid the problem of previous tubes produced with metal coils where the tubes' latex layers had begun to separate from the metal coil. However, the use of the Pollard tube lost favour in the late 1970's after several reports of obstruction of airways actually due to kinking
1968	Revelation that the abdominal aorta, not only the vena cava, can be compressed by the uterus in the supine position in late pregnancy, leading to the term "aorto-caval compression" (key words: postural supine hypotension) (see 1669, **1893**, 1932, 1942, 1950, 1953 & **1960**)	Dr Roberto Caldeyro-Barcia, obstetrician in Montevideo, Uruguay. Along with Professor Hermogenes Alvarez, he also introduced "Montevideo Units" for measuring uterine function and pioneered foetal heart rate monitoring during labour contractions
1968	The Philippines Society of Anesthesiologists (PSA) formed	
1969	Temazepam introduced for clinical use (see 1964)	
1969	Actual "Patient Controlled Analgesia" (PCA) with opioids first reported (see 1847 & 1967)	Dr James S Scott, University of Leeds, England, reported having used the technique since 1964 for women in labour. Pethidine was the drug used
1969	Abortion in Australia pronounced legal if pregnancy would adversely affect the mental or physical health of the mother (see 1971)	Justice Clifford Mennenheit - Supreme Court of Victoria
1969	First anaesthesia simulator developed - called "SIM1" or "SIM ONE" (see 1929 & 1980s)	S Abrahamson, J S Denson & R M Wolf of the University of Southern California School of Medicine. It was an anthropometric mannequin, comprising a head, torso and arms, that was intubatable and able to be cannulated intravenously. It was computer controlled, with a heart beat, temporal and carotid pulse and recordable blood pressure. It could open and close its mouth and blink its eyes. It was capable of responding to 4 different intravenously administered drugs (including thiopentone and suxamethonium) and 2 gases, being oxygen and nitrous oxide. It was used to teach intubation and induction of anaesthesia.
1969	Bronchial-blockers described for paediatric thoracic surgery	Dr Verlie Lines, Royal Alexandra Hospital for Children, Sydney and (separately) Dr Raymond Vale, Guy's Hospital, London. They both described the use of Fogarty arterial embolectomy catheters (5 French gauge) introduced through an endotracheal tube
1969	Demonstration that prolonged ECMO could be used to treat respiratory failure (see 1975)	This was in an experimental setting and demonstrated by Dr Robert H Bartlett
1969	Trans-tracheal Catheter Ventilation reported and advocated in cases of difficult airway access (see 1969 & 1984 - Melker)	Drs Frederick J Toy and J D Weinstein in the journal "Surgery". The technique was further advocated by Dr H B Jacobs et al in 1972 in the "Journal of Trauma" after using it to resuscitate a patient
1960s	Modern cardiopulmonary resuscitation (CPR) techniques developed & promulgated by the American Heart Association in 1966	Workers at Johns Hopkins University
1970	Routine testing for Hepatitis B in Australia	
1970	The "train-of-four" test by a nerve stimulator developed to test for degree of muscle paralysis following the use of muscle relaxant drugs (see 1958)	Drs Hassan H Ali, John E Utting and Thomas Cecil Gray at the Royal Liverpool Hospital attached to the University of Liverpool, England

1970	The Aldrete Post Anaesthesia Recovery (PAR) score officially introduced	This had been developed over the previous 3 years by Dr (later Professor) Jorge Antonio Aldrete, Chief of Anesthesia at the Veterans Administration Hospital in Denver, as a consequence of numerous calls for help from junior nurses working in a Recovery Ward (aka Post-Anaestesia Care Unit). 5 indicators, each scoring 0, 1 or 2, are used to assess suitability for discharge from the Recovery Ward - activity (movement of limbs), respiration, blood pressure, consciousness and colour. The latter has now been replaced by oxygen saturation (SaO_2) with 92% on room air being the acceptable level. A total score equalling 9 or 10 allows the patient to be discharged from Recovery Ward
1970	Fentanyl anaesthesia first reported (see 1959)	Drs FL Grell, R A Koons & J S Denson at the University of Southern California Medical Centre with a study of 500 cases
1970	The peribulbar block for eye surgery introduced	Dr Charles D Kelman, Ophthalmologist, New York. He did not publish his technique and it was not until D B Davis & M R Mandel published it in 1986 that it became more widely known. Kelman was also responsible for introducing the technique of phaecoemulsification for cataract surgery in 1967 after becoming interested in his dentist's ultrasound machine. In 1962, he had devised the cryoprobe for total lens extraction and retinal cryopexy
1970	The Intensive Care Society of the United Kingdom founded (see 1999 & 2000)	Predominantly by the efforts of Dr Alan Gilston, Consultant Anaesthetist, National Heart Hospital in London. It represents all the professionals who work in the ICU environment - doctors, nurses and allied professionals
1970	The Society of Critical Care Medicine (SCCM) founded in the United States	By 29 physicians meeting in Los Angeles, California
1970	The birth of "Evidence-Based Medicine"	Anesthesiologist, John Bunker, in a seminal paper in *The New England Journal of Medicine* . He compared rates of surgery in the USA with those in the United Kingdom. This raised the question of financial incentives and started a wide debate on whether or not health care was based on evidence of its effectiveness or efficiency. Whilst a visiting Professor in the Department of Preventive and Social Medicine at Harvard (1973-1975), he helped organize seminars on the variations in surgical data. This culminated in his co-authoring the book "*Costs, Benefits and Risks of Surgery* "
1970s	First potent and truly selective 5-HT_3 receptor antagonist (MDL 72222) synthesized	John Richard Fozzard & Maurice Ward Gittos, Merrell Dow Pharmaceuticals
1971	Etidocaine synthesized	B H Takman, USA. It was first used clinically by Peere C Lund, Professor of Anesthesiology at the University of Pittsburgh
1971	Concept of Minimum Alveolar Concentration (MAC) re-defined in relation to ED_{50}	Dr Leonard Bachman in Philadelphia (see also 1963)
1971	Cyclic AMP's role in hormone action discovered	Professor Earl Wilbur Sutherland Jr while investigating mechanism of action of glucagon & adrenaline. He received the Nobel Prize for 'Physiology or Medicine' for this. He was a pharmacologist & biochemist at Western Reserve University, Cleveland, Ohio
1971	The establishment that social & economic factors could contribute to abortion in Australia being legal (see 1969)	Justice Levine - New South Wales
1971	High volume - Low pressure cuffs for endotracheal tubes designed (initially for tracheostomy tubes)	Dr Joel D Cooper et al, Pennsylvania
1971	First hyperbaric chamber in Australia commissioned	Vivian Richard Ebsary (see mid-1950s & 1959), Professor Bruce Johnston and Dr Victor Hercus at the Prince Henry Hospital, Sydney. This had actually been designed in 1962 but several personal circumstances of the people involved delayed its commissioning. It was moved to the Prince of Wales Hospital in 1998 and still (2015) functions as one of the best units in the world. Ebsary was awarded an Order of Australia - (AM) in 1989 for his many contributions to biomedical engineering
1971	Introduction of percutaneous intra-tracheal "jet ventilation" (see 1967, 1969 & 1977)	W E Spoerel, P S Narayanan & N P Singh. Using a 16 Gauge needle and monitoring arterial blood gases, they showed it was possible to adequately ventilate paralysed patients with this technique. Spoerel also developed the intra-tracheal, trans-laryngeal approach using a catheter in 1973
1972	Althesin, a steroid-based intravenous anaesthetic (Alpaxalone 9mg + Alphadolone 3mg), first used clinically	Dr John Wharry Dundee *et al* in Northern Ireland. It had been produced at the Glaxo Research Laboratories in the UK by K J Child *et al* in 1971. Because of its propensity to cause severe reactions related to histamine release (ascribed to its carrier agent, cremaphor EL) it was banned for human use in 1984. It remained available for veterinarians' use under the name of Saffan

1972	Fazadinium bromide (Fazadon) developed	This non-depolarizing muscle relaxant was discovered by E E Glover & M Yorke working at Teeside Polytechnic in Middlesborough in the UK. It was marketed by Allen & Hanburys (now Glaxo). Common occurrence of tachycardia and hypertension reduced its popularity
1972	Clinical pulse oximeter developed (see 1942 & 1980)	Takuo Aoyagi at Nihon Kohden
1972	Bain's co-axial circuit introduced (see 1975 & 1977)	James A Bain and Wolfgang E Spoerel. Interestingly, Spoerel, while being anti-Nazi, had allegedly had German naval experience and was therefore held near Oxford as a prisoner of war before being accepted by Canada for migration to that country where he spent 30 years, from 1965, as the Professor of Anaesthesia at the University of Western Ontario, London, Canada
1972	"Adelberg clamp" (aka Precision V-clamp) produced as the still current roller clamp for IV infusion sets	Dr Marvin Adelberg of Adelberg Laboratories Inc, California
1972	The first fibrelight laryngoscope range produced	Penlon, Oxfordshire
1972	First dedicated flexible fibreoptic laryngoscope produced (see 1965 & 1990)	American Optical Company, Southbridge, Massachusetts
1972	First successful use of extracorporeal membrane oxygenation (ECMO) (heart-lung machine) for treatment of acute respiratory distress syndrome (ARDS) (see 1925, 1951, 1953 & 1957)	Dr J Donald Hill & Maury Bramson BME, Santa Barbara, California. This involved a 22 year old post-trauma patient who survived after 72 hours of treatment
1972	The Australian Society of Anaesthetists commenced publishing its "Anaesthesia & Intensive Care" journal	Dr Benedict Barry was the first Editor
1973	Enflurane introduced for clinical use (see 1960-1971 entry)	Ohio Medical Products
1973	Vecuronium synthesized (see 1979)	Buckett, Hewitt & Savage (Organon)
1973	Phillips laryngoscope blade produced	Drs Otto C Phillips & Roger L Duerksen, Pittsburgh, Pennsylvania. This was a straight blade with a distal curve. It was similar to a Snow blade and combined features of both the Miller and the Jackson-Wisconsin blades
1973	Schapira laryngoscope blade produced	Dr Max A Schapira, Director Department of Anesthesiology, Morrisania City Hospital, The Bronx, New York. A modified straight blade with distal anterior curve, minimal vertical component and no horizontal flange
1973	Eschmann bougie introduced	This is a multiple-use endotracheal tube introducer. Originally called the Eschmann Healthcare Tracheal Tube Introducer, it was later renamed the Portex Venn Introducer. Produced by SIMS Portex, Kent, United Kingdom
1973	Winnie's "three-in-one nerve block" described ("3-in-1 block")	A P Winnie
1973	First practical, wearable and ambulatory medication infusion pump produced (see 1963, 1981 & 2002)	Dean L Kamen, a multi-awarded inventor born in 1951 in Long Island, New York. His factory based in Bedford, New Hampshire. He developed the idea while attending Worcester Polytechnic Institute after a suggestion from his older brother, a medical student. He dropped out of the Institute to found his first company, *Autosyringe Inc,* in 1976 where he invented the 'insulin pump' in 1980. He eventually sold *Autosyringe* to Baxter Healthcare for many millions in 1982. He then founded DEKA Research & Development Corporation where he invented, among numerous other things, the Segway (code-named "Ginger"), an advanced fine-movement, brain-controlled prosthetic arm called "Luke" and an all-terrain electric wheelchair called an "iBot". In his late teens, he had been consulted about the automation of the Times Square New Year's Eve Ball. He holds more than 400 patents. A marvellous example of a primary school student who had to be home-schooled because, according to teaching staff, he was "too dumb to learn"!
1974	Sufentanil synthesized	Janssen Pharmaceutica
1974	Atracurium (marketed as Tracrium) synthesized	George H Dewar in John B Stenlake's research group at Strathclyde University, Scotland. While this was another nondepolarizing muscle relaxant whose actions could be pharmacologically reversed in similar fashion to others, it was discovered that it did not rely on renal excretion for its elimination as it is eliminated through several pathways, including by Hofmann elimination (the spontaneous degradation in plasma and tissue at normal body pH and temperature) as well as by hydrolysis by nonspecific esterases. This produced a huge advantage over the other nondepolarizer relaxants when used for patients with renal impairment. It is also possible to infuse the drug without causing accumulation

1974	Sodium nitroprusside (SNP) officially recommended for use in hypertensive emergencies	American Medical Association's Committee of Hypertension. The World Health Organization did likewise in 1979
1974	Psoas compartment nerve block described	A P Winnie
1975	First International Muscle Relaxant Seminar & Symposium	Westminster Hospital
1975	Midazolam (Hypnovel) synthesized	Walser & Fryer (Hoffmann-LaRoche)
1975	Etomidate first used clinically	After clinical trials by Alfred Doenicke had started in 1972
1975	Heroin withdrawn from use in obstetrics	
1975	Dantrolene sodium reported to counteract malignant hyperthermia in pigs (see 1967 & 1982)	Dr Gaisford G Harrison, anesthesiologist, in South Africa. Bill Bowman from the University of Strathclyde in Scotland suggested its use in human cases to Denborough (*vide*) in 1976 as it acted specifically to lower myoplasmic calcium
1975	Huffman laryngoscope blade produced (see 1968)	John P Huffman, Nurse Anesthetist. This Macintosh-type blade was made of plastic and incorporated a prism in the actual blade, as opposed to his earlier prism which clipped onto a blade as an attachment. This version was manufactured by Concept Incorporation, Florida (see 1968)
1975	RAE endotracheal tubes reported being developed & used	Drs Wallace **R**ing, John **A**dair & Richard **E**lwyn, University of Utah Primary Paediatric Hospital, Salt Lake City
1975	First successful use of ECMO in a neonate	Dr (later Professor) Robert H Bartlett while then at the University of California Irvine School of Medicine. It was used on a neonate with severe respiratory distress secondary to meconium aspiration (see 1953, 1954, 1965 & 1969)
1975	The Pethick test for Bain circuit integrity introduced (see 1972 & 1977)	Dr Simon L Pethick, Calgary, Alberta. The Venturi effect from pressing the oxygen flush button causes the reservoir bag to collapse if the connections of the inner tube of the Bain circuit are intact
1975	The American College of Veterinary Anesthesia and Analgesia founded	
1976	Campbell ventilator described	Dr Duncan I Campbell's article in *Anaesthesia & Intensive Care.* Formerly of Glasgow Royal Infirmary, he was then working at Royal Prince Alfred Hospital in Sydney. He developed his revolutionary ventilator over the previous 3 years. It had no mechanical moving parts and was controlled by fluidics. Ulco marketed it and years later converted its control system to electronic.
1976	Lack's co-axial circuit introduced	J A Lack, Salisbury, England
1976	Alfentanil synthesized	Janssen Pharmaceutica
1976	Carfentanil synthesized (10,000 times more potent than morphine & so used only to sedate wild animals, called *Wildnil,* with a lower kill-rate than previous agents) (?? Used by Russians, through the air-conditioning, on Chechen rebels to end the Moscow theatre hostage crisis in 2002)	Janssen Pharmaceutica. There was a claim at the time that one wine glass-full could be used to surgically anaesthetize 16 million people
1976	First automated oscillometric Device for Indirect Non-invasive Assessment of Mean Arterial blood Pressure machine - DINAMAP 825 (see 2011)	Developed by Dr Maynard Ramsey III and produced by GE Medical Systems. Much oscillometric research on blood pressure over many years by many other investigators preceded this particular development
1976	Trans-Oesophageal Echocardiography reported (non-operative) (see 1978)	Frazin et al
1976	Critical volume & pH of acid in the lung needed to produce Mendelssohn's syndrome determined (from studies in monkeys)	Drs M A Shirley & R B Roberts
1976	"Cell Saver" introduced	Haemonetics Corporation
1977	Propofol (diisopropylphenol) with Cremophor EL (see 1986) introduced for clinical trials	Imperial Chemical Industries (ICI) in Macclesfield, Cheshire. Actually propofol had been developed 4 years earlier but until this time had only been used to anaesthetize mice. Dr Brian Kay and Professor Rolly conducted the first clinical trial in Belgium

1977	Labetalol introduced into clinical practice after being patented in 1966	Mr David Jack, a Scottish medicinal researcher working for Allen & Hanburys (a subsidiary of Glaxo Laboratories) at Ware, England. It was the first combined α- and β-blocker and, in its intravenous form, has been used for intraoperative controlled hypotension. **David Jack became the Director of Research & Development at Glaxo Laboratories and led a team of researchers responsible for the discovery of beclomethasone (Becotide), fluticasone (Flixotide), salbutamol (Ventolin), salmeterol (Serevent), ranitidine (Zantac), sumatriptan (Imigran) and ondansetron (Zofran). He was knighted as a Commander of the British Empire and became a Fellow of the Royal Society. Glaxo named their building in Ware the "David Jack Centre"**
1977	The first attempt to detect awareness during anaesthesia	Dr Michael E Tunstall, Aberdeen University, developed the "isolated arm technique" of assessing whether or not a paralysed patient was aware during surgery (see 1961)
1977	Kessell laryngoscope blade produced	Dr John Kessell, King Edward Memorial Hospital for Women & Royal Perth Hospital, Perth, Australia. The blade of this attaches to the handle at 110° instead of the usual 90° in order to avoid difficult insertion of the blade into the mouth of patients with short necks, barrel-chests or large breasts
1977	Grant laryngoscope blade produced	Dr Graham Cameron Grant, Lewisham Hospital, Sydney. This Macintosh-type blade had a lever on the handle that moved another lever near the distal end that would lift the tip of the endotracheal tube anteriorly. The prototype was built by Dr Grant in his own workshop. Subsequent manufacture was by Penlon in the United Kingdom. Dr Grant was made an Officer of the Order of Australia (AO) in 2024 for "distinguished service to biomedical engineering as a pioneer of innovative equipment development, and to medicine" (particularly related to his numerous contributions to anaesthesia). He also received the most prestigious award of the David Dewhurst Medal, College of Biomedical Engineers, Engineers Australia in 2011.
1977	The Foëx/Crampton-Smith manoeuvre to test the integrity of the Bain circuit introduced (see 1972 & 1975)	Pierre Foëx and Alex Crampton-Smith (both, at different times, the Nuffield Professor of Anaesthetics, University of Oxford). By occluding the patient end of the inner tube of the Bain circuit with a finger and observing a depression of rotameters, the integrity of the circuit is concluded. Dr Ghaleb A Ghani, in 1984, suggested a slight modification whereby, instead of using a finger (which might occlude both tubes), the stopper of a 3ml syringe is used to occlude only a 2l/min flow from the inner tube; not only is the effect on the rotameters observed but a hiss should be heard from the release of builtup pressure in the internal fresh gas tube
1977	The "Goldman Cardiac Risk Index" devised for assessing cardiac risk for patients undergoing non-cardiac surgery. This later became known as the 'Original Cardiac Risk index' (see 1999 & 1998)	Drs Lee B Goldman, D L Caldera, S R Nussbaum et al, USA. Reported in the New England Journal of Medicine. Data were derived retrospectively and involved 1001 patients. The Index uses 9 independent risk factors
1977	Introduction of high-frequency "jet ventilation" (see 1967)	Associate Professor Miroslav Klain & Professor & Vice Chairman R B Smith, Department of Anesthesiology, University Health Center, Pittsburgh, Pennsylvania. They developed a fluidic logic-controlled ventilator producing jets at a frequency of 60-100/minute and began by using the system for fibreoptic bronchoscopy
1977	Dutch Society of Intensive Care (NVIC) founded	Prof. Dr Bruining and Prof. Dr Thijs.
1978	Midazolam (Hypnovel) introduced into clinical practice	Hoffmann-LaRoche
1978	Capnography (graphic measurement of exhaled CO_2) first adopted for use in anaesthesia	In Holland - after work by Professor Zden Kalenda at Utrecht University Hospital, Netherlands
1978	Open intra-operative epicardial echocardiography used (see 1976)	Dr Yasu Oka in New York
1978	First disposable Robertshaw double-lumen tube produced (see 1962)	Mallinckrodt Medical, Althone, Ireland. This was known as the Broncho-Cath. It was made from polyvinyl chloride (PVC) and had high-volume low-pressure cuffs, unlike its rubber antecedents
1978	First airway exchange catheter reported (see 1987 & 1990)	Performed in "ad hoc" circumstances by Drs Brendan T Finucane and Hilton Louis Kupshik in Georgia, USA. Following an awake blind nasal intubation for a patient with an unstable cervical fracture and then the insertion of a central venous line, they discovered the endotracheal tube was leaking and had to be replaced. They decided to use the sheath from the Sorenson CVP catheter to help exchange the endotracheal tube with the least disturbance for the then anaesthetized patient

1978	First use of Doppler ultrasound to locate nerves (see 1981, 1992 & 2006)	P Du P. La-Grange et al. It was used to locate the brachial plexus using the supraclavicular approach (see 1885 & 1911). (Ultrasound had been developed from the principles advanced by Johann Christian Doppler in 1842)
1978	Adoption of the Australian Society of Anaesthetists' current logo/symbol - that of a caring hand holding a bowl containing anaesthetic vapours	The search for an acceptable symbol had taken more than 2 years. The design chosen by the Federal Executive was produced by Dr John W Hains who years later became President of the ASA. (refer Anaesthesia & Intensive Care 1987; 15:99-106)
1979	0.75% bupivacaine withdrawn by FDA because of toxicity	
1979	Intra-operative Trans-Oesophageal Echocardiography study reported	Drs Oka & Matsumoto in New York
1979	Epidural morphine for post-operative pain relief popularized (see 1901)	Dr M Behar et al, New York. He reported in the Lancet
1979	Vecuronium first clinical trials (actually synthesised 1973 but not thought better than pancuronium until it was decided the latter's rate-pressure product was not good for the new procedure of coronary artery grafting)	J F Crul & J H D J Booij
1979	Flumazenil (Anexate) synthesized (see 1987)	Hoffmann-LaRoche
1979	Combined spinal & epidural (CSE) anaesthesia introduced - as a "double segment" technique (see 1937, 1981, 1982 & 1984)	Professor Ioan Curelaru, Department of Anaesthesiology at Gothenburg University, Sweden, while working in Romania. He used 2 needles, placing the epidural catheter 2 segments higher than the spinal injection (see 1981, 1982, 1984)
1979	Intrathecal (subarachnoid) morphine advocated for long-lasting pain relief (see 1901)	Josef K Wang (Assistant Professor of Anesthesiology, Mayo Clinic) et al. Initial report made on 8 cases in humans. Previous research in this field had been on animals
1979	Honan's Balloon or 'Intraocular Pressure Reducer' reported in the medical literature	Dr Paul R Honan, Ophthalmologist in Lebanon, Indiana, USA. He began experimenting with this concept in the early 1970s when his first device was made from the cut-down inner tube of a bicycle tyre that included the valve for inflation when attached to a sphygmomanometer. His local garage man 'vulcanized' the tube ends to seal them. Eventually his father, a retired manufacturer, produced a commercial version that they later updated to include a pressure-limiting valve that 'popped-off' at 50-60mmHg. The device received its eponym courtesy of Dr Richard Kratz of California during a lecture in London in the 1970's
1979	First optical stylet produced	Designed by Dr Ronald L Katz, Chairman of Department of Anesthesiology, University of California, Los Angeles and Dr George Berci, notable surgeon, Cedar-Sinai Medical Centre, Los Angeles. They were also responsible for the term "optical stylet". It was a straight and rigid scope, which reportedly made it hard to use in cases of difficult intubation. It was manufactured by American Optical for Karl Storz KG (see 1983 Bonfils and 1983 other)
1970s	Multi-Resistant Staphylococcus appears	
1970s	Flexible fibreoptic intubation technique developed	Dr Andranik Ovassapian who held several posts before subsequently becoming Professor of Anesthesia & Critical Care at the University of Chicago.
1970s	Automated External Defibrillator (AED) developed (key word: CPR)	Dr Arch Diack, Dr W Stanley Wellborn & Robert Rullman in Portland, Oregon. They formed the Cardiac Resuscitator Corporation
1980s	TIVA developed	
1980s	Tapentadol developed (see 1962 & 1998)	Helmut Buschmann at the German pharmaceutical company, Grünenthal, following further research into tramadol. Development continued with both Johnson & Johnson Pharmaceutical and Ortho-McNeil Pharmaceutical from 2003. Approved for use with moderate to severe pain in USA in 2008 and Europe and Australia in 2010
1980s	Screen-only computerised anaesthesia simulators produced - versions called "SLEEPER", "BODY" and "ASC" (Anaesthesia Simulator Consultant) (see 1929 & 1969)	
1980	Pipecuronium developed	O Alánt, K Darvas & I Pulay in Hungary
1980	Isoflurane introduced for clinical use (see 1960-1971 entry)	Ohio Medical Products
1980	First clinically useful pulse oximeter commercialized (see 1942 & 1972)	Biox Technology in USA
1980	Miller's co-axial circuit introduced	D M Miller and J L Couper, Capetown, South Africa. This was described as a "Preferential Flow System"

1980	ADE co-axial circuit introduced	Produced by Dr David Humphrey et al in Durban, South Africa. This was described as being a universal system capable of being used in all three configurations listed
1980	The Australian Society of Anaesthetist's current library founded, although the ASA had decided to establish a reference library in 1937 at its 2nd AGM, following which one of sorts was set up in Melbourne by Dr Geoffrey Kaye	This more recent facility had its beginnings at the first "real" home of the Society in Paddington, Sydney. It started with an historical leaning with the purchase of Dr John Snow's original monograph *On the Inhalation of the Vapour of Ether* and has continued that trend with similarly valuable acquisitions, including a globally significant collection of over 300 texts on Mesmerism once owned by the long-serving Honorary librarian, Dr Richard Bailey. In the latter's honour, it was named eponymously, The Richard Bailey Library, in 1994. It is housed in the ASA's headquarters in Sydney. In 2024, Dr Bailey was awarded the honour of being appointed a Member of the Order of Australia (AM) "for significant service to medicine in the field of anaesthetics, and to professional societies"
1981	Reflection enhancement for echogenic ultrasound needle first patented (see 1978, 1992 & 2006)	This adaptation was developed to enhance the ultrasound reflection coefficient of a needle and used a diffraction grating, comprising multiple parallel grooves helically disposed around the circumference. The inventors were Joe F Guess, Denis R Dietz and Charles F Hottinger of Colorado, USA. The production company was Technicare Corporation, Ohio
1981	Combined spinal & epidural (CSE) introduced in England - for Caesarean section (see 1937, 1979, 1982 & 1984)	Dr Peter Brownridge, later Director of Department of Anaesthesia at Flinders University Medical Centre, Australia
1981	Continuous Positive Airway Pressure (CPAP) developed	Dr Colin Sullivan et al in Sydney, Australia for the treatment of sleep apnoea
1981	First successful long-term lung transplant (involved heart and double lung) (see 1963 & 1967)	Dr Bruce Reitz of Stanford University Medical Centre
1981	Atracurium first used clinically	J P Payne & R Hughes, United Kingdom
1981	Introduction of glyceryl trinitrate for intraoperative controlled hypotension (see 1846, nitroglycerine, GTN)	
1981	The short-handled laryngoscope introduced	Dr Sanjay Datta & John Briwa of the Department of Anesthesia, Brigham & Women's Hospital Lying-In Unit, Boston, Massachusetts. It was designed to overcome the problem difficult intubation of obese women with large breasts. It took them 1 hour to produce the "prototype" by cutting a Penlon laryngoscope handle in half, rewiring and using just a single 4.05 volt battery to power it. Many manufacturers after Foregger Company did not take up an initial offer
1981	Computerized pharmacokinetic-model-driven continuous-infusion pump developed (see 1963, 1973, 1996 & 2002)	Dr (later Professor) Helmut Schwilden. At the time an Assistant in the Department of Anesthesiology at the University of Bonn. His system was based on exponentially declining infusion schemes which, in turn, were based on mathematical equations (derived by E Kruger-Theimer in 1968, *European Journal of Pharmacology*) that outlined intravenous infusion rates that were needed to obtain and maintain a specified plasma concentration of a drug whose pharmacokinetics are described by linear multi-compartment modelling
1982	Combined spinal & epidural (CSE) "single segment" technique first used (see 1937, 1979, 1981, 1984)	Independently by M B Coates, in Bath, England and M H Mumtaz et al, in Ludvika, Sweden. They both used the newly developed needle-through-needle apparatus. Their cases were orthopaedic on lower limbs
1982	Dantrolene sodium reported to counteract malignant hyperthermia in humans (see 1967, 1982 & 1986)	Drs M E Kolb et al. This revelation helped reduce the human mortality of the complication from more than 80% down to less than 10%
1982	The Univent tube produced for thoracic anaesthesia	Dr Hiroshi Inoue et al, Department of Surgery, Tokai University, Japan. This was a single-lumen silicone endotracheal tube with a separate channel for a bronchial-blocker
1982	The European Society of Intensive Care Medicine (ESISM) founded	In Geneva, Switzerland
1982	Hong Kong College of Anaesthesiologists founded	Formed primarily at the instigation of the Society of Anaesthetists of Hong Kong.It was subsequently incorporated in 1989. First President was Dr M T Moles, Reader in Anaesthesia in the Facio-Maxillary Department of the Dental Faculty in the University of Hong Kong
1982	First International Symposium on the History of Anaesthesia (ISHA) held	Held from May 5 to May 8 in Rotterdam. Organized by Professor Wilhelm Erdmann and Dr Joseph Rupreht from the Department of Anaesthesiology, Erasmus University in Rotterdam. About 200 attendees. 120 papers delivered.

1982	Moves made to found the Anesthesia History Association	This was founded in the USA and was inspired by the success of ISHA 1 held in 1982 in Rotterdam. Co founders were Drs Garth Huston (then Chairman of the Wood Library-Museum), Selma Calmes and Roderick Calverly. The inaugural meeting, attended by 47 members of the American Society of Anesthesioologists, was held in January 1983
1983	The Hong Kong Society of Critical Care Medicine founded	Dr Zoltan Lett served as the first Chairman
1983	Patil-Syracuse laryngoscope handle produced	Dr Vijayalakahmi U Patil, along with L C Stehliing & H L Zauder of the State university of New York at Syracuse. This handle was unique in that the angle of an attached Macintosh-type blade could be altered to one of 4 settings: 45°, 90°, 135° or 180° depending on the required circumstances. This was manufactured by Anesthesia Associates in San Marcos, California. Dr Patil was also responsible for the introduction of the 'thyromental distance' concept in difficult airway assessment
1983	The Bonfils Intubation Fibrescope produced	Developed by Dr P Bonfils, Inselspital Hospital, Bern, Switzerland. Manufactured by Karl Storz Endoscopy Ltd. Tuttlingen, Germany. This is a rigid fibreoptic stylet designed for the retromolar approach. It can be loaded with an endotracheal tube of at least 5.5mm internal diameter. The tube is locked so that it just protrudes over the end of the scope. The scope has a 40° curve near its end (a modification of the Katz & Berci optical stylet - see 1979) and it is illuminated by connection to an external light source
1983	Fiberoptic Stylet Laryngoscope produced	This was the first fibreoptic stylet that was malleable. Produced by American Optical Company, Southbridge, Massachusetts (see 1972 & 1979)
1983	First time a laryngeal mask airway (LMA) used to rescue an airway in a case of difficult intubation (multiple entries, key word: LMA)	Dr Archie Ian Jeremy Brain. He used a prototype version (having already used prototypes in about 1000 uncomplicated cases) in a morbidly obese patient with a bowel obstruction after 2 experienced anaesthetists failed in their efforts to intubate the patient with an endotracheal tube. This event stirred Brain into experimenting with endotracheal intubation through his prototype LMA on routine elective patients, a feat he achieved that same year
1983	First Australian case of HIV reported	
1984	Vecuronium approved by FDA	
1984	Ondansetron developed (see 1970s & 1991)	GlaxoSmithKline
1984	EMLA 'cream' marketed (see 1993)	Astra-Zeneca. EMLA was developed by Lennart Juhlin, Hans Evers & Fredrick Broberg during the 1970's. Published article 1980 in Acta Dermatovener describing its use in dermatological surgery
1984	Combined spinal & epidural (CSE) "single segment" technique first used for Caesarean section (see 1937, 1979, 1981, 1982)	
1984	Introduction of microprocessor-controlled tourniquets (see 199BC, 1517, 1593, 1718, 1864, 1873 & 1904)	James McEwen, a Canadian biomedical engineer in Vancouver
1984	Cormack & Lehane difficult intubation anatomical view classification published	Dr Ronald Sidney Cormack and John Robert Lehane, Northwick Park Hospital & Clinical Research Centre, Harrow. The original study was done on obstetric patients
1984	Melker Emergency Cricothyrotomy Kit designed (Patent granted 1987)	Dr Richard J Melker, now Professor of Anesthesiology, Pediatrics and Biomedical Engineering at the University of Florida. He is also the Director of the Florida Anesthesiology Computer and Engineering Team. He holds more than 50 Patents over medical devices and technologies. This original kit was based only on the Seldinger technique and included a final endotracheal device with an internal diameter of 5.5mm; later versions included a surgical method and then a cuffed catheter for jet-ventilation. Produced by Cook Critical Care, Bloomington, Indiana, USA
1985	The first paediatric pain unit in the world established (see 1991)	Known as the 'Pain Treatment Center', it is a division of the Department of Anesthesiology, Critical Care & Pain Medicine at the Boston Children's Hospital. According to excerpts from the BCH's History website, the hospital itself was founded in 1869 by "*Dr. Francis Henry Brown who organized a small group of Harvard Medical School graduates joined by Boston's civic leaders to establish a 20 bed Children's Hospital in a townhouse on Rutland Street in Boston's South End.... Sister Theresa and the Anglican Order of the Sisters of St. Margaret oversaw the nursing care of the children for the first 45 years of the hospital's existence*"

1985	Mallampati anatomical score to predict difficult intubation published	Dr S Rao Mallampati, Boston. The initial score had only 3 levels; the 4th level was added by Drs G L T Samsoon & J R B Young in 1987
1985	The scavenging of anaesthetic gases in operating theatres found to be unnecessary (see 1967)	A 10 year study in the United Kingdom by A Spence et al (*Bull NY St Postgrad. December 1985:140)* . Involved 11,500 female medical graduates 40 years or younger with an 85-92% response rate showed no increased risks to mother or baby, whether scavenging or not and with numerous other factors considered
1985	Australia becomes first country to screen all blood products for HIV which had become clinically significant in the early 1980s	
1985	Percutaneous tracheostomy technique refined with serial dilating methods (see 3600 BC, 2000 BC, 1546, 1620, 1625, 1909, & 1955)	Dr Pasquale Ciaglia et al (USA)
1985	Racz & Allen laryngoscope blade produced	Drs Gabor B Racz and Forrest B Allen of the Texas Tech University Health Sciences Center. This was a straight blade version of the Onkst blade that incorporated a similar collapsing mechanism to avoid dental pressure. Marketed by Anesthesia Medical Specialties, California
1986	Propofol (diisopropylphenol) in soybean oil emulsion (see 1977) released for clinical use in humans. The previous cremophor carrier preparation had not been released due to anaphylactoid problems with that particular carrier	Imperial Chemical Industries (ICI). ICI became Zeneca in 1993 which then merged with Astra in 1999 to become AstraZeneca
1986	Combined spinal & epidural (CSE) Tuohy needle with "back hole" introduced	Professor Kazuo Hanaoka, Department of Anesthesiology, University of Tokyo, Japan
1986	Use of activated charcoal filter in anaesthetic machine gas circuitry first mooted to prevent volatile anaesthetic agents reaching a malignant hyperthermia-susceptible patient	Dr Ernest R Greene Jr, University of Alabama at Birmingham, Alabama
1986	The first formal intensive care training course instituted	Under the guidance of the Joint Advisory Committee for Intensive Therapy (JACIT). This Committee was formed by several Royal Colleges in England. The course was a two year training program
1986	First syringe pump fully suitable for use in the administration of intravenous anaesthetic agents produced (see 1981)	Following a request from John B Glen of ICI (the producer of propofol) to many infusion device manufacturers, the Ohmeda Company (subsidiary of BOC Healthcare) responded and developed the Ohmeda 9000 syringe pump. Until then, syringe drivers could produce a maximum flow rate of 99 ml/hour. The Ohmeda 9000 could administer bolus infusion rates up to 1200 ml/hour and continuous infusion rates up to 200 ml/hour. It could also be interfaced with a controller for computer-controlled infusions
1986	History of Anaesthesia Society founded	This was founded in the United Kingdom and was inspired by the success of ISHA 1 held 4 years previously in Rotterdam
1987	The American Society of Anesthesiologists' Relative Value Guide (RVG) adopted by the American Medicare system as the basis for remuneration of American anesthesiologists (see 2001)	This was done at the instigation of the American Society of Anesthesiologists but it had taken many years for that Society to persuade the goverment as they had developed the Guide for their own use in the 1950s. The Society formally adopted their RVG for use in 1961 mainly in the private sector
1987	The Relative Value Guide (RVG) introduced into Australian practice of anaesthesia (but not then accepted by the Australian Government Medicare system)	The Economics Advisory Committee (EAC) of the Australian Society of Anaesthetists under the Chairmanship of Dr Gregory Deacon who was the moving force behind the introduction of this system for formulating anaesthesia accounts in Australia (see 2001)
1987	Flumazenil (Anexate) marketed (see 1979)	Hoffmann-LaRoche
1987	Sprotte needle introduced after a published trial of 34,000 cases	Dr Jürgen Sprotte - modified the Whitacre needle. The needle was further modified in the 1990s
1987	Bainton laryngoscope blade produced	Dr C R Bainton, Department of Anesthesia, University of California, San Francisco. The distal section of this blade is tubular to protect one's view from oedematous tissue, blood or tumour pushing across the end of the blade - "*to overcome pharyngeal obstruction* "
1987	Callander & Thomas laryngoscope blade introduced	C C Callander & J Thomas. This was a modification of a Macintosh blade that had a reduced flange height (proximal part almost completely cut away) to prevent dental pressure during a difficult intubation
1987	Mizus Endotracheal Tube Replacement Obturator (METTRO) produced (key word: exchange catheter) (see 1978 & 1990)	Dr Irving Mizus, Pulmonologist, Kensington, Maryland, USA. This was a solid core bougie with a flexible tip and had insertion-distance markings
1988	Pathogenesis of "Halothane Hepatitis" elucidated (see 1966)	Dr Burnell R Brown (USA)
1988	Patient Controlled Epidural Anaesthesia (PCEA) introduced	Dr David R Gambling et al in Canada

1988	"Belscope" laryngoscope blade produced	Dr C Paul Bellhouse, Australian anaesthetist. This is an angulated straight blade (45° at the mid point) and also utilises a prism attachment
1988	"Classic" laryngeal mask airway (LMA) produced on a commercial basis (manufactured by Bivona Inc, USA) (multiple entries, key word: LMA)	Designed by Dr Archie Ian Jeremy Brain while at the London Hospital in Whitechapel (now the Royal London Hospital) and who also coined the device's name. The prototype, first used in 1981 on a patient at the William Harvey Hospital in Ashford, was developed by adapting rubber Goldman nasal masks used for dental anaesthesia which he fashioned more accurately later from plaster casts of cadaveric pharyngo-laryngeal structures. Approximately 5,000 cases had been performed using prototypes before this commercial production. This was the original LMA and was re-usable. Made of silicone (since 1986) and available in sizes 3, 4, 5 & 6. Later produced in paediatric sizes as well: 1, 1½, 2 & 2½. Royal East Sussex Hospital was the first hospital to purchase the devices but all UK hospitals were using them by 1990. (***Kind acknowledgement is made of Mr Tim Shao, Group Product Manager - Acute Care/Anaesthesia & EMS, Teleflex Medical Australia & New Zealand, for his assistance in dating the commercial availability of the various LMA devices listed in this timeline. Teleflex Inc. bought the original production company, LMA International (started by Robert Gaines-Cooper, Michael Panter & Archie Brain in 1983) for $276 million in 2012***)
1988	"Flexible" laryngeal mask airway (LMA) commercially available (multiple entries, key word: LMA)	Designed by Dr Archie Ian Jeremy Brain. Available in both re-usable and single-use versions (the latter version available in 2004). A wire coil was included in the 'flexible' tube from 1990. Available from sizes 2 to 6
1988	The Pollard test for accuracy of endotracheal tube placement described in the literature	Drs Brian J Pollard, John O'Leary & M J Ryan, Repatriation General Hospital, Concord, Sydney. This technique had been used for several years by Dr Pollard and he had first described it in a poster exhibition at the European Congress of Anaesthesiologists in Hamburg in 1980. It announced a 100% accuracy in distinguishing between correct endotracheal placement and incorrect oesophageal placement of an endotracheal tube following intubation. The test consists of attaching a 50ml syringe, via airtight connectors, to the endotracheal connector of the tube whose cuff has been inflated and then attempting to withdraw the plunger. The easy withdrawal of 30ml of air shows correct positioning, while a rebounding plunger (from suction on the oesophageal wall) shows mis-positioning of the endotracheal tube
1989	Cisatracurium synthesized	Mary Jackson & James Wisowaty (Burroughs Wellcome (GSK))
1989	Cisatracurium further developed	Maehr & Wastila (Burroughs Wellcome (GSK)) with Dr John Savarese
1989	Bullard laryngoscope blade produced	Dr James Roger Bullard, Director Obstetrical Anesthesia, Medical College of Georgia in Augusta. This was designed specifically for cases of difficult intubation in both children and adults. It has a built-in rigid blade that has a right angle in it; a fibreoptic light source attachment; an external eye piece; and 2 ports - one for oxygen, suction or injection and one for introducing a stylet. Manufactured by Circon Corporation, California
1989	Microcatheters introduced for use in continuous spinal anaesthesia	Drs Ronald J Hurley & Donald H Lambert, Boston, USA. These catheters were 32G and introduced through a 26G needle. They were designed to reduce the incidence of post-dural puncture headache. Because of technical difficulties with such fine catheters, Kendall Healthcare Company, Massachusetts, then advocated 28G microcatheters through 22G needles. Reports (12 in total) of cauda equina syndrome led to the Food & Drug Administration banning microcatheters smaller than 24G in 1992.
1989	First video laryngoscopy performed (see 1999)	Professor Peter Bumm, Head of ENT Department, Zentral-Klinikum, Augsburg, Germany. He used a Karl-Storz rigid endoscope

	The Australian Patient Safety Foundation (APSF) incorporated	The idea for this organization's founding came from a symposium held in Adelaide in 1987 devoted to patient safety and monitoring. That symposium gave rise to an incident monitoring study of anaesthesia titled "AIMS - Anaesthesia". This continuing study received Federal government funding in 1993 and, in 1994, was widened to cover all specialties. In 1996, the APSF established the "Australian Incident Monitoring System" covering all public health units in the State of South Australia. Since then, the system has been adopted widely, including overseas in New Zealand, the USA and South Africa. Analysis of data collected by the system discovers problems and enables corrective measures to be taken
1980s	Anaesthetists start wearing protective gloves routinely (see 1894 & 1965)	This was brought on by the increased likelihood of contamination from AIDS and hepatitis following the worldwide development of the former and the increasing incidence and recognition of the different forms of the latter
1990	Australia becomes second country to screen all blood for Hepatitis C	
1990	Sevoflurane introduced for clinical use (see 1960-1971 entry)	Maruishi Pharmaceutical Company in Japan
1990	The EMG electrode endotracheal tube invented	Drs Andrew C Goldstone & Raymond L Schettino, Baltimore. Now called the "Nerve Integrity Monitoring Electromyographic Endotracheal Tube" as manufactured by Medtronic. Devised to monitor neural function of the recurrent laryngeal nerve and also the vagus nerve during neck surgery
1990	Choi laryngoscope blade produced	Dr Jay Jong-Il Choi, Newark, New Jersey. This was a flangeless double-angled straight blade with a proximal angle of 20° and a distal angle of 30°. Manufactured by Anesthesia Medical Specialties, California
1990	Cook Airway Exchange Catheter produced (see 1978 & 1987)	Cook Critical Care. This flexible, hollow tube allows ventilation with a "Rapi-Fit" connector and so can also be used to "test extubate" a patient in case re-intubation becomes necessary
1990	First textbook on flexible fibreoptic laryngoscopy published (see 1965 & 1972)	Dr Andranik Ovassapian, titled *Fibreoptic Airway Endoscopy in Anaesthesia and Critical Care* , Raven Press, New York
1990	The 'Pain Treatment Center' of the Boston Children's Hospital conducted the world's first randomized trial of patient-controlled analgesia in paediatrics (see 1985)	The trial was conducted by Drs Charles B Berde, John D Yee, Navil F Sethna, Dennis Russo & Beate M Lehn. Results were published in the Journal of Pediatrics in 1991
1991	The multiple-angled laryngoscope blade adapter produced	S S Dhara (Anaesthetist) & T W Cheong (Biomedical Engineer) Department of Anaesthesia and Department of Biomedical Engineering. Singapore General Hospital, Singapore. This adaptor allows the Macintosh-type blade to be opened through multiple angles from 65° to 180°
1991	Ondansetron gains FDA approval (see 1970s, 1984 & 2002)	GlaxoSmithKline
1991	The Scottish Intensive Care Society founded	Glasgow anaesthetist, Dr A B M Telfer, became the first President. He had already served as President of the Intensive Care Society of the United Kingdom
1991	The Nobel Prize in Physiology or Medicine awarded for the establishment of the function of both single and multiple ion channels in cell membranes	Erwin Neher and Bert Sakmann, German biophysiologists. This involved the development of the "patch clamp technique" that could detect electrical currents of a trillionth of an ampere in cell membrane ion channels. Most of this research occurred in the 1970's and 1980's
1992	Rogers v Whitaker case in High Court of Australia - resulted in a duty of disclosure of risk for undergoing a procedure. A majority decision by Justices Mason, Brennan, Dawson, Toohey and McHugh stated: "The law should recognize that a doctor has a duty to warn a patient of the material risk inherent in the proposed treatment; a risk is material if, in the circumstances of the particular case, a reasonable person in the patient's position, if warned of the risk, would be likely to attach significance to it or if the medical practitioner is or should be reasonably aware that the particular patient, if warned of the risk, would be likely to attach significance to it." A 2015 decision in the UK (Montgomery v Lanarkshire Health Board), affecting both doctors and pharmacists, resulted in a similar decision for "informed consent" - a clear appreciation and understanding of the facts, implications, and possible consequences of an action (see 1957 Bolam)	Dr Christopher Rogers (Ophthalmologist) v Maree Whitaker (patient). Maree Whitaker had been blind in one eye from a childhood stick injury. She underwent surgery as an adult to try to improve the sight of that eye. Following surgery, she developed sympathetic opthalmia (1:14,000 incidence) in the other eye with drastic consequences
1992	Sub-Tenon's retrobulbar technique for local anaesthesia of the eye described and re-introduced (see 1805 & 1884)	Dr Julian D Stevens of Moorfields Eye Hospital in London writing in the British Journal of Ophthalmology. This journal article popularised a technique that had been described by several authors in the past, including C S Turnbull in 1884, K C Swan in 1956 and E Hansen et al in 1990

1992	Australian & New Zealand College of Anaesthetists (ANZCA) founded	2,100 founding members. Dr Peter Livingstone, as the last Dean of the Faculty of Anaesthetists of the Royal Australasian College of Surgeons, became the inaugural President. The College was born mostly out of the need to take full control of its assets as well as a general cry for independence. The Coat of Arms was designed by a committee chaired by Professor Arthur Barrington (Barry) Baker & included Dr Peter Livingstone, Dr David McConnel, Dr Michael Hodgson, Dr Peter Jones (RACS) & Mrs Joan Sheales (ANZCA Registrar/CEO)
1992	World-wide clinical trials with ropivacaine (Naropin)	Bo Thuresson af Ekenstam synthesized ropivacaine in 1957, the same year as bupivacaine, but it was not marketed until 1996
1992	Topical anaesthesia technique for phaecoemulsification in cataract surgery introduced	Drs Richard A Fichman and I H Fine (Connecticut) using tetracaine (Amethocaine)
1992	First use of ultrasound to perform an axillary block of the brachial plexus (see 1978, 1981 & 2006)	Fried & Fritz
1992	Schroeder Stylet designed. (Also called the Parker Flex-It Directional Stylet)	Dr Michael G Schroeder to aid both oral and nasal intubations. Manufactured by Parker Medical, Englewood, Colorado
1992	The term "Target Controlled Infusion" first used (see 1997)	Introduced in an article in *Anaesthesia* by S Chaudhri, M White & GNC Kenny. The article discussed the induction of anaesthesia using propofol
1992	The Chinese Society of Anesthesiology formed	
1993	EMLA 'patch' marketed (see 1984)	Astra-Zeneca
1993	Granisetron developed (see 1970s)	
1993	Faculty of Intensive Care (FIC) of the Australian & New Zealand College of Anaesthetists founded (see 2002, 2008 & 2010)	Dr Geoffrey Clarke appointed inaugural Dean
1993	ANZCA purchased the historic "Ulimaroa" in Melbourne to use as its headquarters	
1993	The European College of Veterinary Anaesthesia and Analgesia founded	By the Association of Veterinary Anaesthetists (see 1964)
1993	McCoy laryngoscope blade produced	Drs E P McCoy & R K Mirakhur at the Queen's University in Belfast. It was called the "levering laryngoscope" because of the ability to elevate ("lever") a flange, hinged 25mm from the tip of the blade, to lift the epiglottis anteriorly by squeezing a lever on the handle. Moving the lever 20° moves the flange 70°. Manufactured by Penlon, United Kingdom
1993	Parasacral sciatic nerve block described	N Y Mansour
1993	Laryngeal mask airway (LMA) first included in a difficult airway management algorithm (multiple entries, key word: LMA)	"Classic" LMA recommended for such use by R A Caplan, Professor Jonathan L Benumof, F A Berry et al in the *Practice guidelines for management of the difficult airway - a report by the American Society of Anesthesiologists*
1994	Desflurane introduced for clinical use (see 1960-1971 entry)	Ohio Medical Products
1994	Rocuronium introduced	Organon now Schering-Plough
1994	BIS - Bispectral Index monitoring of Electroencephalogram (EEG)- developed (FDA approval for assessing anaesthetic drug "effects" 1996 (also see 2003))	Aspect Medical Industries (USA)
1994	Tropisetron approved (see 1970s)	
1994	The WuScope marketed	Designed by Drs Tzu-lang Wu and Hsiu-chin Chou and marketed by Achi Corp in California. Consists of a rigid, bivalved, curved, tubular blade with a flexible fibreoptic component attachable to the blade handle. The blade has channels for each of the fibrescope, oxygen and endotracheal tube
1994	Fibrelightview Shuttle optical stylet produced	Anesthesia Medical Supplies
1994	The Intensive Care National Audit & Research Centre (ICNARC) established in England	Established by the Department of Health to provide comparative audit and evaluative research into the practice of intensive care
1995	Cisatracurium approved by FDA (see 1989)	
1996	Remifentanil gains FDA approval	Glaxo Wellcome
1996	Ropivacaine (Naropin) marketed	AstraZeneca
1996	Prions appear	United Kingdom

1996	Shikani Seeing Stylet produced	Developed by Dr Alan H Shikani, ENT surgeon, Baltimore, Maryland, USA. Manufactured by Clarus Medical, Minneapolis, Minnesota
1996	The "*Diprifusor* " syringe pump introduced specifically for the intravenous infusion of propofol (*Diprivan*) (see 1992, 1997 & 2002)	By Zeneca Pharmaceuticals Ltd (UK), the producers of propofol. Members of the University of Glasgow and numerous Glaswegian anaesthetists were also involved in development. The idea behind this instrument is to implement pharmacokinetic modelling (based on work by B Marsh et al published in 1991) to control the infusion rate of the pump such that the anaesthetist has direct control of blood concentration of drug rather than indirect control from infusion rate adjustments. The electronics in the system are run by a dual microprocessor. Numerous in-built safety mechanisms are provided in the pump/system including a pre-filled syringe tag recognition system (a radio frequency-based technology called Programmable Magnetic Resonance (PMR) developed by Scientific Generics Ltd (now Sagentia Inc.), Cambridge, UK.) that is capable of not only recognizing a Diprivan syringe but also the concentration of the drug in the syringe
1996	History of Anaesthesia Library, Museum & Archives ("HALMA") Committee of the Australian Society of Anaesthetists founded	
1996	Bestowal of the first Wood Library-Museum of Anesthesiology *Laureate of the History of Anesthesia*	Awarded to Dr Gwenifer Catherine May Wilson, anaesthetist, Sydney, Australia. The idea for this quadrennial award was conceived by the most notable Professor Nicholas M Greene and created by the Trustees of the Wood Library-Museum in 1993. Selection of recipient/s is not limited to anesthesiologists
1997	Dolasetron approved (see 1970s)	
1997	Henderson laryngoscope blade produced	Dr John J Henderson, Glasgow. This was a semi-tubular straight blade with a long straight tip
1997	Nanoscope optical stylet produced	Nanoptics Incorporated, Gainesville, Florida
1997	Flexguide optical stylet produced	Scientific Sales International, Kalamazoo, Michigan
1997	Video-Optically modified-Schroeder Stylet produced	Developed by Dr Markus Weiss, University Children's Hospital, Zurich. Manufactured by Volpi AG, Schlieren, Switzerland (see 1998)
1997	Visualized Endotracheal Tube (VETT) produced	This device has optical fibres embedded in the wall of the endotracheal tube but needs a separate stylet to direct its insertion. Manufactured by Pulmonx Incorporated, Redwood City, California
1997	"Unique" laryngeal mask airway (LMA) commercially available (multiple entries, key word: LMA)	Designed by Dr Archie Ian Jeremy Brain. This was the original "single-use" LMA introduced to prevent transmission of disease (particularly from 'prions' in this case) from patient to patient. It was made of polyvinyl chloride (PVC) as opposed to the usual silicone. Available in a full range of sizes from paediatric to adult size 5
1997	"Fastrach" laryngeal mask airway (LMA) commercially available. Also called the "Intubating" laryngeal mask airway (ILMA) (multiple entries, key word: LMA)	Designed by Dr Archie Ian Jeremy Brain (first prototype for this in 1983). Produced in both re-usable and single-use versions (the latter in 2006). It features a fixed curve and comes with a matching curved metal introducing flange. Designed specifically for cases of difficult airway intubation and cardiopulmonary resuscitation. A special LMA endotracheal tube is included for intubation through the mask's lumen. The LMA comes in sizes 3, 4 & 5 and the included ETT in sizes 6, 6.5, 7, 7.5 & 8
1997	Portex bougie introduced	This is a single-use endotracheal tube introducer. Official name being Portex Tracheal Tube Introducer.
1997	Aintree Intubation Catheter introduced	Dr Peter Charters, anaesthetist, Aintree Hospital, Liverpool, United Kingdom. This is a hollow bougie and was designed to be used with a fibreoptic bronchoscope inserted through its lumen for eventual endotracheal insertion through an insitu laryngeal mask airway (LMA). It is an adaptation of the Cook airway exchange catheter (see 1990) and has an internal diameter of 4.8mm. Manufactured by Cook Critical Care
1997	The (Adnet) Intubation Difficulty Scale (IDS) developed	Professor Frédéric Adnet et al, Paris. This assessed seven facets encountered during laryngoscopy and endotracheal intubation to provide a score reflecting the difficulty of the process for the information of anaesthetists involved in a patient's future intubation. Published in *Anesthesiology*

1997	The term "Target Controlled Infusion" recommended to be used to describe the overall function/aim of all computer-assisted infusion devices (see 1992, 1996 & 2002)	The use of this term was recommended to solve 2 issues: Firstly, to collate a rag-bag of acronyms describing computer-assisted infusions, viz: CATIA (computer-asssisted total intravenous anaesthesia); TIAC (titration of intravenous agents by computer); CACI (compputer-assisted continuous infusion); and CCIP (computer-controlled infusion pump). Secondly, to remove the implication that a computer, and not the anaesthetist, was controlling the anaesthesia (Reference: Anesthesiology 6 1997; 86:1430-1)
1998	Tramadol introduced into Australia (see 1970s)	Under licence from German pharmaceutical company - Grünenthal GmbH
1998	First COX-2 inhibitor marketed (celecoxib) (see 2009)	Pfizer Inc
1998	Aeroview optical stylet produced	Imagyn Medical Technologies Incorporated, Newport Beach, California. Its design was based on the mechanism of the Schroeder stylet
1998	Paediatric Video-Optical Intubation Stylet (VOIS) produced (see 1997 & 2000)	This has an external diameter of only 2.8mm, a malleable distal end and a separate channel for oxygen. Designed by Dr Markus Weiss, University Children's Hospital, Zurich. Manufactured by Volpi AG, Schlieren, Switzerland
1998	Frova bougie introduced	Designed by Professor Giulio Frova, Department of Anaesthesia & ICU, Spedali Civili, Brescia, Italy. This is a hollow, single-use, endotracheal tube introducer with a blunt curved tip with side ports to prevent whipping during jet ventilation. In "difficult airway" situations, ventilation can be achieved through it by attaching a "Rapi-Fit" 15mm connector. Official name of the device being Frova Intubating Introducer. Manufactured by Cook Medical Inc., Indiana, USA
1998	The "EuroSCORE" (**E**uropean **S**ystem for **C**ardiac **O**perative **R**isk **E**valuation) for assessing post-cardiac surgical patient risks first reported	At the European Association for Cardio-Thoracic Surgery conference in Brussels. It was then published in 1999 in the European Journal of Cardiothoracic Surgery by the authors - Drs S A M Nashef (UK), F Roques (France), P Michel (France) et al. The pilot study had been started in 1995. It was refined using a "logistic regression model" and this reported in 2003 in the European Heart Journal. The latter refined study involved 19,030 patients in 128 hospitals in 8 European countries looking at 97 potential risk factors. 17 factors were eventually chosen (9 patient-related, 4 cardiac-related & 4 operation-related) as indicators of higher complication rates, longer ICU stays and more post-operative long-term sequelae
1999	The "Revised Cardiac Risk Index" devised (aka "Lee's Revised Cardiac Risk Index") (see 1977 & 1998)	Dr T H Lee et al, USA. Published in *Circulation* . This involved studying 2893 patients undergoing major non-cardiac surgery. It comprises 6 pre-operative patient factors and is said to be more accurate than the Goldman Index for predicting cardiac death, non-fatal myocardial infarction and non-fatal cardiac arrest. In 2007 it was incorporated into the pre-operative guidelines of the American Heart Association and American College of Cardiology
1999	ANZCA's Faculty of Pain Medicine (FPM) founded	After wide consultation involving the Australian and New Zealand College of Anaesthetists, the Royal Australasian College of Surgeons, the Royal Australian and New Zealand College of Psychiatrists, the Royal Australasian College of Physicians and the Australasian Faculty of Rehabilitation Medicine (RACP). Professor Michael Cousins appointed inaugural Dean
1999	Intensive care medicine recognized as a specialty in England (see 1970& 2000)	
1999	Rofecoxib (Vioxx) launched onto the market (see 2004)	Merck & Co
1999	Ultrasound officially recommended for use in anaesthesia & intensive care for nerve blocks and intravascular line placement	Drs Hatfield & Bodenham at Leeds General Infirmary (Review article British Journal of Anaesthesia)
1999	Recombinant Factor VIIa (NovoSeven) approved by FDA	Produced by Novo Nordisk A/S, Bagsvaerd, Denmark in 1996
1999	Dexmedetomidine (Precedex) gains limited approval by FDA (see 2008 & 2011)	Approved only for analgesia & sedation in intubated patients in Intensive Care Units. Approval was refused in Europe. Development of the drug was based on molecule discovery by the Research & Development department of Finnish pharmaceutical company Orion Corporation. It underwent co-development with Abbott Laboratories from 1994 and is marketed by the Abbott spin-off company Hospira Inc.

1999	"Flexiblade" laryngoscope blade produced	Drs I Z Yardeni, Rabin Medical Center/Golda Campus, Israel, A Abramowitz, Kupat Holim Clinic, Israel, V Zelman, USC School of Medicine, Los Angeles & R L Katz, USC School of Medicine, Los Angeles. Another modified Macintosh blade with a movable joint in the middle of the blade whereby it could be flexed anteriorly while staying rigid; this movement controlled by a lever on the handle. Flexion helped to compress and reduce the curvature of the anatomy. Manufactured by Arco Medic Ltd, Omer, Israel
1999	The StyletScope produced	Designed by Dr Takayuki Kitamura et al, The Institute of Medical Science, Japan. Manufactured by Nihon Kohden Corporation, Tokyo. It has a built-in light source and a moveable tip to help guide the loaded endotracheal tube into the larynx
1999	Machida Portable Stylet Fiberscope produced	Machida Corporation, Chiba, Japan
1999	Berci-Kaplan video-laryngoscope developed	Berci-Kaplan DCI (direct coupling interface) video-laryngoscope. This was version one with version two (with MVM technology - micro video module) available in 2001 and version three (the V-MAC) in 2003. An advantage was that the blade was of regular Macintosh shape and hence familiar to many anaesthetists and could be used for either direct laryngoscopy or as a video device - a hybrid laryngoscope with a camera in the handle and a fibreoptic bundle in the blade. It was developed by Drs George Berci and Marshal B Kaplan (and according to one source - Dr Denham S Ward also). In 2008, version four was produced (the C-MAC) with a camera integrated in the blade, a CMOS chip (Complementary Metal-Oxide Semiconductor), LED (light-emitting diode) light and lithium ion battery. Manufactured by Karl-Storz Endoscopy
1999	*"Almost the perfect murder"* - quote from Judge Roderick Macdonald (at trial in Scotland in 2002)	Yvonne Davidson was found dead in a neighbour's yard and her death was at first thought to be from exposure and hypothermia after taking amphetamines, which were evident from toxicology. After boasting to a friend 18 months later, her lover, Craig McCreight, was arrested for her murder. It was then alleged he had smothered her with a rag soaked in chloroform. Re-testing of liver and blood samples revealed its presence. McCreight, sentenced to 'life' in 2002, was freed by an Appeal Court in 2009 when it was determined that "bad science" had been used at his initial trial - a laboratory mathematical error had reported a liver chloroform concentration 1,000 times more than it actually was. Some chloroform had also been found in the victim's stomach raising the legal question of possible suicide. A subsequent quest by McCreight for compensation for his 7 years in jail was refused by the Court of Session in 2016: *"There was strong and compelling evidence against him including two confessions...also what has happened here with the Appeal Court is merely an example of the vindication of the rule of law, not the righting of a mistaken verdict"*
1990s	Fentanyl patches	Dr Paul Jannsen of Jannsen Pharmaceutica
1990s	The FDA approved the use of AED's by lay personnel (key word: CPR)	This use also became covered by Good Samaritan legislation
2000	Carbetocin (Duratocin) marketed	Ferring Pharmaceuticals, Toronto, Canada
2000	TrachView Videoscope produced	This is a flexible fibreoptic endoscope with a pistol-type handle and eye piece. Manufactured by Parker Medical, Englewood, Colorado
2000	Video-Optical Intubation Stylet (VOIS) produced (see 1998)	This is a semi-rigid stylet that is malleable over the distal section and has a proximal adaptor to lock into the 15mm tube connector. Manufactured by Acutronic Medical Systems AG, Baar, Switzerland
2000	"ProSeal" laryngeal mask airway (LMA)commercially available (multiple entries, key word: LMA)	Dr Archie Ian Jeremy Brain. Prototype developed in 1995. Comes with bite block and 2 lumens - one for airway, the other for oesophageal access for a gastric tube. Has 2 cuffs - one for the usual seal around the glottis and the other for putting pressure from behind to increase the seal around the glottis (enabling 50% greater pressure seal). Also has an introducing tool. It is re-usable coming in sizes from paediatric to adult 5
2000	Chlorhexidine 2% with 70% Alcohol approved by FDA for skin antisepsis (see 1950 & 1954 also)	
2000	The Intercollegiate Board of Intensive Care Medicine takes control of Intensive Care training in England (see 1970 & 1999)	

2001	Sugammadex (a 'modified' gamma-cyclodextrin with a "torroid" structure) recognised and developed as the first 'Selective Relaxant Binding Agent' (SRBA) (see 1891, 1903, 1935, 1953, 2005 & 2008)	Dr Anton Bom while researching to increase the solubility of rocuronium at Organon Laboratories at Newhouse in Scotland (later owned by Schering-Plough and now owned by Merck, the world's oldest pharmaceutical & chemical company with roots dating from 1668 as an apothecary's shop in Darmstadt, Germany)
2001	First commercially available video-laryngoscope - the "Glidescope"	Designed by vascular & general surgeon Dr John Allen Pacey, Honorary Professor of Anaesthesiology, Pharmacology & Therapeutics Department, University of British Columbia, Canada. The idea came to him to adapt minimally invasive surgery techniques to endotracheal intubation after observing 2 experienced anesthesiologists struggle with a difficult intubation
2001	The McGrath Series 5 laryngoscope marketed (see 2010)	Aircraft Medical, Edinburgh, Scotland. This company was founded by the inventor of this scope, Matt McGrath, who had started designing the scope in 1999 (at the age of 21) in response to a design brief issued by The Royal Society of Arts in London. Design was based on research collated from 1,500 doctors. It was the world's first fully portable video-laryngoscope, being fully self-contained (power, camera & video monitor). The blade is covered by a disposable acrylic blade
2001	General anaesthesia banned in dental surgeries throughout the United Kingdom	Due to unacceptable morbidity and mortality
2001	The Australian Society of Anaesthetists' Relative Value Guide (RVG) adopted by the Australian Medicare system as the basis for remuneration of Australian anaesthetists (see 1987)	This RVG was based on the American RVG but was adapted to suit Australian practices. After many years of effort and negotiation (starting 1987) by the then Chairman of the Australian Society of Anaesthetists' Economics Advisory Committee (EAC), Dr Gregory John Deacon (later President of the Society), and backed by work of his committee, the Commonwealth Department of Health & Aged Care ran a feasibility study from April 1998 to February 1999 involving 47 hospital operating suites in 4 States. The RVG was eventually introduced into the Commonwealth Government's Medicare Schedule of Benefits in November 2001 at an allegedly cost-neutral $17.15 per Unit. This heralded a milestone whereby anaesthetists' fees were no longer tied to surgeons' fees, as a percentage or otherwise - they were now dependent on the degree of difficulty of the anaesthesia, the physical status of the patient and the duration of the procedure. The 'surgeon' connection had pertained since the very introduction of anaesthesia. As an example of past relativity, in 1886 in Australia, while a surgeon's fee varied from 50 to 100 guineas, the anaesthetist received between 1 and 5 guineas, depending more on the cost of nitrous oxide rather than the nature of the procedure or the skill of the anaesthetist. In 1945, in Australia, the maximum fee for an anaesthetist was still only 3 guineas! The appropriately assessed and indexed Unit value recommended (as a maximum) by the ASA and AMA stood at $86.00 in 2018 compared to the Government's Schedule recommendation of just $19.80, which had also been frozen/unaltered since 2012
2002	Joint Faculty of Intensive Care Medicine (JFICM) founded (see 1993, 2008 & 2010)	The JFICM was founded through cooperation between ANZCA and the Royal Australasian College of Physicians. Dr Felicity Hawker was appointed the inaugural Dean
2002	Ondansetron gains TGA approval (Australia)	GlaxoSmithKline
2002	Truview laryngoscope blade produced (see 2004)	A modified Macintosh blade with a removable lens system and eye piece. The lens system provides refraction of 20°. Produced by Truphatek International Ltd, Israel. Manufactured as ViewMax by Rüsch, Duluth, Georgia, USA
2002	The Dörges Emergency Laryngoscope Blade produced	Drs Volker Dörges and Markus Steinfath, Department of Anesthesiology and Intensive Care Medicine, University Hospital of Kiel, Germany. This blade has properties of both Macintosh and Miller blades and was designed to reduce the number of laryngoscope blades that need to be stored for emergency situations both in and out of hospital. It can be used on all patients from the age of one to adults. It also has a low profile of 16mm

2002	"Smart (computerized) Infusion pumps" began to be introduced (see 1963, 1973 & 1981)	These incorporated computer programs for precision dosing with error alerts, digital storage of and access to dosage guidelines and records, together with the capability of remote programming. The stimulus for these came after several studies into patient harm revealed highly significant results on medication errors. These studies were carried out around the turn of the century and included major reports from the Patient Safety Foundation (1997), the Institute of Medicine (1999) and the Health Grades Inc (2004) - (the latter alone covering 37 million patient records). Despite this advanced technology, these pumps have not been without problems (both mechanical and human error) as reflected by the 56,000 adverse events and 710 deaths together with 87 pump recalls reported to the USFDA in the 4 years between 2005 and 2009
2003	Palonosetron approved (see 1970s)	
2003	BIS monitoring gains FDA approval for assessing "depth of anaesthesia/awareness" (also see 1994)	
2003	Spectral Entropy monitoring of Electroencephalogram (EEG) developed	Datex-Ohmeda (now GE HealthCare) (Finland)
2004	Rofecoxib (Vioxx) withdrawn from the market (see 1999)	FDA - following evidence of high risk of stroke and myocardial infarction with long-term high-dosage use
2004	Microcuff paediatric endotracheal tube produced	Kimberley-Clark Corporation (Texas). This tube has a cuff that is made of ultra thin polyurethane that produces no lines or ridges, has no Murphy's eye and is for infants weighing more than 3 kgs
2004	The Truview EVO2 laryngoscope produced (see 2002)	Based on the Macintosh blade, this has a non-magnified optical side-port and provides a 42° angled refraction. It has an oxygen port and can have a camera attached to the eye-piece. It is manufactured by Truphatek Int. Ltd. in Netanya, Israel
2005	The "Yeescope" launched - world's first disposable laryngoscope	Dr Kevin Yee & Mr Mark Bennett (the latter of Bennett Precision Tooling) - Sydney, Australia
2005	C-Scope video-laryngoscope introduced	Developed by Dr Jon Berall, then a US military Internist. Full name is Coopdech C-Scope Video Laryngoscope. It has an LCD (liquid crystal display) monitor on the handle, and LED (light emitting diode) light source, a rechargeable lithium ion battery and disposable blade covers
2005	Parecoxib refused approval in the USA by FDA	
2005	First human studies using Sugammadex (see 1891, 1903, 1935, 1953, 2001 & 2008)	F Gijenbergh et al using 29 male volunteers at Stuivenberg Hospital, Antwerp, Belgium
2005	"CTrach" laryngeal mask airway (LMA) commercially introduced (multiple entries, key word: LMA)	This LMA comes with integrated fibreoptic channels, and a detachable LMA CTrach™ Viewer screen, which allows viewing of the larynx and thus helps endotracheal intubation through an LMA. It is billed as the only difficult airway device that enables combined ventilation, visualization, and intubation
2005	The European Society of Anaesthesiology (ESA) formed	Its founding President, Professor Thomas Pasch, was responsible for its formation with the amalgamation of the European Society of Anaesthesiologists (ESA), the European Academy of Anaesthesiology (EAA) and the Confederation of European National Societies of Anaesthesiologists (CENSA). There are currently 39 national Societies that are members of the ESA
2006	The Silbronco double-lumen endobronchial tube produced	Drs Jens Lohser and Jay B Brodsky, Department of Anesthesia, Stanford University School of Medicine, California. This was made of silicone and was slightly smaller than its predecessors in length and cuff size and had a distal anti-kink wire coil - all of which was thought to make it safer
2006	The Airway Scope produced	Drs Jun-ichi Koyama et al, Department of Neurosurgery, Shinshu University School of Medicine. Produced by Pentax, Tokyo. This is a flexible video laryngoscope with a channel for a suction catheter. It is short in length and is inserted through a rigid disposable blade with an integrated channel for passage of the endotracheal tube
2006	Airtraq video-laryngoscope introduced	A rigid plastic, single-use, battery powered device that has an in-built channel to direct the endotracheal tube. It was developed by Dr Pedra A Gandarias with assistance from the Spanish Navy. Manufactured by Prodol Meditec, Spain and King Systems Corporation, Noblesville, Indiana, USA

2006	Levitan FPS (First Pass Success) Optical Stylet introduced	Designed by Dr Richard M Levitan, Emergency Medicine Physician, Thomas Jefferson University Hospital, Franklin, New Hampshire, USA. This is a malleable device. Manufactured by Clarus Medical Inc., Minneapolis, Minnesota, USA
2006	Corner Cube Reflectors (CCR) echogenic ultrasound needles produced (see 1978, 1981 & 1992))	Hakko-Medical Co., Lt, Japan. Co-developer was Dr Yutaka Sato of the Anaesthesiology Department, Tsugaru General Hospital, Aomori Prefecture, Japan (Personal communication with Masanori Yamagishi, Sales Manager of International Marketing & Sales, Hakko-Medical). These needles are particularly notable for the mutually orthogonal surfaces in their reflectors
2007	Pseudocholinesterase (butyrylcholinesterase) synthesized in clinically-useful quantities using genetically-modified goats(see 1968)	PharmAthene
2007	"Supreme" laryngeal mask airway (LMA) commercially available (multiple entries, key word: LMA)	Designed by Dr Archie Ian Jeremy Brain. A single-use device with an in-built bite block and a rigid curve in the tube that has 2 lumens. Said to be a combination of ProSeal, ILMA and Unique features. Comes in full range of paediatric to adult 5 sizes
2007	Dr Archie Ian Jeremy Brain awarded a "Medical Futures Lifetime Achievement Award"	This was awarded "for changing people's lives" by his dedication to the development of the numerous laryngeal mask airway (LMA) devices. The award was also endorsed by both the Royal College of Anaesthetists and the Association of Anaesthetists of Great Britain & Ireland. His original device had already received the Queen's Award for Industry in 1993
2007	The "i-gel" supraglottic airway first marketed	Intersurgical Complete Respiratory Systems, Berkshire, UK. These airways had been designed and developed by Dr Muhammed Aslam Nasir, an anaesthetist working in England. The bulk of his development and testing work was undertaken in his native Pakistan. The devices are disposable and latex-free, being made from a thermoplastic elastomer - Styrene Ethylene Butadiene Styrene (SEBS). They have a non-inflatable cuff, an 'epiglottic rest', a channel for gastric suction and an in-built bite-block. They have a broad lateral profile to help prevent rotation when in-situ. Adult sizes were marketed in 2007 and paediatric sizes in 2009
2008	Sugammadex gained approval for use in humans by European Union and by the Therapeutic Goods Administration (TGA) in Australia but failed to gain approval by the Federal Drug Administration (FDA) in the United States (see 1891, 1903, 1935, 1953, 2001 & 2005)	Organon (now Schering-Plough)
2008	Dexmedetomidine (Precedex) approved by FDA for wider applications (see 1999 & 2011)	Approval extended to cases of non-intubated sedation (following the MAC Trial - Monitored Anaesthesia Care) and to cases requiring awake fibreoptic intubation (AWAKE Trial)
2008	Dabigatran (Pradaxa, Pradax or Prazaxa) marketed	Boehringer Ingelheim. Initially approved by the European Medicines Agency and by the National Health Service in Britain. Approved by USA FDA in 2010
2008	The Papworth BiVent double-lumen endotracheal tube described	Dr Sunit Ghosh et al, Papworth Hospital, Cambridge. A single tube with 2 lumens. The distal end terminates in a divided flange that sits on the carina and a blindly-placed bronchial blocker can be threaded down either side
2008	College of Intensive Care Medicine (CICM) founded in Australia (see 1993, 2002 & 2010)	The CICM replaced the JFICM. Dr Vernon Van Heerden, both a Specialist Anaesthetist and a Physician was the inaugural President
2008	The Australian Intensive Care Network (ICN) founded	Started in Sydney by Drs Liz Steel and Hergen Buscher with the aim to educate, link and stimulate all healthcare professionals involved in critical care
2009	ANZCA makes participation in the Continuing Professional Development (CPD) program mandatory	
2009	Pulse oximetry becomes non-clinical - "vitality sensor"	Nintendo Corporation
2009	Admission that the results of studies used to gain USA and European approval for celecoxib had been fabricated to exaggerate the efficacy of the drug. Note that the actual studies were never themselves submitted! (see 1998)	Dr Scott S Reuben, former Chief of Acute Pain at Baystate Medical Centre in Massachusetts, was the perpetrator of the fraud
2009	Report on "surgical" fires (also see 1964)	FDA reported there were at least 600 "surgical" fires out of 22 million in-patient and 50 million out-patient operations during the year. The actual number of fires is believed to be greatly under-reported
2010	The (Y-shaped) EZ-Blocker bronchial-blocker produced	Dr H E Mungroop et al, University Medical Center, Groningen, The Netherlands
2010	The McGrath MAC laryngoscope introduced (see 2001)	Aircraft Medical, Edinburgh, Scotland
2010	College of Intensive Care (CICM) started training its trainees (see 1993, 2002 & 2008)	Initially training in Intensive Care had been provided by the Faculty of Anaesthetists of the Royal Australasian College of Surgeons and the Royal Australasian College of Physicians in separate training programs from 1976

2011	Thiopentone becomes unavailable in USA, Canada & Australia (temporarily in the latter until obtained from a different manufacturer)	The manufacturer, Hospira, ceased production in the US because pentothal was being used for state-sanctioned executions. Hospira's plant in Italy continued production but the Italian Government banned its export to the USA for the same reason. Canada & Australia suffered secondarily, temporarily leaving them with no alternative to propofol for IV induction
2011	FDA approves Exparel (bupivacaine extended-release liposome injection) for long-acting non-opioid post-surgical anaesthesia/analgesia	Pacira Pharmaceuticals
2011	Dexmedetomidine (Precedex) gains approval in Europe (see 1999 & 2008)	
2011	First I-Phone application for automatic blood pressure monitoring (see 1976)	Withings (consumer electronics company) in Issy les Moulineaux in France
2011	The Japanese Museum of Anesthesia established by the Japanese Society of Anesthesiologists	This was the first historical museum to be established in Japan by any Japanese medical society
2012	"SureSeal" laryngeal mask airway (LMA) commercially available (multiple entries, key word: LMA)	Designed by Dr Archie Ian Jeremy Brain. Produced with a pre-curved tube and a cuff pilot valve showing cuff pressure (this latter device available from 2010). Both single-use and re-usable versions. Reinforced version called "Flexy Plus". Full range of sizes from paediatric to adult 6
2013	Technique of Transnasal Humidified Rapid-Insufflation Ventilatory Exchange ("THRIVE") developed	Drs Anil R Patel (Anaesthetist) and S A R Nouraei (Surgeon), The Royal National Throat Nose and Ear Hospital, London and University College Hospital NHS Foundation Trust, London. Use of this technique, with 70L/min flow of oxygen, has allowed apnoeic oxygenation of patients for longer than 1 hour without undue rises in post-apnoeic end-tidal CO_2 levels. Its use is advocated for approaching cases, involving difficult airway access, in order to buy time to secure a formal airway
2013	"Supreme 2nd Seal" laryngeal mask airway (LMA) commercially available (multiple entries, key word: LMA)	Designed by Dr Archie Ian Jeremy Brain. Produced with a specific upper oesophageal sphincter seal as well as the usual oropharyngeal seal
2013	"Guardian" laryngeal mask airway (LMA) commercially available (multiple entries, key word: LMA)	Designed by Dr Archie Ian Jeremy Brain. Similar to Supreme but more flexible. Also has a scavenge port as well as a gastric channel. Has a cuff pressure pilot valve enabling a safe high pressure seal
2014	Announcement of the development of the first long-lasting, implantable, artificial heart - called the BiVACOR	Developed by Dr Daniel Timms PhD, mechanical engineer, Brisbane, Australia. This device is frictionless and has only one moving part, which rotates in a magnetic field. It produces a pulseless pump/circulation. Made of titanium; about the size of a tennis ball; weighs about 500gms. It took 15 years to develop and, while successfully tried in cattle and sheep as of early 2015, it is yet to be trialled in humans
2014	First anesthesiologist elected to the United States' National Academy of Sciences	Dr Emery N Brown, Professor of Anesthesia at Massachusetts General Hospital and Harvard Medical School. He has contributed greatly to the neurophysiological understanding of general anesthesia
2014	The American Society of Anesthesiologists' House of Delegates approved the latest changes to its classification of a patient's pre-operative physical status. The modifier "E" for emergency was retained as a separate entity. The Australian Society of Anaesthetists adopted the basis of this system in 1987 (refer) but then subsequently added modifiers and classifications to account for the extremes of age (less than 12 months or 70 years or older), services delivered after-hours and services provided to patients having surgery in the prone position, or being morbidly obese, or being in the third trimester of pregnancy (see 1941)	**Class 1 (P1):** A normal healthy patient; **Class 2 (P2):** A patient with a mild systemic disease; **Class 3 (P3):** A patient with a severe systemic disease that is not life-threatening; **Class 4 (P4):** A patient with a severe systemic disease that is a constant threat to life; **Class 5 (P5):** A moribund patient who is not expected to survive more than 24 hours without the operation; **Class 6 (P6):** A declared brain-dead patient whose organs are being removed with the intention of transplanting them into another patient
2015	"Protector" laryngeal mask airway (LMA) commercially available (multiple entries, key word: LMA)	Designed by Dr Archie Ian Jeremy Brain. Trademark applied for in 2012, it is also modelled on the Supreme but is more flexible

2020	Mechanism of general anaesthesia demonstrated (published in *Proceedings of the National Academies of Sciences*) (see 1899)	Using nanoscale microscopy (itself a Nobel Prize-winning technology called dSTORM = "direct stochastical optical reconstruction microsopy"), chloroform and experiments in fruit flies (Drosophila melanogaster) scientists from the United States' Scripps Research Institute (chemist Richard Lerner MD & molecular biologist Associate Professor Scott Hansen PhD) have shown that the anaesthetic agent causes the normally ordered state of lipid clusters, called "lipid rafts" or "GM1", in the cell membrane to become grossly disorganized. This also causes the membranes to swell. A chain of events occurs as these GM1 clusters disrupt and spill contents, including an enzyme phospholipase D2 which acts on different lipid clusters, called "PIP2", and causes activation of their molecules, including "TREK1" potassium ion channels and their lipid activator, phosphotidic acid. Activation of TREK1 channels prevents neuronal excitation resulting in loss of consciousness
2021	The Australian and New Zealand College of Anaesthetists (ANZCA) adopts an alternative-use Maori name as a compliment to New Zealand members	The name is **Te Whare Tohu o Te Hau Whakaora** (phonetically pronounced: Teh / Far-re / Tor-who / Or / Teh / Hoe / Far-car-or-rah). The magazine, ANZCA Bulletin (Autumn 2021), provides the following interpretation: i. **Te Whare Tohu** denotes the status of a college or, literally, a "significant house"; ii. **o** means "of"; and iii. **Te Hau Whakaora** means The Life-Giving Breath. The words "Hau" and "Whakaora" have multiple meanings including: a. **Hau** – breath, wind, gas, vital essence of life, aura, prestige, eminence. b. **Whakaora** – revive, revitalise, rescue, restore to health, cure, healing. This Maori name, therefore, falls into sync with ANZCA's Latin motto of "**corpus curare spiritumque**", which can be interpreted as "to care for the body and its breath of life".
2021	The Scott Airway Management (SAM) Safety Shield system launched	Dr Paul Ferguson Scott, Specialist Anaesthetist in Brisbane, Australia, conceived this idea by drawing on a cafe napkin in 2018. It was designed to enhance bag-mask-ventilation (BMV) in patients with beards, with misshapen facial features or who are edentulous. It can also be used to reduce aerosolization during BMV. It provides a seal with a large soft and flexible silicone phlange that spreads laterally around the cheeks, conforming to the face and, with a Guedel airway built in, thus aids BMV. A version using an Oxyguard Bite Block Valve also enables such procedures as endoscopy, bronchoscopy and trans-oesophageal echo-cardiography to be undertaken in these patients. Dr Scott has received the Australian "Good Design Award" for this device
2022	The first pig-heart-to-a-human transplant performed (xenotransplant)	This operation was performed by Dr Bartley P Griffith at the University of Maryland Medical Center (UMMC) in Baltimore, USA. The 57 year old patient, David Bennett Sr., received the heart on January 7 and survived until March 8. The donor pig had been bred genetically modified and there had been no signs of 'rejection' with the concomitant immunosuppression of the patient