The Scientific Genealogy Harry B. Gray

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Franciscus Sylvius

M.D. Basel 1637

Lived 1614-1672. Physician and professor of medicine; one of the first to defend

Harvey's new theory of the circulation of the blood; described the anatomy of

the brain and cerebral arteries; champion of iatrochemistry – the idea that

illnesses are treatable by chemical medicines; investigated heat given off when

acids react with alkalis and iron filings.

Burchard de Volder

Lived 1643-1709. Professor of natural philosophy and mathematics; enthusiastic follower of Boyle; published studies on the weight of air; improved the air-pump; set up the first physics lab in Leiden; co-edited the works of Christian Huygens.

Hermann Boerhaave

M.D. Harderwijk 1693

Lived 1668-1738. Founder of clinical teaching; established that smallpox is

spread by contact; outstanding teacher and writer; introduced exact quantita-

tive methods into chemistry by measuring temperature and using the best

available balances; considered the founder of physical chemistry; first to obtain urea and discovered its diuretic properties; demonstrated that water is a product

of the combustion of alcohol; provided evidence against the transmutation of

metals; proved experimentally that heat is weightless and carried out first calori-

metric studies; classified and studied solubilities of salts.

Andrew Plummer

M.D. Leiden 1722

Lived 1698-1756. Professor of chemistry. Analyzed mineral waters and coal;

established teaching of modern chemistry in Britain; developed "Plummer's

pills" which were used for nearly 200 years to treat various diseases – the pills

contained antimony sulfide and mercuric chloride (calomel).

William Cullen

M.D. Glasgow 1740

Lived 1710-1790. Professor of medicine and chemistry. Held first independent

lectureship in chemistry in the British Isles and first at Glasgow to teach in

English rather than Latin; discovered the phenomenon of the cold produced by

evaporating fluids; first to give symbolic precision to the affinity tables then in

vogue; studied various medical phenomena, especially the classification of

diseases; suggested analysis of soils for nitrate content to determine soil fertility.

Benjamin Rush

M.D. Edinburgh 1768

Lived 1745-1813. Aided writing of and signed the Declaration of Independence;

cooperated with Thomas Paine in publishing Common Sense; professor of chem-

istry at Philadelphia; analyzed mineral ores and spring water; wrote first chemis-

try textbook by an American; first American psychiatrist; founded first free

dispensary in the US, first antislavery society, and the College of Physicians; the

"father of chemistry in America".

James Woodhouse

M.D. Pennsylvania 1792

Lived 1770-1809. Founder of Chemical Society of Philadelphia – the first chemi-

cal society in the world; determined that "heavy inflammable air" is not hydro-

gen but an oxide of carbon (CO); studied action of poison ivy for medical

purposes; opponent of phlogiston theory; independently of Davy, may have

prepared potassium from soot and potassium carbonate; discovered fixation of

nitrogen by the cyanide process; studied indelible ink, heats of evaporation, the

making of bread, the combustion of coal, and the refining of camphor; explained role plants play by their uptake of carbon dioxide.

Benjamin Silliman, Sr.

A.M. Yale 1799

Lived 1779-1864. Education in law. Taught chemistry, pharmacy, geology, and

mineralogy; discovered the fusion of carbon by electric arcs; performed first

chemical analysis of petroleum; founded Am. J. Sci. in 1818, the oldest scientific

journal in America; co-founded the AAAS; "the most eminent of American teach-

ers of natural science".

Amos Eaton

A.B. Williams 1799

term for forgery and continued his studies at Yale. Itinerant lecturer in New

England and the Hudson Valley, specializing in chemistry but also teaching

geology, botany, and zoology; persuaded Stephen van Rensselaer to finance a

school for training "in the application of science to the common purposes of life"

Douglass Houghton

A.B. Rensselaer 1829 Lived 1809-1845. Surgeon and botanist on expedition to find the source of the Mississippi; Michigan state geologist; twice served as mayor of Detroit and

engaged in profitable real estate enterprises there; appointed first professor of

geology, minerology, and chemistry at the University of Michigan, but never

taught courses in the latter.

Silas Hamilton Douglas M.D. Maryland 1842

Lived 1816-1890. Co-authored (with A.B. Prescott) Qualitative Chemical Analysis;

established chemistry laboratory at Michigan.

Albert Benjamin Prescott

M.D. Michigan 1864

Lived 1832-1905. Founded qualitative organic analysis; studied toxicology of

alkaloids, especially the composition of alkaloidal periodides; investigated the structure of caffeine; developed first assay for opium; wrote textbooks on qualitative analysis and organic chemistry.

Moses Gomberg

Giulio Cesare Casseri

M.D. Padua 1580 Lived 1552-1616. Professor of surgery and anatomy; gave first detailed descriptions of the organs of speech and hearing; published anatomical tables.

Nicolo da Lonigo M.D./Ph.D. Padua 1453

Lived 1428-1524. One of the most famous scholars of his time and largely responsible for the reformation in medicine in the 16th century; professor of mathematics, Greek philosophy, and medicine; pioneer in the accurate translation of ancient Greek medical texts into Latin, especially those of Galen and Hippocrates; published first scholarly work on syphilis.

Antonio Musa Brasavola M.D./Ph.D. Ferrara 1520

Lived 1500-1555. Physician to Francis I of France, Kaiser Charles V of Germany, King Henry VIII of England, and four popes; introduced the use of many plants for medical purposes; organized the famous botanical gardens of Belvedere.

Gabriele Fallopio M.D. Ferrara 1548

Lived 1523-1562. Professor of botany, surgery, and anatomy; discovered Fallopian tubes; described the anatomy of the kidneys; described the structure of the skull with its muscles and nerves; studied the ossification of bones and dentition of the teeth during growth; first to describe the cochlea, the vestibules, and the semicircular canals of the ear; colleague and supporter of Vesalius.

Girolamo Fabrici M.D. Padua 1559

Lived 1533-1619. Professor of anatomy and surgery; first to detail the valves in veins; wrote treatises on the anatomy of the larynx, the lens of the eye, the mechanics of respiration, and the actions of muscles; published exhaustive study of the development of the chick embryo and thereby founded the fields of comparative and developmental embryology.

Adriaan van den Spieghel M.D. Padua 1603

Lived 1578-1625. Professor of anatomy, surgery, and botany; published works on malaria and tapeworms, and one of the first texts on plant anatomy; wrote an influential anatomical text, De humani corporis fabrica.

Werner Rolfinck

M.D. Padua 1625 Lived 1599-1673. First professor of chemistry in Jena; also taught anatomy, surgery, and botany; aroused controversy by giving lectures that involved the dissection of executed criminals; first to demonstrate the location of cataracts in the lens of the eye; wrote texts on pharmaceutical chemistry; opposed alchemical and superstitious thinking, and wrote book on chemical impossibilities such as the transmutation of metals to gold, the resuscitation of a plant from its ashes, and obtaining oils from precious stones.

Georg Wolfgang Wedel

M.D. Jena 1669 Lived 1645-1721. Professor of surgery, botany, theoretical medicine, practical medicine, and chemistry; prolific author, especially on alchemy and pharmaceutical chemistry; studied plating of copper onto iron from copper sulfate solutions; studied volatile salts obtained from plants; invented new medicines; drew up a new and accurate edition of the Greek Bible translated into German.

Johann Adolph Wedel

M.D. Jena 1697 Lived 1675-1747. Professor of medicine; published texts on ferr camphor, magnesium carbonate, the combustion of sulfur, and medicine.

Georg Erhardt Hamberger

Ph.D. Jena 1721 Lived 1697-1755. Professor of medicine, surgery, and botany; studied the physiology of respiration, especially the mechanism of breathing; wrote important textbook on physiology and described the function of the thorax muscles, intercostal muscles, and pleural sac; studied reaction of camphor with nitric acid.

Christoph Andreas Mangold

M.D. Erfurt 1751 Lived 1719-1767. Professor of anatomy, chemistry, and philosophy; investigated the chemistry of gunpowder; analyzed cinnabar; proposed a new system of medical thought based on the ideas that a medical diagnosis can only be made after careful comparison of the patient's symptoms and medical tests with those of many other previously studied patients; recognized the importance of distin-

guishing the underlying illness and the overlying complications.

Ernst Gottfried Baldinger

M.D. Jena 1760 Lived 1738-1804. Professor of medicine; founded a chemical laboratory at Marburg; established the first specialized scientific journal published in any language, Magazine fur Ärzte; wrote text on medical ailments of soldiers based on his experiences as a surgeon in the Seven Years' War.

Johann Christian Wiegleb

Apothecary Langensalza 1765 Lived 1732-1800. Phlogistonist; apothecary; founded the first pharmaceutical institute in Germany; investigated fermentation, alkaline salts in plants, and the combustion of chalk; disputed the possibility of transmutation of elements.

Johann Friedrich August Göttling

Apothecary Langensalza 1775
Lived 1753-1809. Developed and sold chemical assay kits and studied process for extracting sugar from beets; studied the chemistry of sulfur, arsenic, phosphorus, and mercury; wrote texts on analytical chemistry; studied oxidation of organic compounds by nitric acid; one of first in Germany to take a stand against the phlogiston hypothesis and for the new "French" chemistry of Lavoisier.

Karl Friedrich Wilhelm Gottlob Kastner

Ph.D. Jena 1805 Lived 1783-1857. Pharmacist; chemist; teacher; wrote textbooks on chemistry, German industry, and meteorology; studied triboluminescence induced by sublimation or dissolution, catalytic effect of Pt on hydrogen combustion, chlorination of starch and sugar, medical applications of bisulfates and calcium salts, and preparation of various inorganic compounds; analyzed mineral waters and developed water purification methods; invented a galvanometer.

Justus von Liebig Ph.D. Erlangen 1822

Lived 1803-1873. One of the greatest chemistry teachers of all time - he was the intellectual father/grandfather of most chemists of his time; promoted the view that metabolism involved oxidation of food; discovered structural isomers, and concept of functional groups (old compound-radical theory); first to experiment with artificial fertilizers; pioneer in agricultural and food chemistry; devised combustion analysis; systemized organic acids.

Carl Schmidt

Ph.D. Giessen 1844 Lived 1822-1894. Determined crystal habits of many important biochemicals such as uric acid, oxalic acid and its salts, lactic acid, cholesterol, stearin, etc.; analyzed muscle fiber and chitin; showed that animal and plant cell constituents are chemically similar; studied reactions of calcium albuminates; studied alcoholic fermentation and chemistry of metabolism and digestion; discovered HCl in gastric juice and its chemical interaction with pepsin; studied bile and pancreatic juices; studied chemical changes in blood associated with cholera, dysentery, diabetes, and arsenic poisoning.

Christophle Glaser

M.D. Basel 1640 Lived 1615-1678. Professor at Jardin du Roi; described preparation of arsenic trichloride, bismuth oxynitrate, and potassium sulfate (glaserite); imprisoned in the Bastille for supplying arsenic to Sainte-Croix, who poisoned the Marchioness de Brinvilliers.

Nicolas Lémery

Apothecary Paris 1667 Lived 1645-1715. First to distinguish between vegetable (organic) and mineral (inorganic) chemistry; published influential textbook on chemistry; adopted an atomic theory assuming that fundamental particles have characteristic shapes; discovered a commercial process for the production of sulfuric acid; obtained boric acid from borax; investigated chemistry of antimony sulfide; analyzed camphor and honey.

> J. G. Spitzley **Apothecary Paris**

Guillaume François Rouelle

Apothecary Paris 1725 Lived 1703-1770. Founder of French school of chemistry; geologist; phlogistonist; proposed first modern definition of salts and first to distinguish neutral, acid, and basic salts; explained dehydrating action of sulfuric acid; proposed a theory of distillation; studied the reaction of essential oils with nitric acid; studied the chemical components of plants; analyzed mineral waters; established that the Egyptians used chemicals for mummification.

Jean Baptiste Michel Bucquet ——

M.D. Paris 1770 Lived 1746-1780. Analyzed zeolite; first to teach Lavoisier's theories in France; collaborator with Lavoisier from 1777; first detailed accounts on plant chemistry; showed CO₂ was acidic; analyzed opium; discovered morphine; studied chemis-

try of NH₄Cl and arsenic salts; analyzed blood and isolated fibrin.

Joseph Black

M.D. Edinburgh 1754 Lived 1728-1799. Rediscovered "fixed air" (carbon dioxide) by heating MgCO₃; recognized existence of CO₂ as a respiration product and showed that CO₂ would not support combustion or life; invented concepts of latent heat and specific heat; discovered the bicarbonates; one of first to apply quantitative measurements of weights to chemical reactions; first to distinguish heat (an extensive property)

Thomas Charles Hope

M.D. Edinburgh 1787 Lived 1766-1844. Teacher; first to introduce Lavoisier's doctrine in Great Britain; rediscovered strontia and proposed that it contained a new element; investigated barium compounds; invented "Hope experiment" on the maximum density of water and was first to measure the corresponding temperature; disproved contention that liquids do not conduct heat; coined the term xanthogen for the colored substances in plants that turn yellow upon addition of a

Pierre Joseph Macquer M.D. Paris 1742

Lived 1718-1784. First to notice that water is produced by a hydrogen flame; analyzed gypsum and discovered first arsenate salts; showed Prussian Blue contains Fe and devised a method to use it to dye wool and silk; re-introduced the term "gas"; wrote first modern chemical dictionary; used burning lenses to study effect of high temperatures on platinum (with Baume) and diamonds (with Lavoisier).

Claude Louis Berthollet M.D. Paris 1778

Lived 1748-1822. Determined composition of NH₃, HCN, H₂S; the latter two compounds disproved Lavoisier's contention that oxygen was the key component of acids; introduced aqueous chlorine as a bleaching agent; one of the originators of volumetric analysis; showed presence of nitrogen in animal matter; discovered cyanogen chloride and potassium chlorate; co-founded modern chemical nomenclature.

Joseph Louis Gay-Lussac

M.A. Paris 1800 Lived 1778-1850. Co-discovered Charles's Law relating temperature to the volume of gases; discovered boron and established elementary nature of iodine and sulfur (both with Thenard); analyzed sugar; showed that fluoride was a constituent of bones; discovered law of combining volumes and originator of volumetric analysis; showed that one volume of oxygen reacts with two volumes of hydrogen to give water, and established similar relationships for NH₃ + HCl, N₂ $+ O_2$, and $N_2 + 3H_2$; developed assay of Ag⁺ by titration with chloride; studied chemistry of cyanogen and determined its composition; showed that "prussic acid" was HCN; first to prepare ethyl iodide, hydrogen fluoride, organic amides, and the peroxides of Na and K; coined the name racemic acid; held world record for manned balloon flight (7019 meters) and pioneered measurement of temperature, pressure, humidity, and magnetic field strength as a function of

Friedrich Wilhelm Ostwald Ph.D. Dorpat 1878

co-established (with Arrhenius and van't Hoff) physical chemistry as a separate discipline; first to show that stronger acids are more extensively dissociated in solution; proposed idea that catalysts lower energy of activation of chemical reactions; popularized use of physical properties such as density and refractive index to study chemical reactions; formulated first scientific theory of indicators; discovered industrial catalytic method for the oxidation of ammonia to nitrogen oxides; invented a volumetric method to measure the relative strengths of monobasic acids.

John Livingston Rutgers Morgan Ph.D. Leipzig 1895

Lived 1872-1935. Studied molten hydrated salts as solvents, liquid surface tension, photochemistry, electrical conductivities of electrolytes in acetophenone, solubility of oxygen in liquids, and the quinhydrone electrode.

Ward Vinton Evans Ph.D. Columbia 1916

Lived 1880-1957. Investigated the phase rule, the electrolysis and structure of Grignard reagents, refrigeration, surface tensions of mutually soluble liquid systems, interatomic arrangements, detonation rates of high explosives, electromotive force of non-aqueous solvents, and critical solution constants; served on the three-man security board which reviewed charges against J. R. Oppenheimer, and dissented from the majority finding against Oppenheimer.

Ralph G. Pearson

Ph.D. Northwestern 1943 Born 1919. Professor of chemistry. Research in physical inorganic chemistry; developed hard-soft acid-base (HSAB) theory; pioneer in the application of ligand field theory to mechanistic coordination chemistry.

Ph.D. Michigan 1894 Lived 1866-1947. Professor of chemistry. Discovered first organic free radical, triphenylmethyl radical, Ph₃C•; developed first satisfactory anti-freeze.

John Christian Bailar Ph.D. Michigan 1928 Lived 1904-1991. Father of coordination chemistry in the United States; studied stereochemistry of coordination compounds, especially optical inversions and the mechanisms of inorganic reactions; codified conformal analysis and stereo-

chemistry of octahedral complexes; investigated hydrogenation of alkenes

catalyzed by Pt phosphine complexes; cofounder of *Inorganic Chemistry*.

Fred Basolo

Ph.D. Illinois 1943 Lived 1920-2007. Investigated ligand substitution reactions of transition metal complexes; pioneer in the application of ligand field theory to mechanistic coordination chemistry; discovered the ring slip mechanism for associative substitution reactions of cyclopentadienyl metal complexes; isolated and characterized first monomeric cobalt O₂ complexes.



Harry B. Gray

Ph.D. Northwestern 1960

Born 1935. Professor of chemistry. Extensive research in the fields of inorganic chemistry, bioinorganic chemistry, and photochemistry. Investigated electron transfer reactions of metalloproteins; studied the dynamics of protein folding for cytochrome c; recipient of of the ACS Priestley Medal and the Wolf Prize in chemistry; commanding officer of the Solar Army; devoted teacher and mentor.

Legend

Primary Influence

Secondary Influence

Biographical information obtained from the University of Illinois Chemical Genealogy Database and Wikipedia. Poster edited by Paul Bracher.