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The Chemical Genealogy of Richard H. Hanson, Ph.D.

Introduction

Dr. Hanson is not only my undergraduate advisor at UALR, but he is also the "top of the food chain," so to speak of this chemical genealogy paper. As such, this paper will begin with a brief history of him and continue into the past, tracing his mentor, his mentor's mentor, and so forth, until the path has been traced as far back as possible.

From simply talking to Dr. Hanson, I have grown to appreciate the mentor-student relationship that invariably develops during the course of one's academic journey. The chemical genealogy of Dr. Richard Hanson presented here illustrates the inescapable influences mentors, past and present, have had on their individual students, and how these influences were passed down one "generation" to the next. Tracing these roots has revealed a multitude of amazing mentors, accomplished scientists, Nobel Prize Laureates, and innovators in the field of chemistry.

Richard H. Hanson, (1944 -) Ph.D., Kansas State University, 1970,
Clifton E. Meloan, thesis mentor

At present, I am an undergraduate at UALR majoring in geology and chemistry. My undergraduate advisor for chemistry is Dr. Richard Hanson, whom I first met in the spring of 2006 when I took analytical chemistry I. Hanson attended Kansas State University from 1966-1970. At KSU he worked with his thesis advisor Dr. Clifton E. Meloan, where his interests were in the field of analytical chemistry. Hanson, along with fellow students and friends under Dr. Meloan, was educated as a generalist in analytical chemistry. Projects undertaken by Hanson would typically occur in the following manner: A method would be inquired about and that method would be studied. Many times, this method would involve working with metal chelates and observing different aspects of these chelate - metal interactions.

As a graduate student, Hanson worked on projects that involved applications such as determination of water in solvents and the structure of metal complexes. He also worked on a project exploring the presence of lactic acid in powdered eggs using gas chromatography.

Throughout his graduate career, Dr. Hanson knew that he wanted to work at a university. In 1970, after obtaining his Ph.D. in Chemistry from Kansas State University, he was hired at Southwest Minnesota State College. He was a professor here from 1970-1973 and during his time at this school, worked with undergraduate students on various projects involving analytical techniques and methods. In 1973, Dr. Hanson came to

UALR, were he worked as an Assistant Professor in the Chemistry Department. In 1983, he moved to the graduate school and worked there until 2005. During this period, he typically taught one or two classes a semester. In 2005, he began teaching full-time again in the Chemistry department. In the Chemistry department he works exclusively with undergraduate students.

This is where I met Dr. Hanson and currently interact with him. He has been a source of great motivation for me, as I am sure he is with all of his students. There is never too much going on that he cannot take time to speak with one of his students and he is always more than happy to do so. He has been a great source of encouragement and an invaluable reference both in my studies and my research project in the Geology department. In summary, I am very fortunate to have Dr. Hanson as my undergraduate advisor.

This I am sure can be said of his own mentor advisor, Dr. Clifton E. Meloan. As we will see, following down the line from Dr. Hanson's Ph.D. advisor to Dr. Meloan's and so forth, the ideas associated with analytical chemistry and the applications of these ideas are important to many of the previous professors that preceded Hanson. The first one explored here is Dr. Clifton E. Meloan.

Clifton E. Meloan, (1931 -) Ph.D. Purdue University, 1959,
Warren W(illiam) Brandt, thesis advisor

Born August 4th, 1931, Clifton E. Meloan attended Iowa State University, where he received his B.S. Chemistry in 1953. He then attended Purdue University, where he received his Ph.D. in Chemistry under Warren W(illiam) Brandt in 1959, with a heavy focus on analytical chemistry. His thesis project was entitled The *Formation of Hydrogen Peroxide in Alcohols - Its Effect on the Extraction of Chelates of Benzohydroxamic Acid.*

Dr. Meloan was an Assistant Professor and then an Associate Professor at Kansas Statue University from 1959-1968 and a Professor from 1968. Kansas State University is where he became involved with Dr. Hanson.

At Kansas State University, Dr. Meloan explored many different mechanisms and was known for being a very inquisitive man. This is many times how new projects would be undertaken. He was a scientific advisor for the Food and Drug Administration beginning in 1966 and just retired from this job recently. He is a member of the American Chemical Society and his research interests included liquid-liquid extractions, metal chelates, gas chromatography, and spectrophotometry. As a professor at Kansas State University, he taught his students to be generalists, preparing them for work in any number of analytical chemistry fields. On a personal note, he was also known for writing "Single Cell Analysis" in the top left hand corner of the blackboard each day before class. This is where he believed scientists would be doing work on someday. Needless to say, he was correct.

Dr. Meloan was, and is an accomplished analytical chemist who advised many successful graduate students, one of them being Richard Hanson.

Warren W(illiam) Brandt (1923 -) Ph.D. University of Illinois, 1949
George F(rederick) Smith, thesis advisor

Warren W(illiam) Brandt, ca 1974

Warren W. Brandt was born in Lansing, MI in 1923. He finished as class valedictorian while earning his undergraduate degree in chemistry from Michigan State University in 1944 and his Ph.D. from the University of Illinois in 1949. He was an assistant at Michigan State College from 1943-44, 46 and a fellow at Purdue from 1948-49 where he received his Ph.D. in Chemistry. He then moved to an Instructor position at Purdue University in Analytical Chemistry. He became an Assistant Professor at Purdue in 1950 and an Associate Professor in 1955-61. He spent a year at Oxford University in 1958 as a Guggenheim Fellow while at Purdue.

Brandt then moved to Kansas State University to become the Department Head from 1961-63 and an Associate Dean of the College of Arts and Sciences from 1962-63. He then joined the administration of the Virginia Polytechnic Institute (Virginia Tech) and rose through the ranks and in 1964, he was named vice president and later executive vice president at Virginia Tech. He then moved to the newly founded Virginia Commonwealth University, where he did stints as Dean, Vice President and served as president of VCU from June 1969 through October 1974. He was selected from a field of 200 candidates to lead the new university, formed when the Richmond Professional Institute and the Medical College of Virginia merged.

During Brandt's tenure at VCU, 32 degree programs were added, and two new schools were established — the School of Allied Health Professions and the School of Community Services. In addition, more than $20 million of new construction was completed or under way on both campuses, including the James Branch Cabell Library, Rhoads Hall, the School of Business building, the Larrick Student Center and a large addition to Sanger Hall.

As VCU president, Brandt forged relationships with community leaders in an effort to better integrate VCU into the community. And under his leadership, the student

body reached 17,000, for a time making VCU the largest institution of higher learning in Virginia and in August of 2005 Virginia Commonwealth University dedicated Warren W. Brandt Hall, a $28 million, 17-story residence hall on the Monroe Park Campus, in honor of its first president, Warren W. Brandt.

On Dec. 1, 1974, Brandt exchanged his post out East for the top leadership job at Southern Illinois University – Carbondale. The Lansing, Michigan native is remembered for his efforts to improve the University's educational programs and for revitalizing its many diverse services. An August 18, 1979 editorial in the area's Southern Illinoisan newspaper praised Brandt's leadership and his many contributions.

Brandt, according to the paper, had earned respect because:
"He initiated and supported efforts to raise academic standards and improve the quality of education. Student services were improved. Graduate programs have matured. Research - and the funding to pay for it - has increased dramatically. Physical improvements on the campus have been made and a beginning made to restore area services to one of the fundamental functions of the university."

Brandt resigned in 1979 to become the vice president of general administration for the University of Maryland System.

Some of Brandt's particular research interests where in the area of chemistry coordination compounds, spectrophotometric methods of analysis; reactions in concentrated sulfuric acid as a solvent, gas chromatography, and fluorescence. Warren W. Brandt studied under G.F. Smith at the University of Illinois.

George F(rederick) Smith (1891-1976) Ph.D. University of Michigan, 1922
Hobart H(urd) Willard, thesis advisor

G. Frederick Smith, as he was more generally known, was born in Lucasville, Ohio, in 1891 and raised in Columbus, Ohio. He attended the University of Michigan, and received his B.S., M.S. and Ph.D. (1922) degrees where he obtained his Ph.D. under Hobart H(urd) Willard in analytical chemistry.
Smith joined the faculty of the University of Illinois to teach analytical chemistry in 1921. At Michigan he had learned about, and become very interested in, perchlorates. At Illinois he published an article on the analysis of steel, in which he pointed out the advantages of magnesium perchlorate, which he prepared for his own use, as a super drying agent. Chemists in steel laboratories wrote to him requesting some for trials, continuing their demands until Smith told them to buy it from a commercial manufacturer. When he found there was none, A. H. Thomas Co. persuaded and financed Smith to make magnesium perchlorate for them, selling it under the name "Dehydrite". Smith made it in his garage laboratory for years, finally erecting a small perchlorate plant in Columbus, Ohio called the G. F. Smith Chemical Co, established in 1928. This company, which is still in existence today, is the largest manufacturer of perchloric acid and perchlorate salts in the world.

Around 1930 George Walden, Jr. of Columbia University publicized the use of phenanthroline as an oxidation-reduction indicator. Smith started producing commercial quantities of phenanthroline and its derivatives, producing a range of indicators to meet every need. Smith also investigated the preparation of cerium compounds for use as titrants in oxidation reactions, aided by phenanthroline indicators, finally producing hexanitratocerate as a primary standard.

During the depression, one of Smith's students, Charles Getz, working his way through college, learned that milk would foam if CO_2 were forced into it and the pressure released. This led to the idea of producing whipped cream by the release of gas under pressure. Getz and Smith found that nitrous oxide was a satisfactory gas and developed a product called *Instantwhip*, the first spray-can product.

Hobart H(urd) Willard (1881 – 1974) Ph.D. Harvard, 1909
Theodore W(illiam) Richards, thesis advisor

Hobart H(urd) Willard was born in Erie, Pennsylvania in 1881. He received his A.B. in Chemistry from the University of Michigan in 1903, and his A.M in 1905. He then moved to a fellowship position at Harvard from 1908-09 and received his Ph.D. at Harvard in 1909.

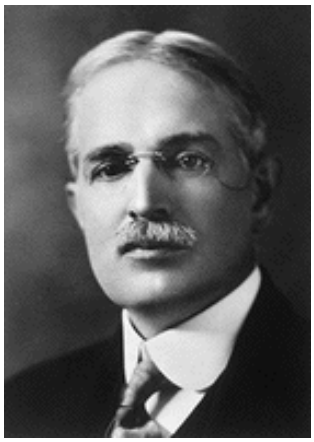
Willard was an Instructor of Chemistry while obtaining his undergraduate degrees at the University of Michigan from 1905-06 and after obtaining his Ph.D. went back to the University of Michigan to take another Instructor of Chemistry position from 1909-12. In 1912, Willard became an Assistant Professor, in 1912 he moved to an Associate Professor position, and in 1918 was promoted to full Professor Status.

At the University of Michigan, his research in analytical chemistry broke ground into fundamentally new gravimetric and volumetric methods. Willard's texts, *Willard, Merritt and Dean* and *Willard and Diehl* are well known to all analytical chemists and in fact were the source of an instrumental analysis textbook used by Dr. Hanson while in graduate school.

Willard was on the Division of Chemistry and Chemical Technology for the National Research Council from 1934-37. He was a member of the Electrochemistry Society, and was interested in numerous topics. He determined atomic weights of silver, lithium, chlorine, and antimony. His analytical innovations in the introduction of perchlorate chemistry and cerium (IV) chemistry, in particular ceric sulfate as a volumetric reagent are well known and highly respected. He determined the amount of vanadium in steel, worked on the precipitation of salts by urea, studied the thermal decomposition of mixed sulfates, and worked with various electrochemical methods. Of additional interest to Willard was the determination of mixed sulfates, quantitative analysis methods and reactions with organic reagents. Interestingly, Willard was renowned as a tough taskmaster in the classroom.

In 1916, he entered the Alpha Beta fraternity and was admitted to the Alpha Chi Sigma Hall of Fame in 1985 and other awards included the Fischer Award in 1951 and the Anachem Award in 1953.

Theodore W(illiam) Richards (1868-1928) Ph.D. Harvard, 1888 (Nobel Prize in Chemistry, 1914)
Josiah Parsons Cooke, thesis advisor



Theodore William Richards was born in Germantown, Pennsylvania, on January 31, 1868. During his childhood, Richards traveled to England and France and, up to the age of fourteen, he was educated by his mother. In 1883 he entered Haverford College, Pennsylvania, to graduate in science in 1885 and enter Harvard University. He received the degrees, B.A. in 1886; M.A. and Ph.D. in 1888. The following twelve months were spent in Germany where he studied under Victor Meyer, P. Jannasch, G. Kruss and W. Hempel; on his return to Harvard he was appointed Assistant in Chemistry. He successively became Instructor (1891), Assistant Professor (1894) and Professor (1901); in 1901 he also declined an offer of a full professorship in the University of Göttingen. In 1903 he became Chairman of the Department of Chemistry at Harvard and in 1912 he was appointed Erving Professor of Chemistry and Director of the Wolcott Gibbs Memorial Laboratory.

About half of Richards' original work concerned atomic weights, starting in 1886 with work on oxygen and copper. He quickly developed a new technique for the determination of halide ratios and did much towards improving methods of weighing. He invented the nephelometer and demonstrated the insidious effect of occluded moisture in gases and solids. By 1912 he had redetermined, with the highest accuracy, the atomic weights of over thirty important elements and in later years he was to play his part, by his work on the determination of the atomic weight of isotopes, in the modern concept of the atom. During his initial work he was guided by Josiah Parsons Cooke.

Richards was the first American to be awarded the Nobel Prize in chemistry, receiving it for his accurate determinations of atomic weights—25 in all, including those used to determine virtually all other atomic weights. His work, which he began, publishing in 1887, corrected earlier studies done in the 1860s by Jean Servais Stas.

Richards also studied atomic and molecular volume and he formulated a hypothesis of compressible atoms. He carried out a series of measurements of compressibilities of many elements and compounds in support of his theory, developing, applying and testing new methods and techniques. He introduced the use of transition temperatures of pure hydrated salts as fixed points in the standardization of thermometers, and the fundamentals of adiabatic calorimetry were developed under his guidance. His researches are recorded in some three hundred technical papers published mainly in the Proceedings of the American Academy of Arts and Sciences, the Journal of the American Chemical Society and the publications of the Carnegie Institution of Washington.

Professor Richards received honorary doctorate degrees in science from Yale (1905), Harvard (1910), Cambridge, Oxford and Manchester (1911) and Princeton (1923); in philosophy from Prague (1909) and Christiania (1911); in law from Haverton

(1908), Pittsburgh (1915) and Pennsylvania (1920); in chemistry from Clark (1909); and in medicine from Berlin (1910). He was President of the American Chemical Society (1914), the American Association for the Advancement of Science (1917) and the American Academy of Arts and Sciences (1919-21). He received the Davy Medal (Royal Society), 1910; the Faraday Medal, 1911, and Willard Gibbs Medal (American Chemical Society), 1912; the Franklin Medal (Franklin Institute), 1916; and the Le Blanc and Lavoisier Medal in 1922. He was appointed Officier de la Lègion d'Honneur in 1925 and he held fellowships or memberships of academies and learned societies in the United States, the British Isles, France, Germany and Scandinavia.

Richards married Miriam Stuart Thayer, daughter of Professor Joseph H. Thayer, in 1896; they had one daughter and two sons. His favorite recreations were sketching, golf and sailing.

Theodore William died at Cambridge, Massachusetts, on April 2, 1928.

Theodore William Richards in his Laboratory, ca unknown

*****From Josiah Parsons Cooke forward all chemical genealogical information was taken verbatim from Dr. Jeffrey Gaffney's paper:**

CHEMICAL GENEALOGY OF AN ATMOSPHERIC CHEMIST: JAMES N. PITTS, JR., A CASE STUDY

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Josiah Parsons Cooke (1827-1894), A.B., Harvard, 1848;
no thesis mentor

Cooke was an extraordinary fellow. He was given the job of starting the Harvard Chemistry Department. He initially was hired as a tutor in mathematics but in 1850 was appointed Erving Professor of Chemistry and Mineralogy, a position he held for the rest of his life. He attended chemistry lectures of Benjamin Silliman, Sr., at the age of 16, but he received no formal education in that discipline. After receiving the appointment in chemistry, he traveled to Europe and attended lectures by Jean Baptiste Andre Dumas and Henri Victor Regnault, who influenced him greatly. Cooke studied the properties of the elements, particularly H, O, and Sb. He also wrote a very interesting book titled Religion and Chemistry (Cooke, 1880). In the third chapter of that book, he wrote about the testimony of oxygen, as follows:

> WERE we to limit our regards to those physical qualities of the atmosphere which we studied in the first two chapters, we should overlook the most wonderful adaptations in its divine economy. These properties belong to the atmosphere, in great measure at least, in virtue of its aeriform condition, and, so far as we know, an atmosphere composed of other gases, and still having the same density, would soften the intensity of the light, and diffuse the genial influences of the sun's heat, as well as air. Not so, however, with the chemical qualities of the atmosphere, which we are next to consider. These belong to the atmosphere solely as air, and could not have been obtained with any other known materials.
>
> When a chemist wishes to investigate the nature of a new substance, his first step is to analyze it. Let us, therefore, as a preliminary to our present inquiry, ascertain what is the composition of this aeriform matter we call air. The air has been analyzed hundreds of times in every latitude and in every climate; and the result has been uniformly that which is given in the following table:
>
> Composition of the Atmosphere
> Oxygen 20.61
> Nitrogen 77.95
> Carbonic Dioxide 0.04
> Aqueous Vapor (average) 1.40
> Nitric Acid, Ammonia,
> Carburetted Hydrogen Traces
> 100.00

Cooke was very interested in the atmosphere and passed on that interest to his students, including Theodore Richards. Cooke's treatise on the atmosphere predates the work by James Pitts by about one hundred years. Cooke was very meticulous and prided

himself on the accuracy of his measurements, a quality that he passed on to Richards and that Richards passed on to his students.

Josiah Parsons Cooke, who had no definite thesis mentor, can be traced by the influences of Benjamin Silliman, Sr., Jean Baptiste Andre Dumas, and Henri Victor Regnault on his writings.

At this point we follow the three lines separately, starting with Silliman.

5. THE BENJAMIN SILLIMAN, SR., LINE

Benjamin Silliman, Sr. (1779-1864), A.B. (Law), Yale, 1796

Silliman was noted as the most eminent teacher of natural science in America. He began as a lawyer but was encouraged to pursue chemistry by the president of Yale. During the winters of 1802-1803 and 1803-1804 he studied with James Woodhouse in Philadelphia. Later he completed his education, attending lectures by Thomas Charles Hope of Edinburgh in 1805. A very astute, influential man, Silliman began the first U.S. scientific journal, The American Journal of Science. He also was a co-founder of the American Association for the Advancement of Science, performed the first chemical analysis of petroleum, and discovered the fusion of carbon through the use of electric arcs.

James Woodhouse (1770-1809), M.D., Pennsylvania, 1792; Benjamin Rush, mentor

Woodhouse was a student of Benjamin Rush. He founded the Chemical Society of Philadelphia, the first organization of its kind worldwide. His studies included the demonstration that "heavy inflammable air" was carbon monoxide. He also explained the role of plants in taking up carbon dioxide and maintaining the balance of gases in the atmosphere.

Thomas Charles Hope (1766-1844), M.D., Edinburgh, 1787; Joseph Black, mentor

Hope was the first to introduce Lavoisier's theories to Great Britain. He proposed that strontia contained a new element, studied barium compounds, investigated the behavior of liquids, and disproved the idea that liquids do not conduct heat.

Benjamin Rush (1745-1813), M.D., Edinburgh, 1768; Joseph Black and William Cullen, mentors

One of the founding fathers of the United States of America, Benjamin Rush was a multitalented individual who aided in writing the Declaration of Independence and Common Sense. He wrote the first chemistry textbook in America, beginning the long tradition of writing books on the subject in his line's future generations. He was the first psychiatrist in America and opened the nation's first free dispensary. Rush also founded the first antislavery society and the College of Physicians. A professor of chemistry at Philadelphia, he is considered by many to be the father of chemistry in America.

Joseph Black (1728-1799), M.D., Edinburgh, 1754; William Cullen, mentor

Black dedicated his thesis to Cullen in 1754, citing Cullen's chemistry teaching in Edinburgh. Black rediscovered fixed air, carbon dioxide, by heating inorganic carbonates and showed that carbon dioxide would not support combustion or animal life. He was one of the first to apply accurate weight measurements to chemical reactions, anticipating the later use of this approach in work on elements by Cooke and Richards. Black was the first to distinguish heat from temperature.

William Cullen (1710-1790), M.D., Glasgow, 1740; Andrew Plummer, mentor

Cullen held the first independent lecture position in chemistry in Great Britain and was the first to teach at Glasgow in English rather than in Latin. He discovered that evaporating fluids cause cooling and suggested examination of soils for nitrate to determine soil fertility. He

attended lectures of Andrew Plummer on chemistry in 1734-1736 and was influenced greatly by him.

Andrew Plummer (1698-1756), M.D., Leiden, 1722; Hermann Boerhaave, mentor

Plummer established the first modern teaching of chemistry in the British Isles. He analyzed mineral waters and coal and developed "Plummers Pills" (calomel, antimony sulfide, and mercuric chloride), which were used for over 200 years as a panacea for various diseases. Abraham Lincoln took these pills for ailments.

Hermann Boerhaave (1668-1738), M.D., Hardewijk, 1693; Burchard de Volder, mentor

Boerhaave was an outstanding teacher and writer and is considered the father of physical chemistry. He introduced exact measurements to chemistry, using the best available balances and thermometers. He demonstrated that water is a product of combustion, proved that heat is weightless, and performed the first calorimetric studies.

Burchard de Volder (1643-1709), M.D., Leiden, 1664; Franciscus Sylvius, mentor

An enthusiastic follower of Boyle, Burchard de Volder published studies of the weight of air and invented an improved air pump. He set up the first physics laboratory in Leiden and clearly influenced future students with his interest in gases and the atmosphere.

Franciscus Sylvius (1614-1672), M.D., Basel, 1637; Stupaeus, mentor

Sylvius investigated the heat given off when acid was poured onto iron filings. An anatomist of the brain and cerebral arteries, he defended Harvey's theory of blood circulation. He believed strongly in iatrochemistry (that chemicals could be used to treat illnesses). Little is known of his mentor, Stupaeus.

THE JEAN BAPTISTE ANDRE DUMAS LINE

Jean Baptiste Andre Dumas (1800-1884), no formal degree ca. 1823, Geneva; Charles Gaspard De La Rive, mentor

Dumas was an extraordinary organic chemist. Although he obtained no formal degree, he received training in pharmacy from Augustin Le Royer in Geneva. After publishing a book on the physiology of the nervous system, Dumas was invited to Paris, where he assisted Thenard in his lectures on chemistry at the Ecole Polytechnique and later replaced him in a position as professor there. Dumas was also influenced greatly by Charles Gaspard De La Rive. Dumas' work dealt with element vapor densities, the compositions of alcohols and ethers, and the development of a law of substitution reactions in organic compounds (based on his initial work with chlorine and hydrogen in organics). His development of chemical types for organic compounds led to his wide renown as one of the preeminent organic chemists of his time. His research on the atomic weight of carbon influenced Cooke and Richard. He studied the composition of water and of the atmosphere, including the chemical composition of carbon dioxide.

Late in his career, Dumas turned his attention to politics. He was elected a deputy from the department of Nord (1849) and helped to pass laws dealing with recoining of money; stamped paper; forgery of public acts; and taxes on salt, sugar, etc. His abandonment of chemical research for politics was considered a major loss for chemistry, as he ceased his brilliant work when in his prime.

Charles Gaspard De La Rive (1770-1834), M.D., Edinburgh, 1797; John Allen, mentor

De La Rive was an early supporter of the views of Davy (electrochemistry), Dalton (atomic theory), and Berzelius (definite proportions). De La Rive studied the sound produced by burning hydrogen in tubes and invented a galvanometer based on water electrolysis and a qualitative

method for arsenic detection. His mentor, John Allen, attributed animal heat to the combustion of food particles in the blood.

Louis Jacques Thenard (1777-1857), M.A., Paris, 1797; Louis Nicolas Vauquelin, mentor

Thenard discovered hydrogen peroxide (an important atmospheric species). He worked with Joseph Louis Gay-Lussac on isolating boron and improving combustion analysis. Thenard was the first to suggest that fermentation was due to living organisms. Gay-Lussac was very interested in the composition of the atmosphere and surely had an influence on Thenard. Gay-Lussac held a world record of 7,019 meters for a balloon ascent, in which he showed that the composition of the atmosphere was the same (i.e., four parts nitrogen to one part oxygen) at this height and at ground level, indicating that the atmosphere is well mixed.

Louis Nicolas Vauquelin (1763-1829), M.A., Paris, 1790; Antoine Francois de Fourcroy, mentor

Vauquelin discovered chromium and the first amino acid, asparagine (from asparagus). He isolated camphoric, quinic, and cyanic acids from natural products and studied the reactions of wine, vinegar, and oil with drinking vessels. He also isolated platinum metal and investigated the respiration of insects. Vauquelin was a prolific writer who described in detail many methods for the analysis of mineral waters, minerals, plants, and other substances.

Antoine Francois de Fourcroy (1755-1809), M.D., Paris, 1780; Jean Baptiste Michel Bucquet, mentor

Fourcroy co-discovered iridium with Vauquelin. He studied the chemistry of chlorine, urea, and mercury and showed that sulfuric acid can act as a desiccant. Fourcroy was an important teacher and an advocate of Antoine Laurent Lavoisier's ideas.

Jean Baptiste Michel Bucquet (1746-1780), M.D., Paris, 1770; Guillaume Francois Rouelle, mentor

Bucquet was a student with Antoine Laurent Lavoisier under Rouelle. Although Lavoisier had no students (because chemistry was not his livelihood), Bucquet trained his students in the concepts and ideas that Lavoisier had developed, and they collaborated and interacted on many projects. Bucquet studied plants and their chemistry and isolated opium and morphine. He was the first to demonstrate that carbon dioxide is acidic.

Antoine Laurent Lavoisier (1743-1794), L.L.B., Paris, 1764; Guillaume Francois Rouelle, mentor

The father of modern chemistry, Lavoisier showed that oxygen is the key to combustion. He also demonstrated the law of conservation of mass, a key concept in the development of chemistry. Lavoisier's interests besides chemistry included mineralogy, economics, and geology, and meteorology was his second love. At the age of twenty, he began making barometric observations from his home, continuing them throughout his life. He developed methods and rules for standardization of temperature measurements and studied natural electricity and its relation to thunder. He considered weather forecasting to be almost as difficult an art as medicine and recognized that daily measurements of atmospheric pressure, the velocity and direction of winds at different altitudes, and the hygrometric state of air would be needed to predict weather. He developed a network of colleagues in France and Europe using selected barometers and wind gauges to predict weather.

> With all this information it is almost always possible to predict one or two days in advance, within a rather broad range of probability, what the weather is going to be; it is even thought that it will not be impossible to publish daily forecasts which would be very useful to society (Imprimerie Nationale, 1864-1893).

Lavoisier was guillotined during the French Revolution. Joseph Lagrange noted at his death that "it took only an instant to cut off that head, and a hundred years may not produce another like it."

Guillaume Francois Rouelle (1703-1770), Apothecary, Paris 1725; J.G. Spitzley, mentor

Rouelle is considered the founder of the French school of chemistry. He proposed the first modern definition of salts and distinguished between neutral, acid, and basic salts. He also proposed a theory of distillation, analyzed plants, and established that the Egyptians had used sodium carbonate, succinic acid, and coal to effect mummification. Amazingly, Rouelle was also a phlogistonist.

J.G. Spitzley (1690-1750?), Apothecary, Paris, 1715(?); Nicolas Lemery, mentor

Little is known of Spitzley. It seems that there is a mystery in everyone's family tree.

Nicolas Lemery (1645-1715), Apothecary, Paris, ca. 1667; Christofle Glaser, mentor

Lemery was the first to distinguish between plant and mineral chemistry, leading to the concepts of organic and inorganic chemistry. He published a very well read book on chemistry and developed a theory of atomic particles based on fundamental shapes.

Christofle Glaser (1615-1678), M.D., Basel, ca. 1640; Etienne de Clave, mentor

Glaser was a professor at the Jardin du Roi. His writings described arsenic trichloride, bismuth oxynitrate, and potassium sulfate. Glaser practiced iatrochemisry in Paris. His book, Traite de la Chymi, published in Paris in 1663, is likely the source for much of Lemery's book that was later so well known. Glaser was a physician, pharmacist, and alchemist who treated his patients' ailments with chemicals.

Glaser was imprisoned in the Bastille for supplying arsenic to Sainte-Croix, who used it to poison the Marchioness de Brinvilliers. Little is known about Etienne de Clave, except that he was a professor at the Jardin du Roi in Paris around 1620. Clave accepted the Parcelcus ideas of three principles of mercury, salt, and sulfur, while adding phlegm and earth.

THE HENRI VICTOR REGNAULT LINE

We conclude with the last of the major influences on Josiah Parsons Cooke: Henri Victor Regnault and his mentors. These mentors had a strong analytical background and were also very productive in authoring a number of works on mineralogy and chemistry.

Henri Victor Regnault (1810-1878), Ph.D., Paris, 1837; Pierre Berthier, mentor

Regnault's mentor at the Ecole Des Mines was Berthier, an inorganic analytical chemist. Regnault's visit to the laboratories of Justus Von Liebig in 1835 sparked his interests in organic chemistry, at which he excelled. We will trace Regnault's mentoring back through Berthier, but the interested reader can track the Justus Von Liebig connection via Mainz and Girolami (1998).

The Berthier line goes back to the fifteenth century and includes many important scientists and physicians from the Jena and Padua schools. Regnault was the first to prepare carbon tetrachloride, vinyl chloride, and trichloroethene. He carried out detailed studies of the compressibilties, specific heats, and densities of gases. He actually measured the volume of carbon dioxide exhaled per volume of oxygen inhaled by animals in a series of experiments. His interests in how the air around us is used by organisms and the importance of the atmosphere were clearly shared by his followers.

Pierre Berthier (1782-1861), Ing. Ordinare, Ecoles des Mines, 1805; Johann Gottfried Schreiber, mentor

Berthier was very well known metallurgist. He wrote a textbook on assaying and metallurgy that was widely distributed. His interests in that area led to his discovery of bauxite and to studies of beryllium, zirconium, and lithium silicates, along with manganese and nickel oxides. He was one of the many mentors of the past who were authors of very influential works.

Johann Gottfried Schrieber (1746-1847), Academie des Mines, Freiberg; Christian Hieronymous Lommer and Johann Friedrich Wilhelm de Charpentier, mentors

Schrieber was a mining engineer. He studied gold and silver ores and described naturally occurring iron nuggets. He attended the Academie des Mines and likely obtained his degree there in about 1772.

Christian Hieronymous Lommer (? - 1787)

Lommer wrote a number of textbooks on the history of mining and (of all things) the finding of turquoise in petrified animal teeth. He was an expert on silver ores and studied silver chloride found naturally in mines.

Johann Friedrich Wilhelm de Charpentier (1738-1805), Leipzig

Charpentier was trained as a mathematician and was a professor of mathematics. He later established and built the amalgam works in Freiberg. Charpentier wrote a book on the mineralogical geography of Saxony.

CONCLUSIONS

This Chemical Genealogy of Richard Hanson has hopefully been a source of interesting and exciting stories. From this comprehensive genealogy, due in most part to the work of Dr. Gaffney, and Dr. Marley, it is easy to see the strong influences that weave themselves throughout each of the lives of those presented here. The continuity of certain interests, particularly in the analytical chemistry and later organic and gaseous chemistry is excitingly prevalent throughout this chemical genealogy lineage.

Each of the mentors presented in this paper contributed to a piece of the larger puzzle that is scientific inquiry and the quest for answers. It is equally amazing to note how these lineages quickly verge into each other. In this paper, the lives of two distinguished professors at UALR (Dr. Richard Hanson and Dr. Jeffrey Gaffney) meet up with a shared decedent at Josiah Parsons Cooke. This conversion of mentors serves to illustrate the impact mentors have on their students and how that relationship sets in motion a unique set of future mentor-student relationships, some of which come full circle again. The circle is wonderfully illustrated here where about a hundred years prior to the meeting of Dr. Hanson and Dr. Gaffney, their common mentor, Josiah Parsons Cooke was busy passing on his knowledge and interests to his students – students who would one day do the same and become an integral part of Dr. Hanson's chemical genealogy.

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