Our Academic Ancestors

It is hard to overlook the fact that our faculty, for the most part, are academically descended from three men: Berthollet, Berzelius, and Fourcroy. (There is disagreement as to whether those who preceded them, going back to Paracelsus, were truly chemists.) Presenting brief biographies of the three is an on-going project.

Claude Louis Berthollet (1748-1822)

He was after Lavoisier one of the most distinguished French chemists of his time Berthollet had, according to Weller (1999) "determined the composition of ammonia in 1785, prussic acid in 1787, and hydrogen sulfide in 1789. Berthollet pointed out that the absence of oxygen in HCN and H_2S disproved Lavoisier's hypothesis that all acids contain oxygen."

Berthollet was also a friend and confident of Napoleon Bonaparte (1869-1821), and was one of the savants who went with Napoleon on the Egyptian campaign in 1998. He was the organizer of a "Committee on the Arts and Sciences" that accompanied the army.

The expedition was a military failure because the French fleet was destroyed at the battle of Aboukir Bay (on August 1, 1798) by a British fleet under the leadership of Admiral Sir Horatio Nelson.

Among Berthollet's assignments in Egypt was finding fuel for bread ovens, obtaining substitutes for hops for making beer, and obtaining raw materials for making gun powder (Weller, 1999). Another special assignment involved investigating a set of small lakes 45 miles northwest of Cairo. The shoreline of the Natron lakes had a crust of natron, hydrated sodium carbonate. Berthollet recognized that he had seen a unique occurrence. The reaction of sodium carbonate and calcium chloride is an effective way of producing calcium carbonate in the laboratory (Eqn 1)

$$Na_2CO_3 + CaCl_2 \rightarrow 2\,NaCl + CaCO_3 \qquad (1)$$

What he had seen was a partial reversal where salt water (brine) was in contact with limestone (calcium carbonate) (cf. Eqn 2).

$$2\,NaCl + CaCO_3 \rightarrow Na_2CO_3 + CaCl_2 \qquad (2)$$

This discovery and several other examples led to the proposal of the law of mass action by C.M. Guldberg and P. Waage in a series of papers cf. Guldberg and Waage, 1879) .

> "The chemische Kraft mit welcher zwei Stoffe A und B auf einander einwirken is gleich dem Produkte ihrer activen Massen…"

Napoleon was able to escape from Egypt in secret, hazardous voyage back to France in 1799. He chose Berthollet and another savant to accompany him. Berthollet was later cited for bravery in Egypt, and was rewarded financially and in other ways.

We should appreciate his contribution to early progress in understanding the role of the mass of a substance in a chemical reaction.

Background

Guldberg, C. M. and P. Waage. 1879. J. prakt. Chem. 19: 69-

Weller, S. W. 1999. Napoleon Bonaparte, French scientists, chemical equilibrium, and mass action. Bull. Hist. Chem.24: 61-65.

Jöns Jacob Berzelius (1779-1848)

Berzelius was the Swedish chemist who provided us with the concepts of *isomerism* and *catalysis,* with blowpipe analysis, ash correction in gravimetric analysis, the system of notation of chemical formulas that we use today (except he favored superscripts instead of subscripts), the atomic weight (mass) concept, and electrochemical series, a law of combining weights, and the encouragement toward Latin-based names (for the sake of wider acceptance)..

He was a noted teacher, and his students included Gmelin, H. and G. Rose, Magnus. Wöhler, and Mitscherlich. These persons later made significant contributions to chemistry

He was well regarded in his time, both locally and internationally. He married for the first time at age 56, and the King of Sweden granted him a barony as a wedding present. Ten years after his death, he was honored by a statue in a Stockholm park (Berzeli Park). Subsequently, his wife, 32 years his junior, was asked patronizingly at a social event what her husband did, and Baroness Berzelius responded, “Oh, my husband. Well, he’s a statue in Berzeli Park” (Russell, 1998).

His personal background (Russell, 1998): Berzelius was born in the village of Väversunda, about 75 km southwest of Stockholm, where his father was the local clergyman/.schoolmaster. He was orphaned at an early age and lived with relatives on farms nearby. He entered the University of Uppsala in 1796 to study medicine, and became interested in physics and chemistry. So much so that after receiving his M.D. in 1802, he took leave for two years to study chemistry. He eventually became professor of medicine (subsequently chemistry) at the Stockholm School of Surgery. He resigned in 1832 to devote all of his efforts to the Swedish Academy of Sciences. He was also the author of a series of annual reports (starting in 1822) called *Jahres Berichte* that were excellent summaries of progress in chemistry and these undoubtedly contributed to his extensive correspondence and international recognition.

Background

Russell, C. 1998. A chemical Colossus. Chem. Brit.34(9): 36-38.

Antoine-François de Fourcroy (1755-1809)*

Lavoisier, Berthollet, and Fourcroy were three partisans of the anti-phlogistonist theory in the latter part of nineteenth century France. Fourcroy was the youngest of the group that centered around Lavoisier, and perhaps the most cautious.

Fourcroy received a medical education, then became professor of chemistry at the Jardin du Roi in 1874, following the death of Macquer. (At the same time, Berthollet assumed Macquer's position as superintendent of the French dying industry).

Lavoisier, Berthollet, and Fourcroy joined with Louis Bernard Guyton de Morveau in an effort to reform nomenclature (1787). Among their reforms was avoiding names based on places (Epsom salts, for example), and they were influential in part because of the popularity of a textbook written by Fourcroy and widely translated.

Fourcroy was influential in preventing the destruction of learned societies during the French revolution, a effort spearheaded by the Jacques Louis David, founder of the French classical school of painting (and the artist who painted a well-known portrait of Lavoisier and his wife).

Fourcroy's research was concerned with organic chemistry during its primitive stages. He and Vauquelin, for example, demonstrated that ethyl ether, formed from the action of sulfuric acid on ethanol, and called "sulfuric ether", did not contain sulfur. The two also prepared urea in a highly purified state, and they investigated substances of medical interest.

Background

*Ihde, A. J.1984. The Development of Modern Chemistry. Dover, New York, NY.