CARL SPRENGEL -- AGRICULTURAL SCIENTIST AND ENTREPRENEUR

by Gene Maas

One of the most outstanding agricultural scientists in the 1800's was Dr. Carl Sprengel who became Secretary-General of the Pomeranian Economic Society in 1839 with headquarters in Regenwalde. Dr. Sprengel has been considered the founder of agricultural chemistry with more than two dozen publications dealing with soil chemistry and mineral nutrition of plants. In 1842, he founded an agricultural school and experiment station known as the *Land-wirthschaftliche Lehranstalt zu Regenwalde* (Agricultural Institute of Regenwalde). He also founded a farm equipment factory, a dairy and a cheese factory in Regenwalde. Sprengel traveled extensively prior to settling in Pomerania and many of the locations where he studied and worked are shown on the map below.

Map showing the former and present borders between Germany and Poland. Red dots denote the main stations in Carl Sprengel's life. (Special thanks to Lori Salamone-Limbachs for contributing this hand drawn map)

Little is known about Carl Sprengel's personal life and details of his academic and professional career are in biographical accounts written in German. Unfortunately, many of his personal, professional and business records were lost in fires, one in 1809 that destroyed vital records at the Amtshaus Burgdorf in Hannover and the second on January 2, 1859 at his machine factory in Regenwalde. One of the first biographies was written by Fritz Giesecke, but his manuscript was never completed. The documents he collected and the first part of the 1945 manuscript are archived at the University of Hohenheim in Stuttgart. Later, Günter Wendt published the most thorough study[i] of Sprengel's life and work, often citing Giesecke. The best English account was published by R. R. van der Ploeg, W. Böhm and M. B. Kirkham[ii] which appeared in the Journal of the Soil Science Society of America in an article about the history of soil science. Most of what follows comes

Carl Sprengel
(an undated photo in the Main Library of the University of Göttingen)

from their excellent paper for which I am very grateful.

Philipp Carl Sprengel was born on 29 March 1787, the son of postal administrator Anton Lorentz Sprengel and Marie Helene Gräver, on a combined postal station and farm house in rural Schillerslage near Hannover, Germany. Growing up on a farm apparently led to his curiosity and interest in agriculture and by the age of 15 years, he accepted an apprenticeship at the agricultural academy of Albrecht Daniel Thaer in nearby Celle. Thaer was one of the most renowned agronomists in Germany at the time and an avid supporter of the humus theory for plant nutrition. [According to this theory, plants feed upon organic substances which are similar to them in nature. The organic matter of the soil, or the soil humus, was regarded as the chief nutrient for plants and the major source of soil fertility.] Although the humus theory was eventually repudiated by Sprengel, Thaer undoubtedly had an important influence on Sprengel's career. In fact, when Thaer moved to Möglin (Brandenburg) in 1804, Sprengel followed him to help set up an agricultural academy on the banks of the Oder River. He continued working as Thaer's assistant until 1808 when he became an agronomic adviser to the Grafen v. der Schulenburg in Oberlausitz and manager of large estates in Saxony, Silesia, and Thuringia. During the winter months he attended lectures of the chemist Heinrich Ficinus in Dresden and kept busy learning foreign languages and painting.

In an effort to learn new and innovative methods of farming, Sprengel traveled extensively visiting farms throughout Germany as well as farms in France, Belgium, Switzerland and the Netherlands. The observations and experience he gained during these years convinced him that any significant progress in farming would require the sound foundation of basic science. So, in 1821, at the age of 34, he enrolled at the University of Göttingen where he received a broad education in chemistry, geology, paleontology and botany. He earned his doctorate in 1823 and worked eight more years at this University teaching agricultural chemistry and publishing his research on soil chemistry and fertility.

One of Carl Sprengel's greatest contributions to agricultural science came during his years at Göttingen. He came to understand that plant growth was dependent on minerals in the soil and not the "humus" or organic matter. He also laid the groundwork for the 'theory of the minimum", a revolutionary advance in the field of plant nutrition when he found that plant or crop growth is dictated not by total resources available, but by the scarcest resource (limiting factor). In other words, increasing the amount of plentiful nutrients cannot increase plant growth if any one of the nutrients is deficient and limiting. Unfortunately, Sprengel received little recognition for this discovery at the time. Some years later, the theory was popularized by Justus von Liebig, a fellow German chemist and contemporary of Sprengel, and became known as **Liebig's Law of the Minimum**. It wasn't until 1999 when R. R. van der Ploeg, W. Böhm, and M. B. Kirkham proposed that Sprengel be recognized by the International Union of Soil Sciences as a cofounder of agricultural chemistry and that the Law of the Minimum be renamed the **Sprengel-Liebig Law of the Minimum.**

The significance of the Law of the Minimum cannot be overstated. It was not only crucial to understanding plant mineral nutrition, it spawned a vast mineral fertilizer industry which led to huge increases in crop production. Moreover, the law has since found application in many other biological applications, e.g. the role of essential amino acids in human nutrition.

In 1831, Sprengel took a position at the Collegium Carolinum in Braunschweig to develop an agricultural and forestry teaching institute and later was appointed professor of agricultural science. During this time, he authored three books: one on soil science, one on soil amelioration, and one on fertilizer use. He was also editor of the newly founded *Land u. Forstwirthschaftl. Magazine* for Brunswick, Hannover and the neighboring lands. To Sprengel's disappointment, the intended research and experiment station was never funded or established, so in July 1839, at the age of 52, he left Braunschweig to become secretary general of the *Pommerschen Ökonomischen Gesellschaft*, a semi-governmental society headquartered in Regenwalde to represent the interests of landowners in Pomerania, to campaign for agricultural progress and to organize agricultural exhibitions.

Unlike in Brunswick where he received little support or recognition for his ideas, Sprengel found Regenwalde welcoming and supportive. He expressed his happiness and satisfaction there as early as 1840 in a letter. Sprengel was exceedingly innovative, industrious and productive during his years in Regenwalde. One of his first achievements was founding an international agronomy journal titled *Allgemeine Landwirthschaftliche Monatsschrift* (General Agricultural Journal Monthly) which he edited and contributed to beginning with the first issue in April 1840 until 1856.

In 1842 he founded a private agricultural training institute and experiment station initially named the *Land-wirthschaftliche Lehranstalt zu Regenwalde*. He carried the main teaching load at the institute and simultaneously managed a 76-ha (188 acre) experimental farm on which he carried out large-scale fertilization experiments on 200 different varieties of plants. He set up his own soil testing laboratory to conduct mineral analyses.

Although the agricultural school was being supported with state funds by 1846, both the school and the experiment station were privately owned and managed by Sprengel. According to an 1849 issue of Working farmer [iii], the school had five professors including two chemists, Bertels and Birner who became his brother-in-law; the veterinarian Hartmann; the mayor and former forestry official, Rackwitz and the *Regierungs-Conducteur* Vincent. A four-semester curriculum included courses in soil science, fertilizer theory, tillage, agronomy, and animal husbandry.

In spite of his many research and teaching activities, he still found time to revise his earlier books which culminated in a new 3-volume book on crop production. The book, titled, "*Meine Erfahrungen im Gebiete der allgemeinen und speciellen Pflanzen-Cultur*" (My Experience in the Fields of General and Special Plant Cultivation), is considered by many to be among the best books published in Germany on the subject.

Sprengel's vision and activities soon led to an economic boon for Regenwalde. In 1841 he established a private company in partnership with veterinarian Hartmann to construct farm equipment. By August 1841, the new company already had 25 or more craftsmen presumably working in various locations in the city. On May 20, 1843, he bought land to build a factory for agricultural machinery. The factory quickly expanded and employed 70 workers. By 1848 farm machinery was being exported throughout all of Germany. In 1851 the Official Catalogue of the Great Exhibition of the Works of Industry of All Nations [London][iv], lists Dr. C. Sprengel and Co. as manufacturer of a sowing machine; drill machine;

Indian corn threshing machine; Flander's plough; Pomeranian vibrating plough; Mecklenbourg hoe with yoke; East Prussian zocke with yoke; 16-share crooker; underground plough; and a water-furrow plough.

Sprengel's interests also included animal husbandry as he started a dairy and built a cheese factory on a 1400-acre farm and initiated an animal breeding program.

Although Sprengel's business enterprises were successful, he wasn't spared from the economic downturn in the 1850's. Finally, in 1856, he was forced to sell the factory to a local agricultural association, a share-holding company. Despite his cash flow problems, Sprengel had amassed a considerable fortune in real estate and inventory and he retained a share of the company.

Machinery factory in Regenwalde
An undated image with a handwritten date of 14 April 1913

Factory buildings in 2007
The Carl Sprengel monument is in the foreground.

Whether all or any of the buildings shown in the "1913" image above existed in the mid 1800's is unknown. The 2007 photo on the right was taken of the factory on Ulica Jedności Narodowej. The 3-story building in the color photo is the same as the one in the lower left corner of the black and white image. The factory was a successful business enterprise in Regenwalde until the end of World War II.

A restored painting of Carl Sprengel (thanks to Dr. Hübner, managing director of the Fördergesellschaft Albrecht Daniel Thaer for permission to publish the image here)

Sprengel remained active until shortly before his death in 1859 at the age of 72. The agricultural academy that he founded was destroyed in a fire the same year.

In Regenwalde, Carl Sprengel not only saw his dream of an agricultural school and experiment station come to fruition, but it was also where he found the love of his life. On September 30, 1841, at the age of 54 years, he married Ernestine Juliane Amalie von Wulffen (1822-1859), the 19-year-old daughter of a Prussian major. Carl and Juliane had two children, a daughter named Luise Helene Friederike Elisabeth Emma born August 13, 1842 and a son, Carl Wilhelm Rudolph, born October 3, 1843, but little else is known about their family life. Sadly, on February 7, 1859, Juliane died at the age of 37 years. Two months later, on April 19, Carl died of heart

failure. Their children were then educated by a guardian, the officer Kropf. Emma, later married a preacher Ernst Gottfried Panse, from Dramburg. Her family and their descendants can be traced to the present day. Rudolph, although talented and intelligent, apparently never amounted to anything during his lifetime.

In 1881, on the occasion of its 50th anniversary, the Agricultural Association of Regenwalde erected an obelisk in memory of Dr. Carl Sprengel. It is located across the street (now *Ulica Jedności Narodowej*) from the factory. The monument was badly damaged during World War II but with the 2004 expansion of the European Union, a joint initiative of German and Polish agronomists and local politicians succeeded in restoring the damaged obelisk.

A monument erected in Regenwalde in 1881 in memory of Carl Sprengel
[Gene Maas posing next to the obelisk in 2007]

At the same time the obelisk was restored, a new gravestone was erected on Carl Sprengel's grave in the Regenwalde cemetery. The inscription was engraved in both German and Polish.

Sprengel grave in Regenwalde

An English translation of the inscription says:

Carl Sprengel
29 March 1787 -- 19 April 1859
This monument to agriculture was dedicated to the highly respected Dr. Carl Sprengel by his followers in 1881. Carl Sprengel worked from 1839 to 1854 as the Secretary-General of the Pomeranian Economic Society with headquarters in Regenwalde. Restored 2004

Endnotes:

[i] Wendt, G. 1950. Carl Sprengel und die von ihm geschaffene Miner-altheorie als Fundament der neuen Pflanzenerna¨hrungslehre (Carl Sprengel and his mineral theory as foundation of the modern science of plant nutrition). Ernst Fischer Publ. Co., Wolfenbu¨ttel, Germany.

[ii] R. R. van der Ploeg, W. Böhm and M. B. Kirkham, On the origin of the theory of mineral nutrition of plants and the law of the minimum. Journal of the American Soil Science Soc. 63, 1999, p. 1055–62.

[iii] Working Farmer, Vol. 1 No. 10 p. 147 Nov. 1849 James J. Mapes, editor; Kingman & Cross, Publishers; Clinton Hall, NY

[iv] London. Great exhibition of the works of industry of all nations, 1851; Great Britain. Commissioners for the Exhibition of 1851; Yapp, George Wagstaffe, 1811-1880, comp; Ellis, Robert, F. L. S., ed