From Triads to Catalysis: Johann Wolfgang Döbereiner (1780–1849) on the 150th Anniversary of His Death

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Abstract: The Time: May 7, 1999. The Place: The auditorium (Döbereiner-Hörsaal) (Figure 1) of the Chemical Institute of the Friedrich-Schiller-Universität Jena, the famous German university founded in 1558, which numbered among its faculty the illustrious philosophers Johann Gottlieb Fichte, Georg Wilhelm Friedrich Hegel, and Friedrich Wilhelm Joseph von Schelling; the writer and critic Friedrich von Schlegel; and the dramatist and poet (Johann Christoph) Friedrich Schiller, whose name the university now bears [1].

The Event: A Döbereiner Festkolloquium (Figure 2), attended by about 300 persons and organized by the university’s Chemische-Geowissenschaftliche Fakultät, Institut für Anorganische und Analytische Chemie and sponsored by Degussa (originally Deutsches Gold- und Silber-Scheide-Institut, now Degussa-Hüls AG) and the Fonds der Chemischen Industrie, to commemorate the 150th anniversary of the death of the university’s Professor of Chemistry and Technology, Johann Wolfgang Döbereiner (1780–1849).

The Program: Two scientific lectures by leading authorities in those fields of chemistry whose foundations were erected by Döbereiner—catalysis and the periodic system of the elements: “Heterocyclocarbenes: New Controlling Ligands in Catalysis” by Professor Wolfgang Anton Herrmann, President of the Technische Universität München and “On the Nuclear Physical Limitation of the Number of Elements—The 100-Year Journey from Polonium to Element 112” by Professor Peter Armbruster of the Gesellschaft für Schwerionenforschung mbH Darmstadt, head of the team that discovered the last seven elements of the periodic table up to element 112. Two history of chemistry lectures: “Johann Wolfgang Döbereiner—a Pioneer for Modern Chemistry” by Professor Dietmar Linke of the Brandenburgische Technische Universität Cottbus and “Döbereiner’s Contemporaries—Chemists, Natural Scientists, Philosophers” by Professor Egon Uhlig of the Universität Jena.

This was not the only celebration for Döbereiner in recent history. On the occasion of the bicentennial of his birth (1980) an International Döbereiner-Kolloquium was held on May 20–22 at Jena. In that year the Deutsche Demokratische Republik (East Germany) issued a commemorative postage stamp in his honor (Figure 3). Perhaps the latest colloquium will serve to renew interest in a creative and prolific chemist who, although renowned during his lifetime, is not as well known by today’s chemists and chemical educators as he deserves to be.

Döbereiner’s Early Life

Döbereiner (Figure 4) was born on December 13, 1780 in Hof an der Saale in Bavaria in the Fichtelgebirge mountain range of Southern Germany [2–20]. A self-made man in the literal sense of the word, he was the son of a coachman, Johan Adam Döbereiner, who was first a servant and later a manager of an estate in Münchberg in Oberfranken (Upper Franconia) where the boy grew up in close proximity with nature and agriculture but received little schooling. Financially unable to provide his precocious offspring with any but the barest essentials of education, his father put him to farm work. His mother, Johanna Susanna Döbereiner (née Göring), however, valued learning and encouraged him by arranging for lessons with the pastor in a neighboring village.

After three years of an apprenticeship with an apothecary named Lotz in Münchberg, at the age of seventeen young Döbereiner began five precarious Wanderjahre, holding similar positions in Dillenburg, Karlsruhe, and eventually Strasbourg, where, unable to afford to enroll at the university, he attended lectures on chemistry, botany, and mineralogy, studied on his own, and learned French. In 1802 he returned to his parent’s home. In the following year (1803), at the age of twenty-three, he married Clara Henriette Sophia Knab (1784–1861), a childhood friend and daughter of a distinguished Münchberg family. Their first child was born in 1804. One of his sons, Franz Karl Alexander Döbereiner (1809–1866), helped his father, especially with his research on platinum, revised several of his books, and later became Professor of Chemistry at the Universität Halle and the author of several semipopular and semitechnical books [8]. The couple eventually had eight children—five sons and three daughters.

Although now an apothecary, Döbereiner had neither the money nor license to buy a pharmacy. He opened an agricultural produce business (Landesproduktenhandlung) and small chemical factory in the small town of Gefree near Bayreuth, and he began to produce pharmaceutical-chemical preparations. By 1803 he was reporting his experiments with white lead (2PbCO₃·Pb(OH)₂), sugar of lead (Pb(C₂H₃O₂)₃·3H₂O), epsom salt (MgSO₄·7H₂O), and other commercially valuable products in the Neues allgemeines Journal der Chemie, edited by Adolph Ferdinand Gahlen (1775–1815), which brought him to the attention of chemists. After complaints of envious neighbors caused him to lose his license and his business, his relatives gave him a position in charge of bleaching and dyeing in their textile mill, where he investigated the bleaching of cotton goods with sodium hypochlorite (NaClO), preparation of caustic soda (NaOH)
Döbereiner then began to supervise agricultural estates, where he modified brewing and distilling practices. At this time he began his lifetime friendship with Johann Salomo Christoph Schweigger (1779–1857), Professor of Mathematics and Physics at the high school (Gymnasium) in nearby Bayreuth, the future site (1876) of composer Richard Wagner’s Festival Theater (Festspielhaus). In 1811 Schweigger was to become the editor of the Journal für Chemie und Physik, the successor of Gehlen’s journal, which had ceased publication in 1809, and just as Döbereiner had published in Gehlen’s journal, he now began to publish in Schweigger’s journal.

The Call to Jena

In 1810 Döbereiner’s agricultural projects were discontinued, and once again the 29-year-old father of a family found himself unemployed and unable to pay his debts. Fortunately, at this lowest point in his life fate suddenly intervened. Döbereiner was surprised to learn from the Senate of the Universität Jena that he had been nominated to be Extraordinary (ausserordentlicher) Professor of Chemistry and Technology by Duke (Herzog) Carl August (1757–1828) (Figure 5) of the small state of Sachsen-Weimar-Eisenach (Figure 6), an enlightened and liberal ruler and a patron of the arts and sciences. The duke (he became Grand Duke (Grossherzog) in 1815) had asked Gehlen to recommend a successor to Professor Johann Friedrich August Göttling (1753–1809), who had died in the previous year. Gehlen, knowing that Döbereiner was out of work, proposed his name with little hope of success, for he did not have a high school (Gymnasium) certificate let alone any higher education. Only after Döbereiner arrived in Jena did he learn that he needed a doctorate to occupy the position. He was granted this degree from Na$_2$SO$_4$, and other processes, which he reported in Gehlen’s journal. The blockade of the Napoleonic war, however, forced the plant to close.