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By George Urdang



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Berzelius and Pharmacy*

By GEORGE URDANG†

IT WAS a century ago, on the seventh of August, 1848, that scientists all over the civilized world mourned the death of one of the greatest among the many excellent chemists who, at the end of the eighteenth and during the first half of the nineteenth centuries, systematized and utilized the new views opened by Antoine Laurent Lavoisier (1743-1794). This man was the Swede, Jöns Jacob Berzelius (1779-1848).

This is not the place to list in detail the numerous contributions to chemistry which have earned immortality for the name of Berzelius. It may suffice to state that it was not only investigations based on thoughts of his own, comprehensive and of highest importance as they were, but his evaluation, classification, and supplementation of the chemical findings of his contemporaries which made the work of Berzelius so enormously influential and consequential.

Some Contributions of Berzelius.—On the basis of the suggestions presented by the Frenchmen J. H. Hassenfratz (1755-1827) and P. A. Adet (1763-1832) the great Swede created the chemical symbols which, with some changes, are still in use. He coined the terms allotropy and catalysis, thus harnessing the phenomena concerned into well-defined limits and chemical tools. He investigated the chemical proportions in a way never surpassed



Jöns Jacob Berzelius (1779-1848)

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† Professor of the History of Pharmacy, School of Pharmacy, University of Wisconsin, Madison, Wis.; Director, American Institute of the History of Pharmacy.

and proved the validity of the law of proportions not only for inorganic, but also for organic substances. Together with W. Hisinger (1766-1852) he presented the fundamentals of the electrochemical theory more than four years before Humphry Davy (1778-1829) published his epoch-making respective observations.

Pharmaceutical Scientists about 1800.—The chemical period into which Berzelius was born was decidedly influenced by great pharmaceutical scientists. In his own country, Sweden, it had been the apothecary-chemist, Carl Wilhelm Scheele (1742-1786), whose early death had prematurely closed an unusually brilliant chain of discoveries. In France, Louis Nicolas Vauquelin (1763-1829), likewise growing into research from the ranks of pharmacy, was president of the Parisian Academy of Science when Berzelius, in 1819, in a special session of this famous institution presented the French edition of his book on the electrochemical theories and chemical proportions, and Berzelius proudly reports in his autobiographical notes¹ the compliments paid to him by this great apothecary. In Germany, the chemical scene in the late eighteenth and early nineteenth centuries was dominated by the pharmacist, Martin Heinrich Klaproth (1743-1817), whom Berzelius, in his reference to a priority quarrel concerning the discovery of cerium, called "Europe's greatest analytical chemist."² There was, furthermore, quite a galaxy of other prominent apothecary-chemists around 1800 everywhere, especially in France and Germany, but also in England and in Russia.

This situation offers an explanation for the fact that, whenever there seemed to be a vague possibility of a practical pharmaceutical activity for the youth Berzelius, it was seized and dwelt upon, and that statements to this effect have been made now and again.

It was in order to contradict the idea of Berzelius having been a pharmacist that Theodor Husemann (1833-1901) in an article written on the occasion of the fiftieth anniversary of the death of the great chemist made the following statements:

"Berzelius, unlike several other famous northern naturalists... was not a pharmacist by profession. He was a physician and, after having completed his studies, he has indeed practiced medicine (as physician at Werner's mineral water establishment at Stockholm) from 1803 to 1806 besides acting as an 'adjunct to the professor of medicine and pharmacy,' a position with an entirely insufficient remuneration."³

Pharmaceutical Experience of the Youth Berzelius.—However, although Berzelius never was "a pharmacist by profession," were there not indeed relations of a substantial nature entitling pharmacy to claim some modest part in the development of the great scientist? The fact that the brief notes on Berzelius in J. A. Häfliger's "Biographicon" include the remark "worked in a pharmacy"⁴ seems to justify such an assumption. It

is furthermore underlined by the following passage in H. G. Söderbaum's book on "Berzelius Development and Growth, 1779-1821":

"Idleness was something which the restless nature of Berzelius could stand the least. He longed for taking up experimental work again and in order to satisfy this longing he decided to look for a position in the pharmacy of some neighboring town. At this time Berzelius was the guest of his aunt Bromander at Bromma near Motala. He remembers a relative and namesake who is an apothecary in Jönköping. He applies for a job, receives, however, a negative reply. He is more successful in Vadstena. There he stays in the pharmacy for the rest of the summer (1799) and takes part in the entire pharmaceutical work.⁵ This episode, as unessential as it may appear as such, is nevertheless of some interest since it furnishes proof for the fact how well Berzelius already at this early time understood how to take advantage of whatever came into his way and to utilize it in one way or another. The insight into the practical part of the profession of pharmacy which he gained in the plain Vadstena apothecary shop was by no means lost. On the contrary, it offered the first incentive to his publication of thirteen years later entitled 'On the Chemical Preparations in the Pharmacopœias of the Various Countries' which made him a reformer of Swedish pharmacy.⁶ His later activity in this field has, by the way, by no means been without influence on the organization of the public health system in other countries."⁷

It is in all probability these statements which still in 1948, in the most recent Berzelius biography, written by Wilhelm Prandtl, found their repercussion in a passage telling that during the summer vacation in 1799 the student Berzelius went to the country, "where life was less expensive and occasionally money could be earned by teaching or as a clerk in a pharmacy."⁸

Do the real facts conform with the description of this episode in Berzelius' life and the conclusions drawn by the enthusiastic biographer H. G. Söderbaum? The view given by the one who ought to know, Berzelius himself, is quite different, and it is not without an ironical connotation that the same man who wrote the flowery story quoted above was bound to bring his hero's contradictory statements to the knowledge of the world. In 1901, only two years after his first book on Berzelius had appeared, H. G. Söderbaum edited for the Royal Swedish Academy of Science the "Autobiographical Notes" of the great chemist presented by the latter to the Academy. In these "Notes" Berzelius describes his vacation activities of the year 1799 as follows:

"I had an uncle, Daniel Berzelius, who was an apothecary in Jönköping, of whom I asked leave to help in the apothecary shop during the summer. In this way I hoped to acquire distinct pharmaceutical experience, but he refused my request. I then accepted the invitation of my aunt, Mrs. Flora Bromander, to spend the summer with her family at

¹ H. G. Söderbaum, J. J. Berzelius, "Autobiographical Notes," translated into English by Olof Larsell, Baltimore 1934, p. 40; Berzelius quotes Vauquelin as follows: "We consider it as only a proper reparation to say to you that, if you and Mr. Hisinger's work on the chemical effects of the electric pile had been known to us when Davy received the great prize from us, we should have divided it between you and him."

² *Ibid.*, p. 51.

³ *Pharm. Ztg.*, 43, 63 (1898).

⁴ J. A. Häfliger, "Biographicon," in A. Tschirch, "Handbuch der Pharmakognosie," ed. 2, Leipzig, 1931/33, vol. 7, part 2.

⁵ For the italicized statements Söderbaum refers to M. Pontin, "Biographi," p. 205. Magnus Pontin (1781-1858), since 1835 physician in ordinary to the King of Sweden, was a lifelong friend and, for some time, collaborator of Berzelius.

⁶ H. G. Söderbaum, Berzelius' "Werden und Wachsen, 1779-1821," Leipzig, 1899.

⁷ Wilhelm Prandtl, "Humphry Davy—J. J. Berzelius," Stuttgart, 1948, p. 122. Prandtl lists Söderbaum's book on Berzelius among his sources.

Bromma near Motala. Bromander was a very industrious man.... He soon found me much too idle which was not to his taste. He sent me, therefore, after a few weeks to Vadstena where I was to live with his mother, a likable but quite elderly lady. I was also to work with apothecary Wessel who, incorrectly, was considered a skillful chemist. In his pharmacy there was little to do. But there was an Italian who blew glass and made barometers, a good old man named Josua Vaccano. With him I associated myself and learned to blow glass with a burner, as well as to make barometers and thermometers. With this occupation I busied myself at home between the hours of instruction from him. After a month I returned again to Bromma."⁹

This statement in which Berzelius himself stresses the lack of opportunity to do pharmaceutical work in the Vadstena apothecary shop and mentions the information in the art of glass blowing as the main achievement of this vacation month, deprives this epoch in the life of the great chemist of every pharmaceutical significance.

The difference between the real meaning of the episode in Vadstena as to Berzelius' later pharmaceutical knowledge and interests, however, and the interpretation given to it by his biographer offers an excellent example for one of the most frequent sources of mistaken views in so many biographies: the endeavor to construe some causal connection between every event in the life of the hero with all subsequent ones which seem to develop along the same line. In his later life Berzelius took an active and very beneficial interest in pharmacy. In his younger life he had spent some time in a pharmacy. There had to be a causal nexus between these two facts.

It is interesting to note that another and much more important job, done by Berzelius in a pharmacy only one year after his pharmaceutically rather uneventful stay at Vadstena, has not been given much publicity by those eager to establish an early influence of pharmacy on Berzelius. In the summer of 1800 Berzelius, still only a candidate of medicine, held for some months the position of a physician to the poor at Medevi, a then much frequented Swedish spa. He evaporated the water of the various springs and, leaving the examination of the residues for the time after his return to Upsala, he made "gas analyses on the spot in the apothecary's shop."¹⁰ This proves that the pharmacy at Medevi offered the young chemist the adequate opportunity, apparatus, and reagents for his analysis which, by the way, has to be considered as his first scientific accomplishment and served him as basis for his dissertation. There is, however, no evidence for the assumption that this use of the facilities of an apothecary shop for scientific work had any influence on the attitude of Berzelius toward pharmacy.

Besides, there is no necessity for any attempt at finding some more or less farfetched reason for the activities of Berzelius in the interest of pharmacy. It belonged, after all, to his duties as a professor of chemistry and pharmacy to pay attention to the scientific fundamentals of the latter. Another factor was that, as intimated above, at this time chemistry and pharmacy were still to a very great extent undivided.

When the young student Berzelius applied for admittance into the laboratory of his chemistry professor at Upsala in order to start practical chemical work, he was given "the two thick volumes" of the renowned "Textbook on the Art of Pharmacy" ("Lehrbuch der Apothekerkunst") by the apothecary and professor of pharmacy at Königsberg in Prussia, Carl Gottfried Hagen. The accompanying advice was: "read them first."¹¹ The two first preparations to be assigned to the ambitious student were undoubtedly of a pharmaceutico-chemical nature, namely, *Colcothar Vitrioli*, an impure iron oxide obtained by heating iron sulfate, and potassium carbonate obtained by heating cream of tartar.

It is a peculiar accident that it was just the pharmaceutical examination to be passed at that time by the Swedish candidates for the degree of Doctor of Medicine which became a cause of great irritation to Berzelius, not because of any fault or deficiency on his part, but because of personal differences among the respective professors at the University of Upsala.

Berzelius the Pharmacy Teacher.—In 1803, only one year after he had met the requirements for the medical doctorate—the official bestowal of the degree did not take place until midsummer 1804—Berzelius was appointed "Adjunct in Medicine and Pharmacy" at the School of Surgery at Stockholm.¹² In this capacity he gave lectures on chemistry to which "the pupils at the School of Surgery... as also the students of pharmacy were invited to listen..."¹³ In 1806 he introduced at the College of Medicine at Stockholm "exercises in pharmaceutical" and chemical operations similar to those in Upsala." In 1807 Berzelius was named as professor of medicine and pharmacy at the School of Surgery, his duties comprising the teaching of chemistry, general science (called at that time "natural history"), pharmacy, and medicine. In 1809, finally, the instruction pertaining to the professorship held by Berzelius "was divided among three new professors,"¹⁴ leaving to Berzelius only the two disciplines in which he was interested primarily, chemistry first and then, in its relations to this science, pharmacy. In 1811 Berzelius was given a seat and a voice in the Swedish College of Medicine and it is, for the topic of this paper, of interest that he received this appointment in his capacity as professor of pharmacy.

In 1812, one year after the firm establishment of Berzelius as the academic representative of Swedish pharmacy, he published the aforementioned observations "On the Chemical Preparations in the Pharmacopœias of the Various Countries." The subsequent activities of the great Swede in the interest and for the sake of pharmacy not only in his homeland but in the world at large have been described by Husemann as follows:

"In his capacity as a professor of pharmacy Berzelius has helped the Swedish pharmacists not

⁹ *Ibid.*, p. 23.

¹⁰ *Ibid.*, p. 38.

¹¹ *Ibid.*, p. 44. In referring to these lectures Berzelius confessed the following: "I believed, like all beginners, that completeness and thoroughness were the principal things.... The only one to derive any benefit from this was myself, since, as the number of my auditors diminished daily, I recognized that this manner of presentation was not the correct one." (*Ibid.*, p. 168, note 77.)

¹² Erroneously called "pharmacological" by Larsell.

¹³ Söderbaum, J. J. Berzelius, "Autobiographical Notes," *loc. cit.*, pp. 66/67.

⁹ H. G. Söderbaum, J. J. Berzelius, "Autobiographical Notes," *loc. cit.*, p. 28.

¹⁰ *Ibid.*, p. 31.

only through his lectures. It should not be overlooked that he participated to an extremely great extent in the preparation of the Swedish Pharmacopoeias which appeared during the time of his active life. Most biographers have silently passed over the fact that the chemical part of the fifth edition of the Swedish Pharmacopoeia is the work of Berzelius. This edition, planned as early as 1793 but not completed until 1817 because of war and political unrest, offers not only an example as to the selection of drugs admitted, but its brevity and preciseness make it undoubtedly the best of all contemporary pharmacopoeias. In the preparation of the next (sixth) edition of this standard, published in 1845, Berzelius has likewise participated, this time as the chairman of a committee of revision especially appointed for this purpose.

"Berzelius has furthermore given vivid support to the establishment of an association of the Swedish pharmacists intended to promote pharmacy as a science. Having shown his appreciation of the beneficial effect of associations as early as 1807 by becoming one of the founders of the Swedish Society of Physicians, he helped in the founding of a similar pharmaceutical group. When in 1820 the newly formed Swedish Pharmaceutical Society under the chairmanship of Carl Göransson created a library and other useful institutions, Berzelius presented the young group with foreign periodicals and other substantial support besides helping by his advice.

"Naturally, more than through these local activities [in the interest of Swedish pharmacy] Berzelius has promoted pharmacy everywhere through his scientific life work and publications."¹⁶

It is of interest that the fifth edition of the Swedish Pharmacopoeia, the chemical part of which had been prepared by Berzelius, appeared in the same year in which the aforementioned German apothecary-chemist, Martin Heinrich Klaproth, passed away. It had been Klaproth who, together with the pharmacists Sigismund, Friedrich Hermbstädt (1760-1833) and Valentin Rose, Jr. (1762-1807), had made the new views of Lavoisier and the new chemical nomenclature the basis of the chemical part of the *Pharmacopoea Borussica* published in 1799, thus setting an example for his time which was followed everywhere. It deserves mention at this place that after the death of Klaproth "the chair of that prominent chemist and his position as counsellor in the *Obersanitätskollegium* in Berlin" was offered to Berzelius. He declined "this complimentary offer with thanks" since, as he expressed it, "I was indebted to my own native land for a passable and carefree living, with full opportunity to pursue the science to which I belonged...."¹⁷

Tributes to Berzelius.—The high esteem, the admiration, and the gratitude felt everywhere for the work and the personality of Berzelius expressed itself on the occasion of his death in numerous and detailed necrologies. But a closer examination shows that those published in English language pharmaceutical journals, for instance in the *British Pharm. J. & Trans.*, 8 148 (1848-1849) and in the *Amer. J. Pharm.* 21, 189 (1849), were reprints of a necrology published in *Lancet*, while the French *J. Pharm. Chim.* presented its readers with the reprint of a "Biographie

Chimique" by P. Louyet. It is understood that these necrologies were of a general nature rather than expressing the particular feelings of the pharmaceutical world toward the great deceased.

It was the German pharmacists who conceived and performed a memorial to Berzelius which has to be regarded as one of the most beautiful tributes of gratitude ever offered to a great benefactor by those who consider themselves his beneficiaries. It is simultaneously proof of the wave of liberalism and universalism, expressing itself in the high emphasis placed on intellectual and humanitarian achievements, which swept over the Germany of 1848.

A "General German Pharmaceutical Congress" ("Deutscher Allgemeiner Apotheker Congress"), convened at Leipzig on September 12 and 13, 1848 and its chairman, the pharmacist Dr. L. F. Bley, told in his opening address that "the year 1848 carrying with it the dawn of German liberty has been joyfully welcomed by the pharmacists" who hoped for redemption from "the pressure of tutelage and the domination by bureaucrats."¹⁸

It was on the second day of this Congress that the pharmacist Dr. E. Geffcken of Lübeck read an "Appeal to the German Pharmacists for the Establishment of a Memorial to Berzelius" from which the following significant part may be quoted:

"Berzelius' professorship of chemistry and pharmacy was not restricted to Sweden where the pharmaceutical profession owes primarily to him the dignified position recognized all over the other parts of Europe; he was, if not directly then indirectly the teacher of all of us. For where in our fatherland can a pharmacist be found, and be it the most simple practitioner, who does not follow in the one way or another the theoretical or practical rules set by Berzelius. Alas, gentlemen, just here in Leipzig we are at a place from where, multiplied by the printing press, the products of Berzelius' mind have been distributed all over Germany, sometimes even earlier than in Sweden. In this respect it may suffice to point, as offering adequate evidence, to the five or six editions of his comprehensive textbook of chemistry."¹⁹

Geffcken suggested as a more fitting memorial to Berzelius, to be presented to the Swedish Academy of Science, a wreath of silver oak foliage with as many individual leaves in solid silver as pharmacists who had attended the 1848 Pharmaceutical Congress at Leipzig.

On August, 7, 1849, Geffcken reported that his appeal had been successful and his suggestion realized, and that "the firm Th. Strube and Son in Leipzig had produced a real piece of art." Having told that the wreath had, on December 11, 1848, been sent to the Swedish Academy of Science together with a poem from the pen of Emanuel Geibel,²⁰ Geffcken concluded as follows:

"The silver wreath was placed on a silver-trimmed black velvet pillow. In a case attached to it were: 1. the beautiful poem by Geibel printed with silver letters on black parchment; 2. the presentation

¹⁶ See footnote 3.

¹⁷ Söderbaum, J. J. Berzelius, "Autobiographical Notes," *loc. cit.*, p. 95.

¹⁸ *Arch. Pharm.*, 106, 83 (1848).

¹⁹ *Arch. Pharm.*, 106, 117 (1848).

²⁰ Emanuel Geibel (1815-1884) was one of the best-known representatives of German conventional poetry about the middle of the nineteenth century. He advocated the political unification of Germany under an emperor, not as a republic, hence was called the herald of the emperor ("Der Kaiserherold").

document. A letter expressing the gratitude of the Academy of Science at Stockholm has informed us that the wreath has been deposited beneath the picture of Berzelius in the room reserved for the sessions of the academy."²¹

The first paragraph of the letter of thanks mentioned above, and addressed to the "highly esteemed Pharmaceutical Congress at Leipzig," testifies to the respect in which German cultural and scientific achievements and standards were held at this time by the world at large. It reads as follows:

"The Swedish nation as well as all the other nations pursuing scientific aims are since days far remote indebted to Germany's noble and intelligent people for the unveiling of many a scientific truth and for a variety of useful inventions. Sometimes Sweden has had the satisfaction of repaying, in its limits, this debt. In more recent time it was Berzelius who has furnished his fatherland with such an opportunity. The Academy of which he was the most precious adornment, has received the most beautiful proof of appreciation of this fact from one of Germany's most reputed associations."

Geibel's poem was reprinted in three different

modifications, in golden as well as silver letters on blue ground, and in black on white glossy paper. All three modifications, sold for the benefit of old meritorious pharmacy clerks, showed the picture of Berzelius enshrined by the wreath of silver oak leaves and followed by the poem which, in free English translation, appears below.

It is significant that the poem pays homage to Berzelius in the most general terms without mentioning pharmacy at all, except in the dedicatory caption. German pharmacy had, in this case, made itself the speaker for German science on the whole.

There cannot be any doubt. The great Swedish chemist and pharmacy have been connected in many and varied ways. It was not accidental happenings in the youth of Berzelius, some more or less ephemeral early "work in a pharmacy," that served as a kind of vantage point. It was the inescapable constellation of cogent circumstances which forced them together, the great chemist and the time-honored profession in which chemistry as a science has found an early place and continuous cultivation.

Pharmacy as an applied science owes Berzelius so much that it is entitled to claim him as one of its Patron Saints on the basis of one of the most elementary human rights: the right of the grateful to express his gratitude.

"TO THE MEMORY OF THE MASTER IN SCIENCE

J. J. v. BERZELIUS

THE GERMAN PHARMACISTS, 1848

For the immortal wreath on the slumbering head of Berzelius
Germany joins and presents gratefully leaves of her oaks.
For him loved Mother Nature. Behold, her veil, the much folded,
Smilingly threw she aside for him, her favorite son.
Graciously taught she him the secret of natural forces
Which she, ready to bless, calmly had kept in her breast.
Now, however, he solved, an enlightened disciple of Isis,
Thousands of riddles, unlocked numberless wonders to us.
As out of barren rock once Moses elicited water,
He out of metal and stone conjured up sources of life.
What, for the sake of mankind, helpful is joining in matter,
What is adversely opposed, what is harmoniously solved,
To the mortals he showed. Then death reluctantly touched him
Bringing the favorite son back to the mother again.
Sweden weepingly buries the dead, all Europe deplores him.
But posterity's offerings are admiration and thanks."

²¹ *Arch. Pharm.*, 110, 127(1849).







