The Multifaceted Career of Louis Borsch

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John Louis Borsch Jr, MD (1873-1929), was an ophthalmologist from Philadelphia who spent most of his career in France. During his lifetime he was probably best known as the inventor of the first fused bifocal lens, which was marketed very successfully as the Kryptok lens. He may be better known today for performing cataract surgery on Mary Cassatt (1844-1926), the American Impressionist artist, and on James Joyce (1882-1941), the Irish author. Little known, but remarkable, is his thesis for his second medical degree, *Le Traitement Chirurgical de l’Astigmatisme* (*The Surgical Treatment of Astigmatism*).


Borsch undoubtedly went to Paris because of its reputation for offering the best ophthalmological training available anywhere. He worked in the clinics of two highly respected ophthalmologists who were known for their teaching, Xavier Galezowski, MD (1832-1907), and Louis de Wecker, MD (1832-1906). Galezowski was born in Lipowice, Poland. He received his first medical degree at the University of St Petersburg in 1858 and another from the Faculté de Médecine in 1865. De Wecker was born in Frankfurt, Germany, and received medical degrees at Würzburg in 1855 and Paris in 1861. He became an Austrian citizen in 1886 and was knighted by that country, hence the “de” in his name. Later, he moved permanently to Paris and became a French citizen. He directed the busiest ophthalmic clinic in Paris and probably earned more money from his practice than did any other 19th-century ophthalmologist. Borsch became chief of de Wecker’s clinic before he received his second medical degree.

The directory of the Société Française d’Ophtalmologie (French Ophthalmological Society) first lists Borsch as one of its members in 1896, which was at the beginning of his education in the French capital. He lived on the Left Bank in Paris, quite close to the Faculté de Médecine. In 1897 Borsch made a return visit to Phila-
delphia to attend the annual meeting of the American Medical Association and present an article that described the new ophthalmoscope he had invented. It contained a revolving mirror and 2 discs of multiple lenses that provided 76 different power settings. By the time he had received his Paris medical degree, Borsch had published many articles as sole author on topics ranging from optics to ophthalmic plastic surgery.

**THESIS**

Borsch successfully defended his doctoral thesis, *Le Traitement Chirurgical de l'Astigmatisme* (*The Surgical Treatment of Astigmatism*), on July 20, 1900 (Figure). It is a series of case reports with a review of the 19th-century literature.

In his historical overview, Borsch described the contributions made by many ophthalmologists. Franciscus Donders (1818-1889), the Dutch ophthalmologist who is known for his work on optics, had mentioned cataract extraction as one of the most frequent causes of astigmatism in his 1864 textbook, *Die Anomalien der Refraction und Accommodation des Auges (On the anomalies of accommodation and refraction of the eye)*. Hermann Snellen, MD (1834-1908), the Dutch ophthalmologist who is known for his visual acuity chart of 1862, had described the possibility of curing astigmatism surgically. He suggested that an incision perpendicular to the steepest meridian would create an opposite astigmatism that would neutralize the original astigmatism.

The first individual who made an incision in the cornea to change its shape was Hjalmar August Schiøtz, MD (1850-1927), the Norwegian ophthalmologist who is remembered for the indentation tonometer he introduced in 1905. In 1885 he described a patient who had 19.5 diopters (D) ofastigmatism after cataract surgery. He incised the cornea from the endothelial surface by means of a Graefe knife. A 3.5 mm limbal transverse perforating incision in the steep meridian reduced the astigmatism to 7 D. In radial keratotomy parolane, Snellen had described a T cut. Borsch’s early mentor, Galezowski, had experimented with corneal wedge resections in approximately 1890. However, neither Borsch nor Galezowski reported the results. But Vincenz Fukala (1847-1911), the Austrian ophthalmologist of Polish descent who described clear lens extraction for myopia in 1890, wrote that Galezowski’s attempts were not successful. It is not clear whether Galezowski was treating myopia or astigmatism. So Galezowski was either the first to do a wedge resection for astigmatism or the first to attempt to correct myopia surgically. Borsch’s other mentor, de Wecker, performed refractive surgery to treat a patient with keratoconus. De Wecker incised the steepest meridian and reduced the cylinder by 5 D.

William Horatio Bates, MD (1860-1931), the American ophthalmologist who later wrote a popular, pseudoscientific book, *Sight Without Glasses*, published an article entitled “A suggestion of an operation to correct astigmatism” in 1894. He wrote, “Incisions of the cornea are made at right angles to the most convex meridian. The amount of correction can be regulated by the number, depth, and location of the incisions.” Bates described two individuals in whom he did refractive surgery by making transverse nonperforating incisions with a Graefe knife. The uncorrected visual acuity improved in both patients.
Other ophthalmologists reported more cases. Faber (first name and dates unknown), in Holland, treated a 19-year old who had been rejected from a military academy owing to astigmatism. A single arcuate limbal incision improved his visual acuity from 20/60 to 20/25, which permitted him to attend the academy. Curiously, Faber wrote that he was unaware of anyone doing this type of surgery before.13 Jacques Lucciola (dates unknown), in Italy, reported 10 cases of nonperforating corneal incisions made parallel to the steepest meridian.15

Two years before Borsch wrote his thesis, Leendert Jan Lans (1869-?), a Dutch medical student, had published a most interesting thesis for his medical degree, Experimentelle Untersuchungen über Entstehung von Astigmatismus durch nicht-perforierende Corneawunden (Experimental Studies of the Treatment of Astigmatism With Nonperforating Corneal Incisions).16 He had performed a series of studies on rabbit eyes. The importance of his experiments lies in their similarity to radial keratotomy and limbal relaxing incisions. Lans scraped the anterior corneal surface, made nonperforating knife incisions, and catarerized rabbit corneas. Scraping the cornea produced no change in astigmatism. Paired superficial arcuate incisions just inside the limbus resulted in an increase in astigmatism from 0.5 to 1.5 D. Superficial cautery applied in the same pattern produced no change in astigmatism, but deep cautery created 2 to 3 D of astigmatism. Lans also applied cautery radially. Superficial treatment produced no astigmatism, but applications of “medium” depth produced 1 D of astigmatism. Lans’s sketches of his radial treatments, which show flattening of the cornea centrally, are remarkably similar to more recent descriptions of radial keratotomy. He concluded that further study was needed, and Borsch agreed with that assessment.

Borsch described a series of 12 case reports, but he had not been personally involved with all of them. Several were those previously described by Bates and Faber. Most were individuals who had astigmatism after surgery for cataract, glaucoma, or foreign body removal. In his conclusions, Borsch agreed with the principles laid out by Bates: incisions in the upper half of the cornea produce against-the-rule astigmatism. A corneal incision will lengthen the radius of curvature of the meridian perpendicular to the line of incision. Astigmatism is often greater early after surgery and stabilizes within 3 months. The closer the incision is to the center of the cornea, the greater is the induced astigmatism. Based on Lans’s work, Borsch wrote that astigmatism can be cured through knife incisions or deep cautery. He thought that astigmatism of less than 3 D could be treated with knife incisions. For astigmatism of more than 3 D, he opined that cautery parallel to the limbus at each end of the meridian, as described by Lans, was preferable. Lans and Borsch became clinical ophthalmologists and neither appears to have made further studies on astigmatism after writing their theses.

LATER CAREER

After completing his training in Paris, Borsch returned to Philadelphia and practiced at 1310 Walnut Street.17-24 His father was still a very active optician and had patented an important advance in lens technology, a cemented bifocal lens. At that time bifocal lenses were often fixed to the back surface of a distance lens.25 When made well, they were useful optically. However, there were problems. Debris could accumulate on the protruding edge of the bifocal segment. The balsam cement that held the bifocal in place could melt if exposed to heat or could be crystallize if exposed to cold. The senior Borsch’s modification was to cement a disc of flint glass into a depression made in the front surface of a crown glass lens. (Flint glass has a higher index of refraction than crown glass and bends light rays more acutely.) A thin cover glass was cemented over the front surfaces of both lens pieces. His bifocal was thicker than the usual one, but it was very useful optically and durable. Its disadvantages were that it was costly and not easy to manufacture.

Louis Borsch invented an even better product, the fused Kryptok bifocal, which was granted a US patent in 1908. (The name originated from two Greek roots, “crypt-,” meaning hidden and “ocu-,” meaning eye.) As with his father’s bifocal, a flint glass lens was placed in a depression on the front surface of a crown glass lens. The newer modification was to fuse the two pieces by heating them to more than 1000°F. After the lens cooled, the prescription could be ground on its front and back surfaces. This was the best bifocal lens of its day and sold for much higher prices than other bifocal lenses. In 1905 Borsch founded the Kryptok Company with two opticians, E. B. Meyrowitz of New York and Matthew W. Dunscombe of England, to manufacture and market fused bifocal lenses. The Kryptok Company sold the marketing rights to large retail dispensers and aggressively defended its patent rights in the courts.

Issues of the American Medical Directory for the second and third decades of the 20th century list an office address for Borsch in Philadelphia. However, by 1908 he had returned to Paris to live and practice. He remained in France for the rest of his life and became Chief of Ophthalmology at L’Hôpital American. His home was in a chic neighborhood, and he and his wife were known for their entertaining. An article in the June 7, 1908, New York Times describes one reception they gave: “The social and musical event of the week in Paris was the first public appearance as a soloist of Miss Flora Wilson, daughter of the American Secretary of Agriculture…. Practically every prominent member of the American colony was present…. [Miss Wilson] was also the principal performer at a large reception given this week by Dr. and Mrs. Louis Borsch of Philadelphia at their place in Rue de la Paix. The doctor and his wife will soon leave Paris for Biarritz, where they will occupy a handsome villa during July and August.”26 That autumn they were mentioned again in the New York Times, just before a description of the social activities of the American ambassador to France.27

Borsch accumulated many governmental honors. On the recom
mendation of the International Congress of Ophthalmology, the Italian government decorated him with its Royal Medal of the Ministry of Public Instruction in 1900. In 1918 the President of France, Raymond Poincaré, conferred on Borsch France’s greatest award, the Legion of Honor, “in recognition of his services as eye surgeon at the French military hospital of Grand Palais in the Champs Élysées.” The Legion of Honor has several levels, and in 1927 Borsch was promoted from Chevalier to Officer. He also received the Croix de Guerre.

Although his father was German by birth, there is no doubt of Borsch’s allegiance during the First World War. Just after the United States entered the war, Borsch became the first American to fire a shot at the enemy. During a visit to the front, Borsch requested and immediately obtained permission from the French commander to fire a 75-mm field gun. In 1917 Borsch sent a long report to Washington, DC, of a visit to the front with the American consul general. His objective was to examine conditions for treating ocular injuries. Here is an excerpt:

We went to the Champagne front. We saw one of the most perfect installations for the wounded that you can possibly imagine… One hospital we inspected was in an excavation in the earth going down anywhere from six to ten yards deep, all protected by logs and iron plates. It is on one floor and is lighted up with electricity of the most modern apparatus. Fresh air is pumped into the hospital all the time, night and day. I am told that even the .210 caliber German shells can do no harm to this hospital… Men are on the lookout all the time for gas shells and emanations of poisonous gas.

During and after the war, he treated civilians, some of whom were very prominent individuals. Mary Cassatt, the American Impressionist artist, was one of his patients. He removed her cataracts but, for reasons that are incompletely understood, the results were not good. Before surgery she had suffered from iritis and had had adhesions within her eye. She also had diabetes mellitus, but we do not know the status of her retinas. During the 1920s Borsch took care of James Joyce, the author of the novel Ulysses. A story in the New York Times from 1932 was headlined “Joyce’s bad eyes are laid to teeth.” Author’s troubles have been the result of abscesses, doctors in France believe. He faces operation again.” The article says “Mr. Joyce regained his sight in 1923 through the skill of an American practitioner in Paris, Dr. Louis Borsch, but later his eyes failed him again.” In 1929 Borsch, age 56, died in his sleep from heart disease, and Joyce went to Switzerland for further care.

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