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BOOK REVIEW

Dietrich Stoltzenberg

Fritz Haber: Chemist, Nobel Laureate, German, Jew

Chemical Heritage Press, Philadelphia, Pa, 2004,
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This thoroughly researched biography of the Nobel Prize winner Fritz Haber, coming 70 years after his death, is an excellent source of information about Haber's life and scientific achievements, but also about the situation in science in Germany, notably in chemistry, before and after World War I.

Dietrich Stoltzenberg, the author of the book, is a chemist himself. His biography of Haber (1868–1934) is based on interviews with Haber's family and on archives. To write Haber's biography, Stoltzenberg spent eight years doing research in archives, institutes, and libraries in Germany, England, Israel, and the USA. In the meantime, some other Haber's biographies appeared in the German language, but Stoltzenberg's English version remains the only authoritative Haber's biography for English-reading scientists.

In this English edition, Stoltzenberg prudently abridged his German edition, published by Wiley-VCH Verlag GmbH, D-69469 Weinheim (Bundesrepublik Deutschland), 1998, ISBN 3-527-29573-9, from its 669 to only 326 pages, retaining the essential features of the original work. Thus, the English edition became acceptable to readers in a broad sense. The author of this review consulted the German original as well.

Until recently, no adequate biography of Haber existed in book form. In the meantime, some extensive biographies appeared that Haber's relatives considered not very true. Further, the memoirs of Haber's second wife, Charlotte Nathan, published in 1970 under the title *Mein Leben mit Fritz Haber*, did not treat adequately his scientific achievements.

Haber is primarily known for his ammonia synthesis and poison gas involvement during World War I but, according to Stoltzenberg, to focus only on these aspects would be an injustice to Haber.

By 1905 Haber had reached the objective long attempted by chemists of fixing nitrogen from air. Using high pressure and a catalyst, he carried out the reaction between nitrogen and hydrogen gases to obtain ammonia. Carl Bosch, a great chemist and engineer from the famous BASF industry, soon scaled up the process - hence the name »Haber-Bosch« process. The nitric acid produced from the ammonia was then used to manufacture agricultural fertilizers as well as explosives.

Fritz Haber

In Chapter 1, *Forebears*, (7 pp), Stoltzenberg shortly describes the history of Haber's family. The family name Haber is common among Eastern European Jews, especially in Poland. Chapter 2, *Childhood and Youth* (14 pp + 19 pp), describes Haber's youth. He was born on December 9, 1868 in Breslau, Prussia (now Wroclaw, Poland) in a well-to-do German-Jewish family. His father, Siegfried, was a prosperous chemical merchant and for a short time he worked for his father. His mother, Paula, died three weeks after Fritz's birth. When he was eighteen, he enrolled in the University of Berlin. From 1886 until 1891 he studied chemistry at the University of Heidelberg under Robert W. Bunsen, at the University of Berlin under August Wilhelm von Hoffmann, and at the Technical School at Charlottenberg under Carl Liebermann. In 1891 he received his doctorate from the University of Berlin. Chapter 3, *Years of Study and Travel* (9 pp + 10 pp) relates to his studies of chemical technology at the Eidgenössisches Polytechnikum, which is now the famous ETH (Eidgenössische Technische Hochschule, Zürich); there he worked under Georg Lunge. All these professors were leading world chemists of that time; nevertheless, he was disappointed and considered his work uncreative routine. He finally decided to take up a scientific career and worked for one and a half years at Jena with Ludwig Knorr, a known organic chemist. Knorr helped Haber to write his first paper on diacetosuccinic acid. Chapter 4, *The Glorious Years in Karlsruhe* (88 pp + 83 pp) describes his research at the Technische Hochschule

Karlsruhe where he worked as Hans Bunte's assistant (1894–1896), Privat-Dozent (1896–1898) (no salary), Associate Professor (1898–1906) and finally as Professor of Physical Chemistry and Electrochemistry (1906–1911). Chapter 5, *Nitrogen Fixation* (30 pp + 65 pp) describes Haber's contribution to the field, his patents, and also Carl Bosch's contribution to scaling up the ammonia synthesis. Chapter 6, *Establishing the Kaiser-Wilhelm-Institute für Physikalische Chemie und Electrochemie in Berlin* (13 pp + 24 pp) describes Haber's rise in 1911 to the position of Director of this Institute and its laboratories, the finest of its kind in the world. Chapter 7, *World War I* (34 pp +103 pp) describes Haber's efforts to help his country in chemical warfare, his work on the production of nitrogen compounds for explosives and fertilizers. Chapter 8, *Haber's Research on Chemical Warfare after World War I* speaks about his participation in the preparation of chemical weapons, which he considered equally inhumane as other modern warfare methods. Chapter 9, *Family and Friends* (41 pp + 76 pp) describes his marriage and relation with Clara Immerwahr, his first wife, his relationship with their son Hermann (b. 1902), Clara's suicide in 1915, his marriage in 1917 to Charlotte Nathan (28 years his junior), their divorce after ten years of marriage, and his relations with their children, Eva (b. 1918) and Lugwig-Fritz (Lutz) (b. 1921). Chapter 10, *The Nobel Prize and Succession to Emil Fischer's Position* (8 pp + 10 pp) describes the circumstances of awarding (in 1919) the 1918 Nobel Prize for chemistry to Haber, in the light of the Allies' stand that Haber was a war criminal. [But British and French army used poison gases as well; and what to say about the famous atomic physicist and Nobel Prize winners who took part in the production of two atomic bombs with frightful consequences – the comment of the writer of this article].

Chapter 11, *Haber's Institute and Scientific Work from 1919 to 1933* (32 pp + 88 pp) describes Haber's unsuccessful attempt to extract gold from seawater to help Germany repay war reparations. Chapter 12, *Haber's Promotion of the Sciences, 1920–1933* (16 pp + 45 pp) speaks about his contributions to scientific education and science policies and his attempt to connect German scientists with their colleagues in other countries. Chapter 13, *Emigration and Death* (27 pp + 64 pp) describes Haber's problems after Adolf Hitler's rise to power and his resignation to all his positions on May 2, 1933, as well as his relations with Chaim Weizmann's Palestine Project. He left Germany for good, stayed shortly in England and in Switzerland, where he died from a heart attack in Basel on January 29, 1934. Chapter 14, *Epilogue* (8 pp + 9 pp) describes the funeral and memorial addresses and naming Haber's institute as the Fritz-Haber-Institute of the Max-Planck-Gesellschaft.

Carl Bosh and Friedrich Bergius shared the Nobel Prize for 1931 »in recognition of their contribution to the invention and development of chemical high-pressure methods«, which enabled production of ammonia by Haber's nitrogen fixation process in the industrial practice.

Like many German Jews, Haber converted to Christianity (Protestantism) at the age of 24. In a way, Haber adopted German nationalism as his religion, but he was always aware of his Jewish roots and never denied or neglected them.

The writer of this article recalls a secondary school lesson given by Dr. Antun Hurm, a known Croatian Germanist, in Osijek, a Croatian city of high secondary schooling reputation. The lesson was devoted to Heinrich Heine and his poem *Wallfahrt nach Kevlaar* (Pilgrimage to Kevlaar). Commenting on this lovely poem, Dr. Hurm said that German Jews most often felt primarily as Germans while the religion was in the second place. Heine, though a Jew, had obviously much understanding for Christianity, otherwise he would not have been able to write such a beautiful poem, glorifying the Mother of God, commented Dr. Hurm. All this helps to understand the behaviour of many German Jews during World War I. They were faithful to Germany, and the great injustice done to them by the Nazi regime appears additionally greater.

In the first decade of the twentieth century, the world demand for nitrogen, needed for fertilizers, was much larger than the available supply. The main source of the chemicals necessary for fertilizers was found in the huge guano deposit (sea bird droppings), which was 220 miles in length and a few feet thick, along the coast of Chile. Unfortunately, this natural source of ammonia was disappearing relatively fast.

The Haber-Bosch process enabled Germany to be supplied with fertilizers and munitions during World War I, after the British naval blockade cut off supplies of nitrates from Chile. During the war, Haber invested his energies into further support for Germany. He developed a new weapon – poison gas – the first sample being chlorine, and supervised its initial deployment on the Western Front at Ypres, Belgium, in 1915. He deeply believed that Germany was not responsible for the war. He was an example of Prussian pride, and he unquestionably and uncritically accepted the State's policy, believing that Germany was unjustly landlocked during the war and deprived of supplies necessary for life. Ironically, Zyklon B, one of the gases developed by Haber around 1920 as a fumigant (a means of disinfection, consisting of HCN adsorbed into a carrier), was later used to kill concentration camp prisoners, including members of Haber's own family.

In many ways, as Stoltenberg's book describes, Haber helped the German war-machinery to run for four years. Feeling some responsibility for his country's fail-

ure in the war, Haber's life took an unhappy turn, and he was near a nervous breakdown. Despite the great honours bestowed on him, his role in chemical warfare had isolated him from the foreign scientific community, at least for some time. When Hitler became Chancellor, Haber tried to cope with the new reality that his enormous contributions to German industry were disregarded by the Nazi regime. He realized that it was time to emigrate. He was offered a position at Cambridge and left Germany for good in 1933. Because of his heart problems he did not stay long in England. On route to Switzerland, he suddenly died of a heart attack in Basel in 1934 at the age of 65.

Stoltzenberg describes in detail a variety of other Haber's important findings (quinone-hydroquinone equilibrium at the cathode, invention of the glass electrode, electrolysis of crystalline salts, study of the loss of energy by steam engines, turbines and gas motors, his quartz thread manometer for low gas pressure measurements, determination of flame temperatures, his firedamp whistle for the protection of miners, to mention only a few of his findings) which prove Haber's brilliant talent.

Haber's private life was a tragedy. His first wife Clara Immerwahr (1870–1915) was also a chemist, and a very intelligent and sensitive person (her surname literally translated means »always true«). She wanted to be a good housewife to Haber, but he did not show much understanding for her feelings. Haber was not a particularly devoted family man. He excluded Clara from being involved in his research and teaching at Karlsruhe. After a dinner party at Haber's home, aimed to praise the effectiveness of poison gas application, Clara and her husband had a furious argument. She, supposedly, accused her husband of perverting science, but the actual reasons for their conflict will never be known, says Stoltzenberg. That night, Clara took her husband's army pistol and shot herself in their garden in Berlin. Two shots were heard. The first was obviously a test shot and the second passed through her heart. She did not die immediately. Her son Hermann, who heard the shot in the early morning, found his mother dying and called his father. Details are not known but Clara might have still lived for several minutes to a few hours. Haber left the next day for the Eastern front, not even staying for the funeral. In 1917, two years after Clara's death, Haber remarried with Charlotte Nathan. She was much less demanding than Clara. One year later they got a daughter and in the summer of 1920 their son Ludwig Fritz was born.

There are several possible reasons for Clara's suicide: the promotion party for the new weapon – poison gas – by her husband at their home, which she could not tolerate; jealousy (Charlotte, who was Haber's secretary, was 26 years younger than Clara), hereditary streak in the family (Clara's sister committed suicide, and the oldest son of Haber and Clara committed suicide in 1946).

Clara Haber was buried at the cemetery in Dahlem (Berlin). Later, Haber expressed his wish that after his death Clara should repose beside him. This was fulfilled in 1934 and both, Fritz and Clara Haber, repose together at the cemetery in Basel. These lines in Stolltzenberg's book are moving.

Stoltzenberg succeeded in painting a vivid picture of Haber. No doubt, Haber lived for science. He had many friends. Richard Willstätter (Nobel Prize laureate for Chemistry for 1915) was his life-long closest friend. He also worked closely with Emil Fischer, a great German chemist. He was friends with Albert Einstein, Carl Bosch, Herbert Freundlich, Michael Polanyi, and many others.

The worldwide fixation of nitrogen is nowadays of the order of 100,000,000 tonnes per year, which, in the best way, illustrates the great importance of Haber's discovery. According to G. J. Leigh, thanks to Haber, the world food problem seems to be solved for those who can afford to buy ammonia. It still remains a problem for those who cannot. (G. J. Leigh, *The World's Greatest Fix*, Oxford University Press, Oxford 2004).

According to the British chemist J. E. Coates: »All who knew Haber will remember with lasting affection the man who enriched their lives. He will live on as a great chemist and will be honoured for his services to humanity. He deeply wished to be remembered as someone who served his country in war and peace«. (*J. Chem. Soc.* (1937) 1642–1672.)

Stoltzenberg's book is more than just a carefully documented biography. It provides an insight into the scientific, social, and political events in Germany in the first quarter of the 20th century, and will be definitely recognized as an invaluable document of the relevant time.

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