The Highs and Lows of a Scientific Genius

A century has passed since the German science world underwent rapid development in conjunction with the then-booming chemicals industry. The two chemistry institutes of the newly founded Kaiser Wilhelm Society were officially opened by the Kaiser himself in 1912. The first Director of the **Institute for Physical Chemistry** was **Fritz Haber** – a brilliant scientist whose achievements, however, were not without controversy.

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The Kaiser was punctual, but the weather left something to be desired for the guests who had gathered in pastoral Dahlem on October 23, 1912. The occasion was the official opening of the Kaiser Wilhelm Institute for Physical Chemistry and Electrochemistry and the Kaiser Wilhelm Institute for Chemistry. According to the official program, the distinguished persons from the fields of business, science and politics were to assume their standing places in the narrow library of the Institute for Chemistry by 9:45 a.m. sharp to await the arrival of the Kaiser, who would make his way by car to Dahlem, which, back then, was still a rural village enclave on the outskirts of Berlin.

Although the ceremony took only half an hour to complete, great hopes and aspirations were riding on the event. The new institutes aspired to expand knowledge and expertise in two scientific fields in which German research already enjoyed world renown and which, based on their practical applicability, were expected to yield very concrete gains for the country's booming industrial sector. Both institutes operated in accordance with the principles of the Kaiser Wilhelm Society (KWS), which had been established in 1911 as an innovative association for the advancement of science, and which had also resolved to establish two research institutes of its own within the first year of its existence.

Following the rapid construction of the institute buildings, which took just 11 months, the scientists quickly settled into their, for the time, technically sophisticated laboratories and offices. Ernst von Ihne, an architect already renowned for the design of such prestigious buildings as the Königliche Bibliothek (later known as the Berlin State Library), also designed the new institute buildings. Despite their distance from the center of Berlin, he gave them quasi-palatial façades to lend them a representative grandeur.

Enormous expectations rested on the Directors of the new institutes. The KWS succeeded in recruiting chemist Fritz Haber for the Institute of Physical Chemistry. Haber was responsible for the research carried out there over the following two decades and, in memory and honor of this brilliant – but also controversial – scientist, the institute has borne his name since its incorporation into the Max Planck Society in 1953.

Fritz Haber revolutionized the use of artificial fertilizer with the help of ammonia, and developed poison gas weapons and respiratory filters for the war effort.

The son of a Jewish paint and chemicals merchant, Haber was born in Breslau in 1868 and completed his doctorate in chemistry in Berlin in 1891. He embarked on his career as a scientist at Karlsruhe Technical University, where he made a name for himself with the publication of the first textbook on electrochemistry, a subject which was then emerging as a separate scientific discipline that combined innovative methods from physics and chemistry. He achieved his scientific breakthrough with the ammonia synthesis process, which he developed in 1908 and later perfected for industrial production together with Carl Bosch. The process enabled the cost-effective synthesis of ammonia from hydrogen and atmospheric nitrogen.

Given that ammonia was the basic component of artificial fertilizer, the process had a wide range of potential applications. At a time of expanding cities, declining child mortality and the general mobilization of resources, the resulting increases in agricultural yields provided a solution to looming social problems. Thanks to the Haber-Bosch process and the ability to make "bread from air," famine revolts became a thing of the past.

Leopold Koppel, a Jewish banker, was a key supporter of Haber's appointment to the institute. Koppel had had the foresight to invest in the light bulb industry, and his company had made enormous profits from the rapid spread of artificial lighting to roads, railway stations, factories and homes. Koppel's bank also invested in the iron industry, safe and bank vault construction, and in the Berlin hotel sector, including the prestigious Grand Hotel Bristol. Shortly after the turn of the century, he was one of the richest men in Prussia. Awestruck visitors reported that his villa in Tiergarten, Berlin's posh embassy quarter, contained "rooms full of Rembrandts, Rubens and Van Dycks."

Photo: Archive of the Max Planck Society

A new campus on the green field: The Kaiser Wilhelm Institutes for Chemistry (second building from the left) and for Physical Chemistry and Electrochemistry (second building from the right) following their official opening in 1912.

But vast reserves of money and education did not automatically equal social recognition, as the influential German middle class was unwelcoming and even blatantly hostile in its attitude toward Jews. Moreover, baptism, for which Haber opted as a young man, no longer provided unrestricted access to German-Christian society. Endowments therefore provided an effective means of securing a foothold on the social ladder. Science offered wide-ranging possibilities in this context since, even though it was viewed as the field of the future, it was still struggling for recognition and thus welcomed the support of wealthy, upwardly mobile outsiders.

Based on its mission of making scientific insights profitable through industry-oriented synthesis and catalyst research, Koppel was persuaded to donate a large sum of money to Haber's Institute for Physical Chemistry. The expectation of the Institute's rapid success was further cemented by Haber's reputation for burning the midnight oil. With 700,000 marks – the equivalent of around 3.5 million euros today – Koppel donated the lion's share of the funding for the construction of the institute building. The fact that his desire for social recognition was an important motivation for this generous donation is substantiated by the program for the ceremony of October 23, 1912: the tightly scheduled proceedings allowed time for a brief personal encounter between the Jewish banker and the Kaiser. Having been honored in this way, Koppel did not hesitate to provide a further 300,000 marks.

Vossische Zeitung newspaper of October 23, 1912 (evening edition)

» Usually shielded from the noisy rush of the metropolis, the idyllic and peaceful village of Dahlem was the scene of bustling activity this morning. A steady stream of cars drove along Friedbergstraße to the two new institutes of the Kaiser Wilhelm Society for the Advancement of Science: the leading men from the natural sciences (…), the top representatives of industry (…) «

The practicality of the research carried out at the institute was clearly demonstrated to the Kaiser during his tour of the laboratories. He inspected an innovative gas interferometer that could accurately detect the presence of hazardous mine gas in the air and prevent explosions underground. The Kaiser also praised as "colossal" the testing of gas and water pipes that were under strong attack from the corrosive effects of "vagabonding tram currents."

However, no one could have predicted on that day in October 1912 that gas research would ultimately shape the institute's early years of activity. World War I broke out just two years after the opening and, like most German intellectuals, Haber welcomed the conflict with open arms.

In accordance with his motto "In peace for humanity, in war for the Fatherland," Haber placed his scientific talents entirely at the disposal of the national cause of German victory in the war. Beginning in 1916, his institute was under the Supreme Army Command, and Haber himself was appointed Director of the Central Office for Chemistry at the War Ministry in 1914.

Fritz Haber viewed the use of poison gas by the artillery as a particularly promising addition to modern weaponry. Contrary to expectations, the German advance had ground to a halt just two months after the start of the war, and the fighting on the western front had stagnated into trench warfare. This put the Germans under considerable stress, as ammunition was running low due to problems with nitrate imports. Although Haber's ammonia synthesis opened the door to the artificial production of this basic material, large volumes of poison gas weapons could be produced faster and more cheaply from industrial waste products.

Thus, the new weapon was used for the first time on Haber's advice when the Germans launched a renewed attempt to break through the front in Flanders in April 1915. The resulting breach of the laws of war, which prohibited the use of chemical weapons, was accepted with the fatal consequence that their use quickly became established on all sides of the conflict.

Fritz Haber and his institute became the driving force behind the development of this new war technology. The institute developed gas weapons and respiratory filters for masks to protect the soldiers and military horses against chemical attacks from both their opponents and their own weapons in the event of a change in wind direction. Haber, who was appointed a captain, led the frontline action himself. Despite establishing his public credentials as a patriot, in moral terms, his involvement in the war effort proved fatal. His wife, Clara Immerwahr, a chemist and pacifist, shot herself in 1915 using Haber's service weapon. At the end of the war, Haber had the distinction of being honored by the 1918 Swedish Academy of Sciences with the Nobel Prize in Chemistry, while simultaneously being vilified as a war criminal by the Allied victors.

After the war, the focus of the work carried out at Haber's institute shifted to basic research. X-ray crystallography and theoretical chemistry, which availed of the insights and approaches developed by the recently emerged discipline of quantum mechanics, became important research fields for the institute. Subsequently, such renowned scientists as James Franck, Michael Polanyi and Herbert Freundlich all started out as members of Haber's team at the institute.

Among the researchers from all over the world who frequented the social circle at Haber's villa was Albert Einstein who, despite his pacifist beliefs that contrasted starkly with Haber's nationalistic and conservative views, had been a close friend of Haber's since 1911. Haber's institute enjoyed an excellent reputation throughout the world. In the late 1920s, almost half of its employees came from abroad, including – as had been the case even before 1914 – Japan, a country in which Haber had a particular interest.

The first phase in the history of today's Fritz Haber Institute came to an abrupt end a good 20 years after its establishment with the coming to power of the National Socialists. Affected both personally and as Director of the institute by the new anti-Semitic laws, which excluded Jews from public appointments, Fritz Haber applied for retirement in 1933. Profoundly depressed at the developments there, he turned his back on Germany and died in Basel, Switzerland in 1934 at the age of 65.

Photo: Archive of the Max Planck Society