

Good morning everyone,

Today I'm going to talk about Fritz Haber and the Nobel Prize he received in 1918 for synthesising ammonia. His work not only changed chemistry, but also agriculture, food security, and even global history. Let's explore why this discovery was so important, and also why it's remembered as both a blessing and a controversy.

The Challenge of Nitrogen Fixation At the start of the 20th century, the world faced a serious problem. Even though nitrogen makes up about 78% of the air we breathe, it's chemically inert — meaning plants cannot use it directly. Farmers had to depend on natural sources like Chilean saltpeter or animal manure, but these were limited and running out. Meanwhile, populations were growing fast and food demand was rising. Scientists around the world were desperately searching for a way to “fix” nitrogen so it could be used in fertilisers. This was one of the biggest scientific and humanitarian challenges of the time.

Fritz Haber: The Man Behind the Breakthrough Fritz Haber was born in 1868 in Germany. He studied chemistry and earned his PhD in 1891. He was a brilliant and determined scientist, and he understood the importance of solving the nitrogen problem. Haber believed that if he could find a way to turn nitrogen from the air into ammonia, it would change agriculture forever. After years of persistence, in 1908 he patented his method for synthesising ammonia.

The Scientific Breakthrough So what did Haber actually do? He figured out how to combine nitrogen from the air with hydrogen, under very high pressures of about 150 to 250 atmospheres, and at high temperatures of 400 to 500 degrees Celsius, using an iron catalyst. The result was ammonia — NH_3 . This was a huge breakthrough because for decades scientists thought it wasn't possible. Haber proved it could be done, and his process became the foundation for producing fertilisers on a large scale.

Nobel Prize in Chemistry 1918 For this achievement, Haber was awarded the Nobel Prize in Chemistry in 1918. The Nobel committee recognised not just the clever science behind it, but also its massive impact on food production and economic stability. When Haber gave his Nobel lecture in 1920, he described the scientific and practical challenges he faced, and the prize really confirmed how revolutionary his work was.

Industrial Scale-Up: The Haber–Bosch Process But Haber's lab method wasn't enough on its own. To feed the world, it had to be scaled up. That's where Carl Bosch, an engineer at BASF, came in. Bosch solved the engineering challenges of working with high pressure and corrosive gases, and by 1913, large-scale ammonia production had begun. This collaboration between Haber's science and Bosch's engineering became known as the Haber–Bosch process. Later, in 1931, Bosch himself received the Nobel Prize for his contributions.

Impact on Agriculture and Food Security The effect on agriculture was dramatic. With synthetic ammonia available, farmers could replenish soil nutrients and grow more food than ever before. This process supported the huge global population growth of the 20th century and prevented famines. In fact, it's estimated that today, about half the food produced in the world relies on fertilisers from the Haber–Bosch process.

Dual Use: Fertilisers and Explosives But ammonia has a double edge. On the one hand, it gives us fertilisers that save lives. On the other, it can be turned into nitric acid and then explosives like TNT. During World War I, when Germany was cut off from natural nitrate supplies, the Haber–Bosch process became vital for making weapons. Haber himself also played a direct role in developing chemical warfare, like chlorine gas, which damaged his reputation deeply. So the same discovery that fed the world also helped prolong war.

Environmental and Ethical Legacy Even today, the Haber–Bosch process has consequences. Fertilisers are overused, leading to water pollution, algal blooms, and dead zones in oceans. They also release nitrous oxide, a strong greenhouse gas that worsens climate change. Ecologically,

they disrupt natural nitrogen cycles and affect biodiversity. Ethically, Haber's legacy is complex: he helped humanity avoid starvation, but his work also enabled war and environmental damage. It's a classic double-edged sword.

Conclusion So, to conclude: Fritz Haber's Nobel Prize in 1918 marked a turning point in history. His work revolutionised chemistry and agriculture, fed billions of people, and became a cornerstone of modern civilisation. But at the same time, it reminds us that every scientific discovery has consequences — both good and bad. The challenge for us today is to continue benefiting from such innovations while also finding sustainable, responsible ways to protect our planet and prevent misuse.

Thank you.