

## Curriculum Vitae Prof. Dr. Nicolaas Bloembergen

**Name:** Nicolaas Bloembergen

**Life Dates:** 11 March 1920 - 5 September 2017



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Nicolaas Bloembergen was a Dutch-American physicist. An expert in laser spectroscopy, he played a predominant role in the development of nuclear magnetic resonance spectroscopy. He was also one of the founders of nonlinear optics. In 1981, he received the Nobel Prize in Physics jointly with Arthur L. Schawlow for his contribution to the development of laser spectroscopy.

### Academic and Professional Career

Nicolaas Bloembergen studied physics at Utrecht University in the Netherlands from 1938 to 1943. He graduated shortly before the university was closed during the German occupation. In 1945, Bloembergen moved to the United States and continued his education at Harvard University, where he worked as research assistant until 1947. During his temporary return to the Netherlands in 1948, he earned his doctorate at Leiden University with a thesis entitled: "Nuclear Magnetic Relaxation". In 1949, he was appointed Junior Fellow, in 1951 Associate Professor and in 1957 Gordon McKay Professor for applied physics at Harvard University.

During his career he frequently worked abroad as visiting scholar: In 1957 he served as Guggenheim fellow at the École Normale Supérieure in Paris. Later he worked at the University of California, Berkeley (1965), as Lorentz guest professor in Leiden (1973), as Raman Visiting Professor at the Indian Academy of Sciences in Bangalore (1979), at the Collège de France (1980), at the California Institute of Technology (1984), as well as a Senior Distinguished U.S. Scientist at the Max Planck Institute of Quantum Optics in Garching (1980 and 1987).

In June 1990, Bloembergen retired from Harvard University and became Gerhard Gade University Professor Emeritus. In 1995, he joined the College of Optics and Photonics of the University of

Central Florida as visiting scholar. Between 1996 and 1997, he was a visiting scientist at the Wyant College of Optical Sciences of the University of Arizona, where he became professor of optical sciences in 2001.

In the 1960s, Nicolaas Bloembergen was already a co-founder of non-linear optics, a field that investigates the phenomena caused by changes in a material's optical properties when exposed to light.

## **Nobel Prize**

Spectroscopic methods are an essential part of physics and many discoveries are based on them. They became a method for making exact analyses of matter – by using the radiation sources of the entire electromagnetic spectrum. The development of laser technology began in the early 1960, and is a field which is inextricably linked with the names of Nicolaas Bloembergen and Arthur Leonard Schawlow, an American physicist.

Bloembergen initially followed Schawlow's work on this topic with great interest. Schawlow had already gained insights into low frequency radiation when developing a microwave antenna for radar systems during the Second World War. In the 1950s, Schawlow and Charles Townes (Nobel Prize in Physics 1964) wrote a book on microwave spectroscopy. They later investigated whether and how the principle of a maser (laser at microwave frequencies) could be applied to the visible light spectrum, which led to the joint publication of an article on optical masers. In their paper, the researchers made predictions that were confirmed by American physicist Theodore Maiman in 1960. Maiman went on to build the first laser in the Hughes Research Laboratories in Malibu, California.

From 1961, better funding for his laboratory at Harvard University provided Nicolaas Bloembergen with laser devices, equipping him to start working in the new research field of laser spectroscopy. From that point on, Bloembergen studied nonlinear optical effects in theory and through experiments, which made him the founder of nonlinear optics.

Jointly with Arthur Leonard Schawlow, Nicolaas Bloembergen received the Nobel Prize in Physics for his contribution to the development of laser spectroscopy in 1981.

## **Honours and Awarded Memberships**

Nicolaas Bloembergen received numerous awards for his scientific work, such as the Oliver E. Buckley Condensed Matter Prize (1958), the Morris E. Liebman Award (1959), the National Medal of Science (1974), as well as the Nobel Prize in Physics (1981).

He was a member of several academies and scientific associations, among them the American Academy of Arts and Sciences (1956), the National Academy of Sciences (1960), the American Philosophical Society (1982), as well as the German National Academy of Sciences Leopoldina (1983). He was also the president of the American Physical Society in 1991.

### **About Nicolaas Bloembergen**

Nicolaas Bloembergen was born on 11 March 1920 as the second of six children of Auge Bloembergen, a chemical engineer, and French teacher Sophia Maria Quint in Dordrecht, Netherlands. The family moved to Bilthoven on the outskirts of Utrecht, where Nicolaas started secondary school once he was twelve.

In 1950 in Amsterdam, he married Huberta Deliana Brink, whom he had met during a holiday trip of the physics club in the summer of 1948. The couple had two daughters and a son, and attained American citizenship in 1958.

Nicolaas Bloembergen died on 5 September 2017 in Tucson, Arizona.

In 2001, an Asteroid (10447) was named after Bloembergen.