

# Simon van der Meer Biography

## Simon van der Meer

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# Biography

The electroweak theory developed by Sheldon Glashow, Steven Weinberg, and Abdus Salam in the late 1960s and early 1970s predicted the existence of three massive mediating particles, the  $W^+$ ,  $W^-$ , and  $Z^0$  bosons. Discovery of these particles would provide important confirmation for this theory. In the late 1970s, scientists at the European Center for Nuclear Research (CERN), led by Carlo Rubbia, suggested an experiment by which these particles might be produced. In this experiment, beams of protons and antiprotons, traveling in opposite directions, would be caused to collide with each other. If the electroweak theory were correct, the total energy released in this reaction (about 540 GeV) would be sufficient to produce the predicted particles.

The design of such an experiment, however, presented a number of very difficult technical problems. Some scientists predicted, for example, that the two particle beams would pass completely through each other without ever interacting. Others wondered how a beam of antiprotons could be produced, collected, and focused since the interaction of antimatter with matter results in the immediate annihilation of both.

The solution to this problem was proposed by the Dutch physicist, Simon van der Meer. Van der Meer's approach is known as stochastic cooling. The term *stochastic* means "random," and *stochastic cooling* refers to the reduction of random variations in the particle beam's path. Stochastic cooling involves measuring the precise location of a beam at one point in the accelerator ring and then making appropriate adjustments in the frequency of the electrical field to hold the beam in exactly that position at other locations in the ring.

Van der Meer's design proved to be successful. His modification of the CERN Super Proton Synchrotron made possible the discovery in 1983 of the  $W^+$ ,  $W^-$ , and  $Z^0$  bosons.

Simon van der Meer was born in The Hague, the Netherlands, on November 24, 1925. He earned his degree in technical physics at the Technische Hogeschool at Delft in 1952. After three years with the Philips Corporation in Eindhoven, he accepted a research position at CERN. He shared the 1984 Nobel Prize for physics with Carlo Rubbia for the discovery of the electroweak bosons. He has also been awarded honorary doctorates by the universities of Geneva and Amsterdam.