Arnold Johannes Wilhelm Sommerfeld Biography

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Biography

Sommerfeld was born in Königsberg, Prussia, on December 5, 1868. He was educated at Königsberg University and then taught at Göttingen, Clausthal, and Aachen. In 1906, he succeeded Boltzmann as professor of theoretical physics at the University of Munich.

The first two decades of Sommerfeld's career were devoted to a wide range of topics, including optical phenomena, the behavior of gyroscopes, and **radio waves**. In 1915, he turned his attention to the subject where he made his greatest contribution: **atomic structure**.

In 1913, **Niels Bohr** had proposed a new model of the hydrogen **atom** in which **electron** s traveled in specific quantized **energy** levels outside the **nucleus**. The distance of each orbit from the atomic nucleus became designated by the principal quantum number, *n*. The movement of electrons between energy levels resulted in the gain or loss of specific quantities of energy that could be observed in experiments as hydrogen's **spectral lines**. Almost immediately, however, it became apparent that the Bohr model was inadequate to explain certain fine structure of spectral lines. That is, upon close examination, some lines that appear to be single in fact consist of two or more lines aligned very close to each other.

Sommerfeld's solution to this problem was to suggest that electrons travel in elliptical, not circular, orbits around the nucleus. This realization allowed Sommerfeld to introduce into Bohr's analysis a second factor, called the azimuthal quantum number , designated by the letter *l*. This quantum number relates the major and minor axes of the elliptical orbit to each other. He also found that a third quantum number was needed to explain the splitting of spectral lines. This quantum number, *m*, explains the behavior of an electron in the presence of an external magnetic field.

Sommerfeld continued in his post at Munich until the rise of Adolf Hitler in Germany. He strongly opposed the new Nazi government and was forced into retirement. He survived both Hitler and the war, however, and lived to the age of 83. He died in Munich on April 26, 1951, after being struck by an automobile while out walking.