

NIELS BOHR

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(1) You've probably heard of me because you've had to draw Bohr-Rutherford diagrams of atoms in your science class. I am responsible for discovering that electrons exist in orbits around the nucleus of an atom. That might not seem very exciting to you (especially if you've gotten a hand cramp drawing all those Bohr-Rutherford atoms) but in my day, this idea revolutionized both chemistry and physics and helped spawn a new understanding of quantum mechanics.

(2) I was born into a wealthy Danish Jewish family in Copenhagen, Denmark on October 7th, 1885. I was the middle child of three and my father was a university physiology professor. Both my parents were serious about my education and always encouraged me towards excellence in everything I tried. My father brought home a variety of professors who had lively intellectual discussions and I was encouraged to sit in on them even though I was just a child. He hoped that this exposure would spark in me curiosity and intellectual engagement and it did.

(3) In school, I was not very good at languages, but I excelled in maths and sciences. I was a bit of a know it all and if a textbook, teacher, or another student was wrong, I corrected them. This did not win me any favors with some of my classmates and I often got into fistfights. Luckily for me, I was also be very physically gifted. I was unusually strong and athletic and would win most of my fights.

(4) In 1903, I was 17 and began attending the University of Copenhagen where I majored in physics. Two years into my studies, the Royal Danish Academy of Sciences announced a gold medal competition for any scientist who could figure out the best method for measuring surface tension. Though I was only a student, and this competition was not meant for me, I was highly ambitious and entered. I worked exhaustive hours in my father's laboratory in the university which was not set up for this type of research. I had to make my own custom glassware to conduct my experiments. I went over and above the criteria for the competition and my research was deemed brilliant. I won the gold medal which was an amazing achievement for an undergraduate student.

(5) In 1909, I earned my master's degree and in 1911, I earned my doctorate (PhD). The turn of the 20th century was an extremely exciting



Niels Bohr
Physicist (1885-1962)

time in chemistry and physics and new pioneering theories were being formed quickly. The fertility of the scientific climate fueled my passion for science. To give you a sense of how amazing this era was, here's a short list of some of the astounding contributions to science during this time. In 1897, J.J. Thomson discovered that atoms contained electrons. Ernest Rutherford discovered that uranium emitted alpha and beta particles in 1898. In 1905, Albert Einstein unleashed some amazing theories that electrified the scientific community. He formulated $E=mc^2$, the theory of special relativity, Brownian motion and the photoelectric effect all in that one year. In 1909, Ernest Rutherford discovered that all atoms contained a nucleus. Later in life, I would become good friends with Rutherford and have lively debates with Einstein. I had no idea at the time that I would one day be considered one of the great minds of that era.

(6) In 1911, at the age of 26, I got a position to work with J.J. Thomson at the University of Cambridge in England. Thomson and I didn't get along. My tendency to tell people they were wrong resurfaced and Thomson was not happy that I disagreed with him at times. To make things worse, I was bored by the work I was assigned in his lab. Luckily I found a new job working with Ernest Rutherford with his outstanding research team at the University of Manchester, England. This began one of the

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best friendships of my life. Rutherford and I would spend the next 25 years sharing exciting intellectual ideas as well as vacationing abroad with our wives. Margrethe Nørlund and I were married in 1912. She was the love of my life as well as my most trusted confidant.

(7) Many scientists were still not convinced about Rutherford's discovery of the nucleus, but I was convinced and began basing my research on electrons on his theory. At this time, no one knew exactly where electrons were located in an atom. There was a vague idea that they were in a cloud swirling around a central core (the nucleus). In 1913, my big breakthrough came when I hypothesized that electrons existed in distinct pathways around the nucleus of an atom, and that each electron in its orbit could only possess a specific amount

of energy. I also proposed that electrons in orbits further away from the nucleus contained higher energy than ones in closer orbits. Electrons could only change their location from one orbit to another if they gained energy (absorbed energy) to go to a higher orbit or lost energy (emitted energy) to drop down to a lower orbit. My ideas were revolutionary and I became greatly respected.

(8) I ended up creating a research laboratory (later named the Niels Bohr Institute) for theoretical physics in Copenhagen in 1921. I modeled it after Rutherford's lab which I so admired. In 1922, I won a Nobel Prize in physics for the work I did in 1913. My institute would end up being the research center for many of the greatest minds in quantum theory like Werner Heisenberg and Wolfgang Pauli.