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Nobel Prize Winner Erwin Schrodinger

Famous for his theory "Schrodinger's Cat", based on the observation that electrons behave differently when being "watched", Erwin Schrodinger was born on August 12, 1887, in Vienna. His father, Rudolf Schrodinger was married to the Alexander Bauer's daughter. Alexander Bauer just happened to be Rudolf's Chemistry Professor at the Technical College of Vienna. (Nobel Prize). Schrodinger had no brothers or sisters, and as a result was an only child. Schrodinger's father was descended from a Bavarian family which had settled in Vienna many generations before. At an early age, Schrodinger was interested in a wide variety of things. He enjoyed being in the Gymnasium, while he also had a great liking for the scientific disciplines and severe logic of ancient grammar and German poetry. Like many students, the menial task of studying out of a book or memorizing data before a test was what Erwin despised the most. In 1906 he was admitted to the University of Vienna where he was under the strong influence of Fritz Hasenohrl, Boltzmann's successor. During the time at the University of Vienna and Hasenohrl's influence, Schrodinger began mastering the controversial and unsolvable problems in the physics media, a foreshadowing of his future work. Afterwards, he and his friend K. W. F. Kohlraush conducted work for students. As World War I creeped around the corner, Schrodinger served in the military as an artillery officer. (Nobel Prize)

The year then was 1920, where he took a position as Max Wien's assistant, followed by positions at Stuttgart and Breslau, and finally at the University of Zurich, settling for six

years. During this time he met his faithful companion, Annemarie Bertel, whom he also married. Here at Zurich he enjoyed the contact and great friendship between he and his colleagues, which included Hermann Weyl and Peter Debye. During this period he became actively engaged in subjects of theoretical physics. At the time he studies heats of solids, thermodynamics, and atomic spectra. He also studied physiology of color. One of his many great discoveries, Schrodinger's wave equation, was created in this time, during 1926. In 1927 Schrodinger decided to move to Berlin. At this time Berlin was a center for great scientific activity and Schrodinger took part in weekly colloquies with his many colleagues who exceeded him in age and reputation. In 1933, Hitler came to power. Schrodinger thought he could not continue his work in Germany with this new threat. As a result, he moved his base of operation to England and worked at Oxford. This continued until 1936 when Schrodinger was offered a position at the Graz University due to missing his native country. In Germany he faced immediate difficulties after the annexation of Austria, luckily he escaped to Italy where he then went to Oxford once more and finally Ghent University. Shortly after, he moved to the Institute for Advanced Studies in Dublin. Here he assumed the position of Director of the School for Theoretical Physics. He lived the remainder of his time here until his retirement in 1955. After his retirement, he returned to Vienna, assuming an honored position. On January 4th, 1961, due to an illness, Schrodinger passed on. (The Nobel Foundation).

Schrodinger was awarded the Nobel Prize, along with Paul Dirac, for his work in Quantum Wave Mechanics. His formula for this became the second formulation for quantum mechanics, following the matrix mechanics by Werner Heisenberg. Schrodinger's equation is now one of the most basic equations of quantum mechanics. Similar in magnitude to

Newton's equations of motion, Schrodinger's equation was in relation to the mechanics of the atom. Unlike Newton's work, Schrodinger's wave equations are functions that can only be related to probably occurrence of physical events, which is why "Schrodinger's Cat" made him famous. His equation is regarded as the single most important contribution to physics in the 20th century, as it sets a basis for the mechanics of the atom and its subatomic particles. Schrodinger first learned about Einstein's general theory of relativity during his service in WWI for Austria. At this time was when he recognized its great importance and served as an inspiration for his work. Even while on the Italian front during the war, Schrodinger submitted a paper for publication. (Vigyan Prasar) As Austria's economy collapsed due to WWI and Schrodinger's family was ruined, he had no choice but move to Central Europe where he found several opportunities for greatness. His position in the widely German-speaking countries gave him the edge that he needed with the exceptional universities and extraordinary professors. At Zurich was where Schrodinger made his most important contributions. There, he studied several topics such as atomic structure and quantum statistics. Not until he came across Louis De Broglie's work on atomic structure did he make his greatest discoveries. Schrodinger wrote to Einstein about the extraordinary thesis of Broglie, and the great difficulties he experiences while trying to figure his equation out. Schrodinger's reason and motive behind his work was that he was not at all satisfied with the quantum theory of the atom developed by Bohr. He was also not satisfied with most of the good many quantum rules or dual description of atomic physics in terms of waves and particles. Schrodinger took out the particles altogether and believed it should be simply waves alone. He first developed an equation for describing the movement of electrons in an atom. Broglie's equation gave wavelength representing a simple picture, which didn't match the reality with

the inner atomic orbits. Schrodinger knew that this would result in a very complex and variable configuration, unlike Broglie's simple model. Schrodinger succeeded in developing his equation with a very abstract entity at that time, the wave function. Schrodinger applied the wave function to the hydrogen atom and yielded all the same results as Bohr and Broglie. Although the success prediction of Schrodinger's wave function was very high, he still had to overcome problems. He had to attach a physical meaning to the idea of an electron if it was nothing but a wave and he also had to show what would be represented by the wave function. Schrodinger attempted to have electrons visualized as wave packets made up of smaller waves so that the packets would behave in a similar way to a particle in classical mechanics. The packets were later shown as unstable. He thought that the wave function could be interpreted as a measure of the spread of an electron but this also failed. Max Born stated that the wave function for an H2 atom is represented with each of its physical states and it can be used to calculate probability of finding the electron at a certain point. This means that the wave function at nearly zero will have a very small probability of finding the electron. Where the function is large the probability will also be large. These mechanics can't determine the motion of a particle or its position and velocity at any given moment. This equation simply tells one how the function evolves in space and time and how the value would determine probability of finding the electron in a particular point of space. Schrodinger's students at Zurich ended up finding his lectures had become "extremely stimulating and impressive." One of his students who attended his lectures recalled that at the beginning he states the subject and gave a review of how to approach it. He then started exposing the basis in terms of mathematics and had it develop in front of us. He would stop and smile saying he had missed a bifurcation in his development, and then turn back to the critical point and start all

over again. The students would be fascinated with this and learn much more by following the calculations. He would develop the calculations without looking at his notes except in the note to check his own work. Schrodinger would take his students bathing on the beach in Lake Zurich. They would sit in the grass and watch Schrodinger teaching and writing calculation, in his swimming trunks. (Vigyan Prasar)