Biographical Encyclopedia of Astronomers

Schrödinger, Erwin

Born Vienna, (Austria), 12 August 1887

Died Vienna, Austria, 4 January 1961

Austrian physicist Erwin Schrödinger is chiefly known for the development of wave mechanics, as expressed in a fundamental equation that bears his name. He was educated in Vienna by a private tutor before attending the city's academic gymnasium. At the University of Vienna, he became a protégé of Ludwig Boltzmann's successor, Fritz Hasenöhrl. Schrödinger completed his Ph.D. in theoretical physics in 1910 before accepting a research appointment in experimental physics under Franz Exner and Friedrich Wilhelm Georg Kohlrausch. After he completed his *Habilitation* (the post-doctoral qualification required in Germany for teaching at a university) in 1914, World War I broke out. Schrödinger became an artillery officer but nevertheless managed to publish several important papers while serving, with distinction, on the Italian front. A tour of duty in Hungary included a battle victory and another physics paper. Upon his return to the Italian front, Schrödinger received a medal for outstanding service as commander of his battalion

After the war, Schrödinger became a research assistant to Max Wien. In 1920, he was appointed a professor at Stuttgart University and that same year married Annemarie Bertel. There, his close association with philosopher Hans Reichenbach had a lasting influence on his subsequent work, the most important of which he did in Switzerland, at the University of Zurich. At Zurich, Schrödinger became a close colleague of Hermann Weyl (one of David Hilbert's students) and Peter Debye (winner of the 1936 Nobel Prize in Chemistry). All of these remarkable influences culminated in Schrödinger's crowning achievement, his development in 1926 of wave mechanics, now known as Schrödinger's equation, which severely modified the classical laws of mechanics on small scales. One year later, he was awarded the Max Planck Chair in Physics at the University of Berlin. In 1933, Schrödinger won the Nobel Prize in Physics (along with Paul Dirac).

Schrödinger's groundbreaking discovery, namely, that the corpuscular conception of matter could be explained purely in terms of waves, grew out of his deep skepticism of Niels Bohr's hypothesis regarding the discontinuous nature of electron orbitals, along with his deep mathematical intuition that atomic spectra could be represented by eigenvalues. Extending Louis Victor de Broglie's revolutionary conception of matter waves, in which the behavior of atomic particles is governed by the laws of wave propagation, Schrödinger provided a theoretically satisfying and logically consistent picture of the quantum universe in which the problematic, discrete nature of matter is replaced entirely by waves. Individual atoms, in Schrödinger's wave theory, are conceived as having no determinate size and are but vibrations in spacetime extending to infinity, themselves limited to a sequence of discrete patterns governed by Schrödinger's equation Thus, instead of dealing with fixed positions and velocities

of "real" particles, Schrödinger's wave function, ψ, expresses the magnitude of the matter waves that vary across space from point to point and through time from moment to moment.

In this scenario, the probability of finding an "individual" particle at a "particular" position is determined by the absolute square of the wave function ψ (χ), giving the probability distribution for all the coordinates of the system in the state represented by the wave function. Moreover, as Schrödinger himself went on to show, his wave mechanics and Werner Heisenberg's matrix mechanics were equivalent and both accounted naturally, and in a logically consistent way, for the empirically verified quantization of energy. Thus, what is generally known as quantum mechanics is in large part a synthesis of Schrödinger's and Heisenberg's conceptually distinct yet empirically complementary theories

In 1934, Schrödinger was offered a position at Princeton University but instead accepted a position in his native Austria at the University of Graz. Four years later, after the German *Anschluss*, the university was renamed Adolf Hitler University and Schrödinger was abruptly dismissed from his position. He fled to Rome, then Oxford, England, and taught for one year at the University of Ghent. Schrödinger then accepted an offer to join the Institute for Advanced Study in Dublin; he remained there until his retirement in 1956, after which he returned to Vienna.

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Selected References

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