Robert William Holley Biography

Robert William Holley

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Biography

Robert William Holley is best known for his 1962-1965 work in chemically isolating pure strands of transfer ribonucleic acid (tRNA), which retrieves specific amino acids for assembly by the cell's ribosomes into proteins. He also determined the complete sequence of one RNA strand. For this work, he shared the 1968 Nobel Prize for physiology or medicine with Har Gobind Khorana and Marshall Nirenberg.

Holley was born in Urbana, Illinois, where his parents were teachers, and received his bachelor's degree from the University of Illinois. He obtained his Ph.D. from Cornell University and spent almost his entire career there, in 1964 becoming professor of biochemistry and molecular biology.

Working with yeast RNA, Holley used techniques developed for proteins by Frederick Sanger, including chemical fragmenting, cutting with restriction enzymes, and separating by ion-exchange chromatography and paper electrophoresis. He used snake venom for the first cuts on long strands. After deciphering the base sequences on the fragments, he reconstructed the sequence of the entire strand.

Following this, Holley studied the relationship between messenger RNA (mRNA), the first copy of a DNA instruction, and tRNA. He also partially identified the three-dimensional structure of RNA and showed that tRNA was a cloverleaf, rather than a helix as deoxyribonucleic acid (DNA) is.