



UPI

Dr. Robert B. Woodward



UPI

Dr. Sin-Itiro Tomonaga



UPI

Dr. Richard P. Feynman

GENERAL SCIENCE

Nobel Prize Winners

The Nobel Prize in Physics was awarded to one Japanese and two U.S. scientists for their major contributions to quantum mechanics and reformulation of governing equations.

► TWO AMERICANS AND ONE JAPANESE were awarded the 1965 Nobel Prize in Physics for refining the complicated mathematical equations that govern the reactions of electrons and photons, atomic particles on which all life depends.

Dr. Julian Schwinger of Harvard University, Dr. Richard P. Feynman of California Institute of Technology and Dr. Sin-Itiro Tomonaga of Tokyo Bunrika University share the \$56,400 Nobel Prize.

Their achievements, considered brilliant by other scientists, make it possible to calculate results from equations that previously led to baffling results. The work of the three 1965 Nobelists represents the first major contribution to quantum mechanics, which explains the behavior of atomic and nuclear particles, since its development in the 1920's. They made the equations fully consistent with the ideas Einstein presented in his special theory of relativity.

As these physicists reformulated them, the quantum equations agree with the measured values of the properties of electrons to at least the sixth decimal place.

In their discoveries in physics, Drs. Feynman and Schwinger took a different approach when they independently began to publish their quantum theories of electrodynamics. Although their approaches varied, their methods provided the same answers, as did those of Dr. Tomonaga.

The major difference between Drs. Feynman and Schwinger was that the former used a more physical approach, the latter a more mathematical one.

Dr. Feynman, for instance, suggested the use of diagrams representing interactions

between electrons and light that simplified the analysis of problems and the setting up of equations to solve problems. Such "Feynman diagrams" are now widely used.

Doctors Schwinger, Feynman and Tomonaga are continuing their search for increased understanding of the structure and reactions of nuclear particles. The work for which they received the award was performed in the 1940's.

• Science News Letter, 88:279 October 30, 1965

Nobel Prize in Chemistry

► THE SYNTHESIS of the complicated green molecule, the life-giving chlorophyll, essential to the survival of man and animal led to the Nobel Prize in Chemistry for a Harvard professor. The \$56,400 prize was awarded for his brilliant achievements in creating organic materials in the laboratory and his "meritorious contribution to the art of organic synthesis."

In the synthesis of chlorophyll in 1960, Dr. Robert B. Woodward achieved the tremendous feat of deducing the positions of the 137 atoms making up this complex molecule and placing each in its proper position. At about the same time, a German scientist, Dr. M. Strell of Munich also announced synthesis of the molecule, but arrived at his results by a different method.

Chlorophyll, which gives the green color to plants and algae, is essential for the photosynthetic process in which carbon dioxide and water produce carbohydrates and oxygen in sunlight. The exact function chlorophyll plays, however, is still not known.

Since the simple carbohydrates of the



UPI

Dr. Julian Schwinger

vegetables and fruit we eat are the material from which proteins, fats and polysaccharides in man and animals are made, the synthesis of chlorophyll which opened the doors for a better understanding of what takes place in photosynthesis and the complex life process of plants is of major importance.

The 48-year-old biochemist is Donner professor of science at Harvard. He not only produced chlorophyll, but did outstanding work in the synthesis of other organic substances such as cholesterol, cortisone, lysergic acid, reserpine and strychnine.

Dr. Woodward's new approach to synthesis and his successful creation of complex organic molecules has brought him many honors, including the National Medal of Science in 1964, awarded by President Lyndon B. Johnson.

He has been associated with Harvard University since the completion of his studies at the Massachusetts Institute of Technology.

• Science News Letter, 88:279 October 30, 1965