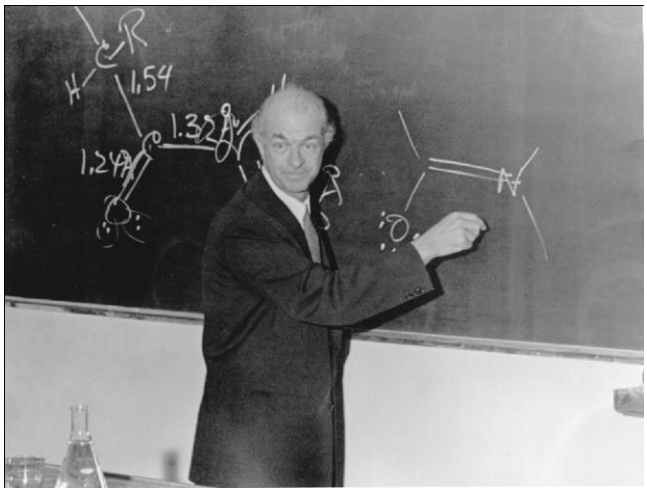
Chapter 2

Web Text Box 1

Linus Pauling, 28 February 1901 - 19 September 1994



Linus Pauling lecturing in 1957

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The Nobel Prizes are the ultimate accolade for outstanding achievement in the fields in which they are awarded (Chemistry, Economics, Literature, Peace, Physics, Physiology or Medicine). Only four people have received a Nobel Prize twice (see box below) and of these only Linus Pauling has received two undivided Nobel Prizes. His 1958 prize was for chemistry and his 1962 prize was for peace.

Linus Pauling applied quantum mechanics to the understanding of chemical bonds and much of our present knowledge of chemical bonds is built upon his work in the years between the two world wars. His book, *The Nature of the Chemical Bond,* came out in 1939 and was enormously influential. The third edition (1960) is still in print. Pauling used X-ray diffraction and electron diffraction to study small molecules. The structures of simple peptides and knowledge of the properties of hydrogen bonds allowed Pauling and colleagues to generate models of the secondary structures of proteins – the α-helix and the β-sheets (published in 1951). These models were subsequently found to be

correct. Later, Pauling applied this approach to model the structure of DNA. Here Pauling's model was incorrect but he was close and the knowledge that Pauling was working on it spurred Watson and Crick's model-making. Crick described Pauling as one of the fathers of molecular biology.

Early studies of oxygen binding to hemoglobin were carried out in the 1930s and in 1949 Pauling published a paper on sickle cell anemia that was the first proof that an abnormal protein caused a human disease.

In 1954 Linus Pauling was awarded the Nobel Prize in Chemistry "for his research into the nature of the chemical bond and its application to the elucidation of the structure of complex molecules."

During World War II Linus Pauling did military work (but not on the atom bomb) and was awarded the Presidential Medal of Merit in 1948 for his contributions. Like many other scientists he was horrified by the destructive power of nuclear weapons and joined Einstein's Emergency Committee of Atomic Scientists in 1946. He campaigned tirelessly for an end to nuclear testing and nuclear disarmament. In 1958 he and his wife presented a petition to the United Nations signed by 11,000 scientists calling for an end to nuclear testing. In 1963 the partial Test Ban Treaty was signed by Kennedy and Khrushchev and the Nobel Foundation announced that Linus Pauling had been awarded the 1962 Nobel Prize for Peace. At the time, campaigners for nuclear disarmament often did not please the United States government and Linus Pauling was called to face the Senate Internal Security Committee and had his passport withdrawn in 1952 (it was restored in 1954 in time for him to travel to Stockholm for the Nobel Prize award). In 2008 he featured on a United States postage stamp!

Very few scientists have been as influential as Linus Pauling and few have made contributions over such a wide range of science and society. It is not surprising that he is the only person to have two undivided Nobel Prizes. His life is fascinating from his early days as a high school student in Oregon setting up a chemical analysis company

(it failed) to the years when he revolutionized our understanding of the chemical bond and stood against the establishment in his work for nuclear disarmament. We strongly recommend reading one of the biographies available on this remarkable scientist, for example “Linus Pauling and the Chemistry of Life” by Thomas Hager 1998 published by Oxford University Press.

Double Nobel Prize Winners

The others two-time Nobel Prize winners are John Bardeen (2 x for physics), Marie Curie (physics and chemistry) and Frederick Sanger (2 x chemistry). Frederick Sanger’s first Nobel prize was for developing methods used in determining the amino acid sequence of proteins and his second for the development of the dideoxy method for sequencing DNA.