



1962

Linus Pauling

(February 28, 1901–August 19, 1994)

United States

One of the leading scientists of his time; only winner of two undivided Nobel Prizes, Chemistry (1954), and Peace (1962).

In presenting the postponed 1962 prize to Linus Pauling at the award ceremony in December 1963, Chairman Gunnar Jahn of the Norwegian Nobel Committee referred to the part Pauling played in bringing about the treaty banning nuclear tests in the atmosphere, which had been concluded on 23 July 1963, between the United States, the Soviet Union, and Great Britain: “Does anyone believe that this treaty would have been concluded now if there had been no responsible scientist who, tirelessly, unflinchingly, year in and year out, had impressed on the authorities and on the general public the real menace of nuclear tests?” Moreover, said Jahn, “through his campaign, Linus Pauling has manifested the ethical responsibility which he believes science should bear for the fate of mankind, today and in the future.”

Pauling was born in Oswego, Oregon, where his father was a druggist. His interest in science began as a child he collected insects and minerals. When he was only nine years old, his father wrote to

the Portland newspaper to say that his son had read everything about history and natural sciences that could be found for him, and he was now seeking advice as to what to give the boy next. Only a few months after writing this letter, Herman Pauling died. The family lost the drugstore he had owned, and Linus's mother moved with him and his two sisters into a smaller house, where she took in boarders. Money worries were a constant concern, and Linus held a variety of jobs after school. He made few friends, but he kept devouring all the books he could find.

He liked to tell how he first became interested in chemistry. One afternoon when he was a high school freshman a schoolmate took him home to show off a brand new chemistry set. Linus watched in amazement as his friend mixed colored powders in solutions that fizzed and smelled and then combined something with some table sugar, added a drop of acid, and the sugar burst into flame. It was not long before Linus was obtaining chemicals from an abandoned iron and steel smelter and putting together his own chemistry set to try experiments himself. As he wrote years later, "I was simply entranced by chemical phenomena, by the reactions in which substances, often with strikingly different properties, appear; and I hoped to learn more and more about this aspect of the world."

He took all the available science and mathematics courses, and when he was refused permission to finish his requirements quickly so that he could enter college early, he simply dropped out before the last term and went off to college anyway. Many years later the high school was proud to award its most famous alumnus his missing diploma.

Pauling entered Oregon Agricultural College in Corvallis (now Oregon State University) when he was sixteen and worked his way through. His last and best summer job was as state inspector of paved roads. While still an undergraduate he was made an instructor of quantitative chemistry for a class of women students of home economics. The brightest and most attractive of them was Ava Helen Miller, and a romance quickly developed between the tall young instructor and his vivacious student that led to a wedding

when he was twenty-two. It was a happy marriage that was to produce four children and to last for fifty-eight years until Ava Helen died in 1981.

With his bachelor's degree in chemical engineering in hand, Pauling began graduate work at the California Institute of Technology. In his first year there, he published his first scientific paper on molecular structure of crystals, publishing four more in his second year, and receiving his Ph.D. in 1925. This was followed by a prestigious Guggenheim grant to study in Europe. Pauling had learned German from his Grandmother Adelheit, who had begun to teach him nursery rhymes in her native language when he was two. He spent most of his eighteen months abroad studying quantum mechanics at the Institute for Theoretical Physics in Munich, but he also worked with Niels Bohr in Copenhagen and Erwin Schrödinger in Zurich. When he returned in 1927, Caltech made him assistant professor, at twenty-six the youngest member of the faculty.

When he was thirty, Pauling published his landmark paper, "The Nature of the Chemical Bond," which reconstructed the foundations of chemistry by explaining for the first time the structure of molecules in terms of quantum mechanics. For this he won the Nobel Prize for chemistry in 1954. Meanwhile he had gone on to a succession of important discoveries, making connections among physical sciences, biology, and medicine, and his introductory textbook was revolutionizing the teaching of chemistry,

During the Second World War, Pauling directed a number of government programs, including research in explosives and the production of a blood substitute for field hospitals. He was awarded the Presidential Medal of Merit for his contribution to the war effort. He declined an invitation to work on the atomic bomb project because he was too busy. This meant that when Pauling later began to speak out about the dangers of the bomb, he could speak freely because he had not been working with classified materials.

When the atomic bomb was exploded over Hiroshima in August 1945 with momentous devastating effect, Pauling began to think about the destructive implications of science and the respon-

sibility of scientists. In his first public lecture after Hiroshima, however, Pauling spoke only about the science of the bomb. Two days later he was visited by an agent of the Federal Bureau of Investigation, who wanted to know where he had gotten his information. "I figured it out," explained Pauling, who had simply been making inferences from his own scientific knowledge.

In further public talks, he began to speak about problems of war and peace. Now Ava Helen objected that he could not speak as authoritatively about questions of war and peace as he could about science. As he later recalled, "I began to devote half my time to catching up with Ava on social, political, and economic matters. It changed my life."

Pauling then joined Albert Einstein's Emergency Committee of Atomic Scientists and began to speak out against nuclear testing. In the Cold War mood of the time, a supporter of a policy of peace was all too readily suspected of being pro-Communist. The State Department limited Pauling's foreign travel "in the national interest," refusing to give him a passport to attend international scientific meetings, even when he was invited to be featured speaker. Pauling always felt that one such meeting he missed would have led him to arrive at the discovery of the double helix structure of DNA before Francis Crick and James D. Watson.

Pauling also had to face congressional committees and declare that he was not a Communist. At one such hearing he pointed out that it was not in his character to follow a prescribed political line: "Nobody tells me what to think," he declared, "except Mrs. Pauling." Despite such harassment and vilification by the press Pauling refused to be silent. "I kept on going to keep the respect of my wife," he explained.

In April 1957, Albert Schweitzer issued his Declaration of Conscience from Oslo, describing the human damage done by radioactive fallout and asking for the cessation of nuclear tests. On 15 May, Pauling echoed this appeal in a speech at Washington University in Saint Louis, and the response was so enthusiastic that that very evening Pauling, encouraged by several colleagues, wrote the

Scientists' Bomb-Test Appeal, calling for a test-ban treaty and sent it out to the scientific community. Within two weeks two thousand American scientists had signed the appeal, and Pauling began to solicit signatures from other countries. Eventually over eleven thousand scientists from forty-nine countries signed the document, and Pauling and his wife were able to present the petition to the United Nations in January 1958 as the opinion of the great majority of the world's scientists.

In 1958 Pauling also published *No More War!*, an exposition of the scientific facts of nuclear weapons in clear and simple language and an appeal for the prevention of their use in war. (It was reprinted twenty-five years later, with little need to revise its basic explanation and message.) In 1959 at a conference on nuclear weapons in Hiroshima, Pauling wrote the resolution calling for a ban on their testing and development.

The Paulings then circulated an appeal against the proliferation of nuclear weapons and convened an international conference on the subject in Oslo in May 1961. Among the sponsors were Albert Schweitzer, Philip Noel-Baker, Lord Bertrand Russell and other notables. Sixty distinguished scientists from fifteen countries attended the conference, which was financed by funds from Pauling's Nobel Prize in chemistry and private contributions.

In September 1961, Pauling sent telegrams to both President Kennedy and Premier Khrushchev, urging them to sign a ban on testing. In November when he was invited to Moscow to attend the second centenary celebration of the Soviet Academy of Science, he used the occasion to speak against new nuclear tests by the Soviet Union. He sent Khrushchev two letters and the draft of a test-ban treaty, which was strikingly similar to the form of the treaty that was finally signed in 1963. The treaty went into effect on 10 October 1963, the very day when Pauling was notified that he was to receive the Peace Prize.

In accepting the prize in Oslo, Pauling said that it should have been shared with Ava Pauling. Chairman Jahn pointed out that she had not been nominated, and he also told Pauling privately that he

had had a hard time getting Pauling's candidacy through the committee. Apparently Pauling was also a controversial figure in Oslo.

In his laureate's address, "Science and Peace," Pauling referred to Alfred Nobel's prediction that once war's destructive power became too terrible, wars would cease. Now that the new bombs had an explosive energy ten to fifty million times that of Nobel's nitroglycerine, "war has been made impossible forever." Science and peace were closely related, Pauling declared. Scientific advance "now provides the possibility of eliminating poverty and starvation, of decreasing significantly the suffering caused by disease, of using the resources of the world effectively for the benefit of humanity." Yet, in the words of Einstein, which he quoted, "There is no defense in science against the weapon which can destroy civilization."

Pauling presented scientific estimates of the genetic damage caused by fallout from atmospheric testing and calculated some of the devastating effects of a nuclear war. He hoped that the recent test-ban treaty would be only a first step in a general program of disarmament, not only of nuclear bombs, but of biological and chemical weapons as well.

In conclusion, Pauling reiterated his belief that war, "this curse to the human race," would be eliminated. With his customary exuberance, he declared:

"We, you and I, are privileged to be alive during this extraordinary age, this unique epoch in the history of the world, the epoch of demarcation between the past millennia of war and suffering and the future, the great future of peace, justice, morality, and human well-being. I am confident . . . that we shall in the course of time be enabled to build a world characterized by economic, political, and social justice for all human beings, and a culture worthy of man's intelligence."

With the prize money of about fifty thousand dollars, Pauling was now able to resign from Caltech, where the Board of Trustees, uncomfortable with his peacemaking, had already had him removed from the chairmanship of the Division of Chemistry and where he still felt limited in his work for peace. He spent several years at the

Center for the Study of Democratic Institutions at Santa Barbara and then returned to academe, first at the University of California in San Diego and then at Stanford University. In 1973 he founded the Linus Pauling Institute of Science and Medicine in Palo Alto, where he centered his activities.

In an interview with this author in his offices in Palo Alto, dressed as usual in jacket and baggy trousers, with the characteristic floppy beret on his desk, his blue eyes in his mobile face alight, Pauling told how he divided his time into three parts. One third was in thinking about pure science, which he loved to do most of all; the other two-thirds, out of his sense of social obligation, were devoted to peace efforts and his more recent concern with nutrition and human health. Again in controversy, this time with much of the medical profession, Pauling was now advocating vitamin C in treatment of ills from the common cold to cancer. His last book was to be entitled *How to Live Longer and Feel Better* (1986).

Was he still confident about the future? "If I weren't," Pauling answered, "I would not be working on improving the human condition, but I would be spending all my time on science."

Into his nineties his insatiable curiosity about the universe was still a driving force for Pauling, who has been ranked with Isaac Newton, Charles Darwin, and Albert Einstein, among the greatest scientists of all time. Pauling's scientific drive, however, had become matched by his determination to place his extraordinary gifts and scientific knowledge at the service of humanity. He remained active and creative both in scientific pursuits and in working for peace and human health until the very end, which came on August 1994. He was then ninety-three, and his critics could hardly maintain that his prescription for living longer had not worked for him. The Linus Pauling Institute, now at Oregon State University, continues with his researches.

BIBLIOGRAPHY***Primary Sources***

Pauling, Linus. *How to Live Longer and Feel Better*. New York: W. H. Freeman, 1986. With a short biography by Robert J. Paradowski. Pauling's regimen for good health through vitamin C and good nutrition.

_____, and Daisaku Ikeda. *A Lifelong Quest for Peace*. Boston: Jones & Bartlett, 1992. A dialogue with the Japanese Buddhist philosopher, poet and peace leader.

_____. *Linus Pauling in his Own Words. Selections from His Writings, Speeches, and Interviews*. Edited by Barbara Marinacci. New York: Simon & Schuster, 1995. With an introduction by Pauling, written several months before he died. An important well-edited collection, divided into sections on autobiography, "The Structure of Matter," "The Nuclear Age," and "Nutritional Medicine."

_____. *No More War!* Anniversary ed. New York: Dodd, Mead, 1983. Updates the 1958 edition with addenda to each chapter and documents on the opposition of scientists to nuclear weapons.

_____. *Vitamin C, the Common Cold and the Flu*. New York: Berkeley, 1981. A revised edition of *Vitamin C and the Common Cold*. San Francisco: Freeman, 1970. Named Phi Beta Kappa's "best book on science of the year."

Secondary Sources

Current Biography Yearbook, 1994.

Goertzel, Ted and Ben. *Linus Pauling. A Life in Science and Politics*. New York: Basic Books, 1995. Admiring, but not uncritical.

Hager, Thomas. *Force of Nature. The Life of Linus Pauling*. New York: Simon & Schuster, 1995. Most comprehensive study, by a science journalist, based on wide use of sources.

Grodzins, Morton, and Eugene Rabinowitch, eds. *The Atomic Age: Scientists in National and World Affairs*. New York: Basic Books, 1963. A collection of articles from the *Bulletin of the Atomic Scientists*, including two by

Harry Kalven, Jr., on Pauling's appearances before the Senate Internal Security Committee.

Horgan, John, "Profile: Linus C. Pauling. *Scientific American*, 268, no. 1 (March 1993): 36-40. Last important interview.

Jacobson, Harold K., and Eric Stein. *Diplomats, Scientists, and Politicians: The United States and the Nuclear Test Ban Negotiations*. Ann Arbor: University of Michigan Press, 1966.

Serafini, Anthony. *Linus Pauling: A Man and his Science*. New York: Paragon House, 1989. Pauling said that this book had "many errors and misinterpretations."