In Remembrance

(The following article originally appeared in the May 23, 2002, issue of Nature *(417:396) copyright 2002 Macmillan Publishers Ltd., reprinted here by kind permission of its author and* Nature.*)*

Victor F. Weisskopf (1908–2002)

by Kurt Gottfried

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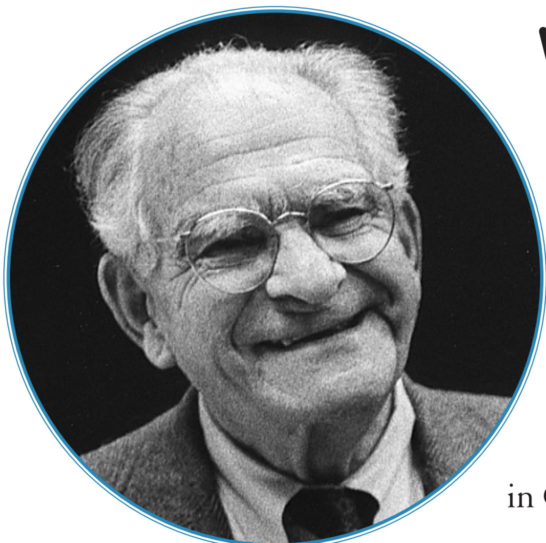

Victor Weisskopf, who died on April 21 at the ripe age of 93, had, as he liked to put it, "lived a happy life in a dreadful century". He knew what he was talking about. He had been a major player in a great voyage of discovery, and was always at the centre of a loving family and a vast circle of good friends. But he had also seen totalitarianism in Germany and Russia, and witnessed the first man-made nuclear explosion.

In 1928, Weisskopf left his native Vienna to study physics at Göttingen, Germany, where quantum mechanics had been born just three years before. It was already clear that the new mechanics could describe, at least in principle, any phenomenon involving particles moving with velocities that are small compared with the speed of light. Now the question was whether a successful marriage of quantum mechanics with relativity could be arranged. Paul Dirac had responded by inventing quantum electrodynamics (QED), but it was soon realized that this theory faced potentially fatal problems. It was to this fundamental issue that Weisskopf repeatedly devoted himself. Today, QED and the theory of gravitation are the most accurately tested theories of physics—an outcome due in good part to Weisskopf's contributions. Willis Lamb, who did the most important experiment in the history

Photo: Donna Coveney/MIT

of the subject, wrote that he based his analysis on "the 1927–34 formulation of QED due to Dirac, Heisenberg, Pauli and Weisskopf".

Weisskopf's first landmark result concerned the spectral lines resulting from the radiation emitted by electrons in the atom. The intrinsic width of spectral lines is due to the interaction of the atomic electrons with the radiation they emit. Working with Eugene Wigner, and at the age of just 22, Weisskopf devised the quantum theory of this effect.

The energy of a charge under the influence of its own field posed a much deeper problem. In 1934, with some help from Wendell Furry, Weisskopf discovered that in QED this 'self-energy' is far better behaved as the diameter of the charge shrinks to zero than it is in classical physics. This behaviour is central to today's highly successful 'standard model' of elementary particles. Another vital contribution by the young Weisskopf was the demonstration, with Wolfgang Pauli, that relativity and quantum mechanics do not require charged particles to have spin—until then, this had been a misconception widely inferred from Dirac's theory.

After Göttingen, Weisskopf had perhaps the most spectacular postdoctoral career of modern physics, holding appointments with Werner Heisenberg, Erwin Schrödinger, Pauli and Niels Bohr. In 1937, he left Europe for a position at the University of Rochester and began a long-term involvement with nuclear physics. This culminated in the book *Theoretical Nuclear Physics*, written with John Blatt and published in 1952, which for decades was the undisputed bible of the subject. But what had begun as a harmless intellectual pursuit assumed a very different tone when he joined the atomic bomb project at Los Alamos. There he became deputy to Hans Bethe, head of the theoretical-physics division.

At the war's end he joined the faculty at Massachusetts Institute of Technology. Here, students and postdocs were exposed to Weisskopf's exceptional talent for the intuitive argument, and also enjoyed the warmth of the atmosphere he created. New experimental techniques had emerged from the wartime radar project, and among the first consequences was Lamb's discovery that the hydrogen spectrum was in stark conflict with existing theory. Weisskopf and his student Bruce French made the first complete calculation, but it disagreed with the slightly later result found by the young geniuses Richard Feynman and Julian Schwinger with their powerful, separate reformulations of QED. Weisskopf, who suffered from a lack of confidence in mathematics, did not publish,

Personal Remembrances of Viki Weisskopf

"**Viki will be remembered** as a true giant of physics, and nowhere more so than at CERN....physicists who where not even born then [Weisskopf was CERN's Director from 1961–65] still speak of him with reverence.... Viki created the spirit of CERN and established traditions that the laboratory still holds dear. His idealism helped to make CERN more than a physics laboratory....he turned it into a meeting place for people from widely different political cultures. A place where tolerance and understanding are the order of the day."

—Professor Luciano Maiani, Director General, CERN

"**He was a friend** to everyone who knew him. His influence here at MIT and in the Center for Theoretical Physics was beneficent and profound. His perpetual curiosity and his enthusiasm for new ideas and young people defined MIT's style of doing physics. We will miss him."

—Robert L. Jaffe, Director, MIT Center for Theoretical Physics

"**It is indeed a great loss**, not only for the world physics community but also for those who...try to remove the threat of atomic weapons from human society and seek world peace....I am sure that his eager spirit for physics and world peace shall remain with us forever."

—Dr. Yoshio Yamaguchi, former President, IUPAP (1963–66)

"**Viki meant much** to very many people—his students, his colleagues at MIT and at CERN, and the wider community of scientists who saw his as a humane voice of reason as well as a brilliant yet practical scientist."

—J. D. Jackson, Professor Emeritus of Physics, University of California, Berkeley assuming that he and French were wrong. They were not—the other two had made the same subtle mistake.

The deep wounds inflicted on European science by the Nazis and the nuclear arms race motivated many of Weisskopf's thoughts and actions after the detonation of the atom bomb over Hiroshima. In 1946 he joined a small committee chaired by Einstein, the first of many platforms from which he spoke of the danger posed by nuclear weapons. He was a co-founder of the Federation of American Scientists and the Union of Concerned Scientists. Starting with the first Pugwash conference in 1956, he pioneered relations with Soviet scientists in pursuit of arms control. And it is no coincidence that Pope John Paul II began to make forceful and widely publicized statements against the nuclear arms race soon after Weisskopf's election to the Pontifical Academy.

Weisskopf never severed his strong ties with Europe. He was delighted be to be named director-general of CERN (the European laboratory for particle physics in Geneva, Switzerland) in 1961, having answered questions about his administrative experience with "none whatever, my greatest strength". He proved to be an inspiring and effective leader, not only of CERN but of high-energy physics worldwide. Before long, CERN and European high-energy physics were on a par with competing research in the United States, in good part thanks to his controversial and ground-breaking decision to build the world's first proton–proton collider.

A sketch of 'Viki' (as he was known everywhere) as a scientist does not begin to give a picture of the man. He radiated emotional warmth combined with intellectual discipline and breadth—a rigorous romantic. He was an accomplished pianist and loved music as much as physics, playing excerpts from Haydn's *Creation* when giving popular lectures on the early Universe. He called his popular exposition of science *Knowledge and Wonder*. Viki exemplified the vitality and imagination that produced one of history's great intellectual revolutions, and gave it a human face. •