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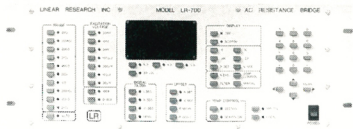
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able accounts of the history of weapon development in this controversial time. (See, for example, Carson Mark, Raymond E. Hunter, Jacob J. Weschler, "Weapon Design, We've Done a Lot but We Can't Say Much," *Los Alamos Science* volume 4, number 7, Winter-Spring, 1983, page 159.)

Carson encouraged his staff to think innovatively and to branch out into new fields. As a result of such encouragement, Frederick Reines designed the Nobel prizewinning experiment, done with Clyde Cowan, to confirm the existence of the neutrino. In another instance, a group of young consultants from outside Los Alamos who had been assembled by the division went on to form the nucleus of the Jason group that has been offering advice to the US government on a variety of topics for many years.

Carson also served as a member of the US delegation to the Conference of Experts on the Detection of Nuclear Explosions, the Scientific Advisory Board of the US Air Force, the Air Force's Foreign Weapons Evaluation Group and, after his retirement from Los Alamos in 1973, the Advisory Committee on Reactor Safeguards of the US Nuclear Regulatory Commission.

As one who understood all too well the destructive power of nuclear weapons, he sought to minimize the probability that they would ever be used again. He wrote essays with this intent, including some for the Pugwash conferences. In addition, he was very much involved in promoting test bans and in preventing nuclear proliferation. For example, he wrote a paper on the explosive properties of reactor-grade plutonium that dispelled the widely held view that plutonium from power reactors could not be used to build nuclear weapons. Also, he suggested limiting the production of tritium, which is used to "boost" the yield of nuclear weapons.

When his final, debilitating illness struck, he was still actively working on nonproliferation as a consultant to the Nuclear Control Institute, which published a paper of his on Iraq's nuclear weapon capability.

Personally, Carson enjoyed frequent hikes in the New Mexico mountains and meaningful evening conversations with friends. Occasionally, he wrote and acted in skits portraying the more ludicrous events in or concerning Los Alamos.

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Friedrich Hund

On 31 March 1997, six weeks after his 101st birthday, Friedrich Hund, the oldest survivor of the original quantum physicists, died in Göttingen, Germany.

Born in Karlsruhe, Hund began studying mathematics and physics in 1915 at the University of Marburg and the University of Göttingen. After an interruption for military service in World War I, he obtained his high school teacher's qualification in 1921, his PhD with Max Born in 1922 and his *Habilitation* in theoretical physics in 1925—all at Göttingen.

Hund's distinguished career started with his doctoral thesis on the Ramsauer effect in 1922. He then collaborated with Born on problems of molecular and solid-state theory until the summer of 1925, when he published a set of pioneering papers. Using Wolfgang Pauli's exclusion principle and Werner Heisenberg's pre-quantum mechanical correspondence approach, he accounted for the way the electron states of many-electron atoms are organized. In particular, he introduced what became known as Hund's rule, which allots the lowest energy to the states of highest angular momentum. These results survived the quantum mechanical revolution.

In 1927, Hund published the monograph *Line Spectra and the Periodic System* (which appeared as volume 4 of *Struktur der Materie in Einzeldarstellungen*) and took up a professorship at the University of Rostock, where he began work on the quantum mechanical treatment of molecules. This work resulted in a series of fundamental papers published in the ensuing years, parts of which he spent abroad (winter 1926 at Niels Bohr's institute in Copenhagen and spring 1929 at Harvard University, MIT and the University of Toronto). Hund first built up the states of diatomic molecules from the corresponding atomic states by considering an adiabatic transition from one-center to two-center systems. Applying Eugene Wigner's and Heisenberg's new group-theoretical methods, he provided the theoretical foundation of the molecular states derived empirically by Robert Mulliken and Raymond Birge. He then extended his approach to polyatomic molecules, describing for the first time what came to be called the tunnel effect, which he invoked to explain the existence of long-lived optically isomeric molecules. That occurred some time before Lothar Nordheim used the same effect in solid-state theory (December 1927), and Edward Condon, Ronald Gurney and George Gamow used it in nuclear theory (July–August 1928).

Hund's molecular theory provided the basis of the molecular orbital method, which he and especially Mulliken developed further to describe covalent molecular bonding. Using what Douglas Hartree called the self-consistent field, the molecular orbital method placed electrons in combined molecular orbitals, rather than in originally unchanged atomic orbitals as proposed by Walter Heitler and Fritz London in their competing valence bond method. In 1929, while Hund and Mulliken were establishing the modern nomenclature of molecular states in the US, Gerhard Herzberg in Germany demonstrated that the Hund and Mulliken molecular orbital method also described the Heitler-London concept of bonding electron pairs, hence it could serve as the basis of quantum chemistry.

Hund spent the 1930s at the University of Leipzig, where he, Peter Debye and Heisenberg created a center of atomic theory. At Leipzig, Hund applied quantum mechanics and symmetry considerations to solid-state and nuclear theory. The result of his research was a set of pioneering papers on the coupling of equivalent nucleons (yielding the energy states of nuclei), which Hund wrote in 1937 independently of Wigner in the US. Hund also worked on the theory of matter at high pressure and temperature, with application to astrophysics (the theory of Cepheid variable stars) and to superconductivity (but, like others, without success).

Germany's scientific isolation during World War II and its aftermath prevented Hund from participating more actively in modern topics, such as quantum field theory. Between 1945 and 1950, he wrote five successful textbooks on introductory theoretical physics, moving in 1946 from Leipzig to the University of Jena.

In the summer of 1951, Hund managed to leave East Germany and take a position at the University of Frankfurt in West Germany. In 1957, after spending six years at Frankfurt, he returned in to Göttingen, where he resumed work on solid-state problems. After his retirement in 1964, Hund concerned himself with fundamental concepts in physics and with the history of physics, notably quantum theory, which he wrote about in the book *The History of Quantum Theory* (Bibliographisches Institut, 1967; English-language edition: Barnes & Noble, 1974). He continued to lecture into the 1990s.

From 1933 to 1951, he lived under two totalitarian regimes in Germany. Contemporaries observed that he behaved bravely, defending people and science against the attacks of Nazis and Communists. In his later years, Hund

served as an inexhaustible, reliable source of information on the historical, conceptual and didactic aspects of physics. This honest and modest man deserved perhaps more than the comparatively few honors that were bestowed on him. A demanding teacher and friendly gentleman, he was loved and revered by many generations of students.

HELMUT RECHENBERG
Max Planck Institute for Physics
Munich, Germany

Tosiya Taniuti

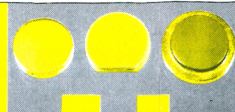
Tosiya Taniuti, an emeritus professor of physics at Nagoya University in Japan, passed away on 6 December 1996, one day after his 72nd birthday. He made many contributions to the study of nonlinear phenomena in mathematical physics and theoretical plasma physics, the most important being the establishment of the reductive perturbation method.

Born in Hyogo prefecture, Taniuti graduated with a major in physics from Osaka University in 1946, going on to pursue studies in the physics departments of Osaka University and Kobe University. In 1956, he received a DSc from Osaka, and in the same year, became an assistant professor at Kobe. Seven years later, he moved to Nagoya University's Institute of Plasma Physics as a professor and head of the theoretical division.

In an early piece of research at Kobe, Taniuti discovered a particular solution for a Born field according to which two waves propagate and return to their original shapes after colliding. This outstanding achievement ranks alongside his later discovery of solitons as nonlinear dispersive waves.

Back in the early 1960s, it was still not clear that the existence of solitons in nonlinear dispersive systems is due to the balance between nonlinearity and dispersion. After the rediscovery of the Korteweg-de Vries (KdV) soliton by Norman Zabusky and Martin Kruskal in 1965, Taniuti was quick to elucidate the special features of nonlinear dispersive systems. To an ion acoustic wave, he applied the reductive perturbation method, which eliminates secular terms successively by the stretching of spatiotemporal variables in terms of a small expansion parameter related to the wave amplitude. As a result, he found that the wave could be described by the KdV equation.

Through this work, Taniuti drew attention to the fact that many nonlinear dispersive waves have the same properties asymptotically. Recognizing the effectiveness of combining scale transformations and perturbation ex-



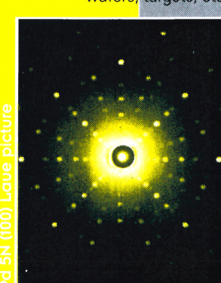
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