

## Fermi Award: AEC Honors Teller for Contributions to Nuclear Science

In public debates over national nuclear policies, as well as in the councils of government, there are few scientists as controversial as Edward Teller.

The "Teller School," as it has come to be called, holds that the safety of the West lies in the forceful and unhindered development of nuclear weapons until safety can be guaranteed by effective international government. The School rejects the view that the arms race is no less a peril than the threat of foreign aggression, and accordingly it is opposed to an East-West nuclear test ban; it also contends that whatever the health hazards of fallout may be, they are a necessary, and small, price to pay for military preparedness. In the acrimony that has been generated by these beliefs, the general public, as well as many scientists, have tended to overlook the fact that, whatever judgment history may pass on Teller's political views, his scientific accomplishments are beyond dispute. Thus, those who have seen Teller's scientific reputation overshadowed by his involvement in public debate responded with pleasure when he received the 1962 Enrico Fermi award this week at the White House.

The award, which is accompanied by a \$50,000 prize, is presented annually by the Atomic Energy Commission, upon the recommendation of its General Advisory Committee, "for any especially meritorious contribution to the development, use, or control of atomic energy."

In selecting Teller, the Committee stated that he is "one of the most original, imaginative, and versatile scientists in the world today. The wide range of his contributions to science is unique in extending from chemistry to physics, from engineering and technology to the most abstract theories of quantum mechanics. There is a similarly wide range in the character of his contributions: some lay the foundation on which large structures have been built subsequently, some are aperçus and illuminating flashes of

light which helped to solve a single but often tantalizing puzzle."

Born in Budapest in 1908, Teller began his university studies at Karlsruhe, but he received his Ph.D. from the University of Leipzig, in 1930. There he came under the influence of Heisenberg, and this influence persists to the present day. After receiving his Ph.D., Teller moved to Göttingen and worked in J. Franck's institute. His affectionate admiration of Franck dates from this period, as does his interest in many problems of physical chemistry. When Hitler's government forced Teller out of Germany, he first went to London, then joined Gamow at George Washington University. It was about this time that he became interested in nuclear physics. During World War II, Teller worked for the Uranium Project, first in Chicago and later in Los Alamos. After the war, he moved around between Chicago, Los Alamos, Berkeley, and Livermore, and he is now professor at large at the University of California.

Teller's contributions to pure science are almost equally distributed over three areas: physical chemistry, nuclear physics, and cosmology. Physical chemistry was his first love, and he never abandoned it completely. His first paper, on the quantum theory of the hydrogen molecular ion, is a classic and marks the beginning of the quantitative theory of molecular orbitals. Just a few weeks ago I was a participant in an international conference in Brussels at which the theory of Landau and Teller, dating back to 1937, was discussed extensively. Landau has just been awarded the Nobel prize. The theory explains the sluggishness of the energy exchange between the translational motion and the vibration of molecules. As a result of this sluggishness, the temperature increase in sound waves where gas is under compression does not affect the vibrations of the molecules and these act as if they were rigid. This results in an increase in the velocity

of the sound. There is another phenomenon which is greatly affected by the sluggishness of energy exchange. In the magnetic cooling process the exchange is slow between magnetic energy and the ordinary translational motion. As a result, the "magnetic temperature" may be quite different from the temperature of the ordinary motion of the atoms. The equalization of these two temperatures may take hours or even longer. It was Teller who discovered this phenomenon.

In nuclear physics, Teller has participated in numerous significant developments, including studies made in cooperation with J. A. Wheeler and L. R. Hafstad. In their work, they have considered heavy nuclei as being composed of alpha particles rather than composed directly of the ultimate constituents—nuclei, protons, and neutrons. Thus, an intermediate structure, that of the alpha particle, itself consisting of a pair of protons and a pair of neutrons, is postulated. There is a certain similarity between this concept and the view that molecules, particularly organic molecules, are composed of larger structures (methyl, phenyl, and other radicals), rather than directly of atoms. There are other similarities between the two theories.

Time is not yet ripe to evaluate Teller's ideas on cosmological problems in a definite way. Much doubt has been expressed concerning the validity of his hypotheses concerning the origin of the elements and of cosmic rays. However, the study of cosmology stimulated Teller to those ideas for which he is best known to the general public: the recognition that thermonuclear reactions, both violent and controlled, can be induced artificially. Before Teller put forward his ideas, such reactions were known to occur only in the sun and in the stars. Violent thermonuclear reaction is, of course, only another name for the hydrogen bomb. It was during the war that Teller first saw the possibility of such a bomb, even before the fission bomb was a reality.

Most of the proposed peaceful applications of thermonuclear reactions were first proposed by Teller. He wanted to use thermonuclear explosions to build harbors and canals, and for many other purposes. He is one of those who advocates pursuing research on controlled thermonuclear reactions with a view to producing power and electricity. The intense effort toward this goal made by the

United States owes much to Teller's enthusiasm and eloquent support.

Like every dedicated man with strong convictions, Teller has many sincere friends and admirers, as well as many vigorous critics. No one can deny the warmth of his personality and his human understanding. He is a lover of music and of poetry, of long walks and excursions. Violence creates in him a deep aversion, and the humiliation and torment of people, in Hitler's concentration camps and elsewhere all over the world, cause him deep anguish and an almost irresistible revulsion. So do deceit and treachery.

Like many others born in Hungary, Teller has a rich store of jokes which he uses to advantage in discussions and arguments, political and scientific. He relishes scientific discussions and throws himself wholeheartedly into them. Many of his ideas were developed, and perhaps even conceived, in the course of discussions with his friends and students. All that he does is done with great intensity and dedication. Even Fermi was once overwhelmed and told him, in mock exasperation, "Teller, you are the only monomaniac I know who has thousands of manias!"—EUGENE WIGNER  
*Princeton University*

## Announcements

The National Academy of Sciences' Geophysics Research Board has recommended that the Government undertake a \$31,000,000 "**Upper Mantle Project**" as the U.S. contribution to a 3-year international program to explore the interior of the earth. The project would concentrate on the uppermost 600 miles of the mantle, which extends some 1800 miles below the earth's outer 30-mile crust. The studies will attempt to determine the structure, composition, and physical state of the mantle, and interpret the relative influence of the crust and mantle upon surface geophysical observations.

Project Mohole, the plan to drill a hole at sea through the earth's crust to the upper mantle, will be a major contribution to the U.S. program, although Mohole expenditures are not included in the proposed budget for the Mantle Project.

The Philip L. Boyd **Desert Research Center**, recently completed at the University of California's 10,000-acre Deep

Canyon Desert Research Area near Palm Springs, is now available free of charge for experimental research on native plants and animals. The air-conditioned center consists of a laboratory equipped with gas, electricity, running water, dissecting microscopes, and lamps, and living quarters sufficient to accommodate from two to four resident researchers. Investigators must provide their own funds, instruments, and equipment. The facility may be used either for long-term studies within the area, or as a base for studies in the surrounding desert or mountains. (Control Committee, Deep Canyon Desert Research Area, Division of Life Sciences, University of California, Riverside)

## Meeting Notes

Syracuse University's annual **reading conference**, intended for teachers, supervisors, administrators, reading specialists, and school psychologists, will be held from 24 to 28 June. The program will include lectures, demonstrations, workshop sessions, and discussion meetings aimed at the improvement of reading instruction in the schools. Graduate and undergraduate credit is available for those who register for a prescribed schedule of conference activities. Attendance will be limited; advance registration is required. (Roy A. Kress, Annual Reading Conferences, 508 University Place, Syracuse 10, N.Y.)

Papers are being solicited for the Institute of the Aerospace Sciences' national specialist meeting on **simulation for aerospace flight**, to be held from 26 to 28 August in Columbus, Ohio. Deadline for receipt of abstracts (300 to 400 words): *1 January*. (P. L. Marshall, Flight Sciences Research, North American Aviation, Inc., 4300 E. Fifth Ave., Columbus 16, Ohio)

## Grants, Fellowships, and Awards

The Genetics Society of America is offering travel grants to attend the 11th **international congress of genetics**, to be held in The Hague, Netherlands, from 2 to 10 September 1963. Applicants need not be members of the society. Deadline: *15 January*. (Francis J. Ryan, Dept. of Zoology, Columbia University, New York 27)

Sigma Delta Epsilon, graduate women's scientific fraternity, is offering a \$500 grant-in-aid for research or relevant course work by a woman in the **mathematical, physical, or biological sciences**. Preference will be shown to applicants who are 35 years of age or older. Deadline: *1 February*. (Virginia Bartow, 7 Chemistry Annex, University of Illinois, Urbana)

## Scientists in the News

Recent staff appointments at the National Science Foundation:

**Philip Grant**, assistant professor of pathobiology at Johns Hopkins University, as director of the developmental biology program; and **John W. Mehl**, chairman of the department of biochemistry at the University of Southern California, as program director for molecular biology in the division of biological and medical sciences.

**Robert H. Owens**, associate professor of mathematics at the University of New Hampshire, as associate director of the mathematical sciences program; and **Robert H. Linnell**, laboratory director at Scott Research Laboratories, Perkasie, Pa., as associate program director of the chemistry program in the division of mathematical, physical, and engineering sciences.

Capt. **James A. Roman**, chief of the biodynamics branch of the Air Force School of Aerospace Medicine, San Antonio, Tex., has received the newly created Air Force Systems Command's scientific achievement award for his work in developing and testing automatic instruments to monitor the functions of pilots and astronauts under flight stress.

**Duke C. Trexler, Jr.**, field director for the People to People Health Foundation (Project HOPE), has been named executive director of the Commission on Drug Safety, established last July by the Pharmaceutical Manufacturers Association to develop new knowledge of human reactions to drugs and help assure increased safety in drug development and testing procedures.

**Henryk Szarski**, chairman of the department of general zoology at Copernicus University, Toruń, Poland, will serve as visiting professor of zoology at the University of Rhode Island during the forthcoming spring semester.