

**PERSPECTIVES ON  
THE LABORATORY**

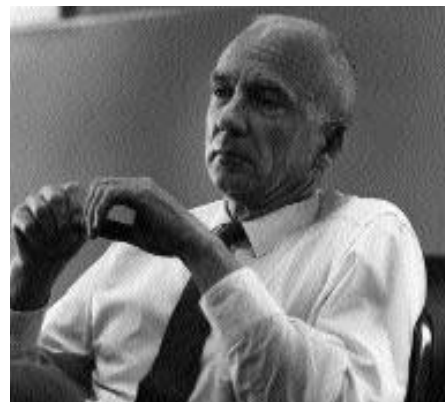
# Milestones in the History of Los Alamos National Laboratory



*J. Robert Oppenheimer, 1943–1945*

- 1943** The Los Alamos laboratory, under the direction of J. Robert Oppenheimer, begins operation as Project Y of the Manhattan Project. The Bethe-Feynman formula, a simple method for calculating the yield of a fission bomb, is derived.
- 1944** The world's third nuclear reactor (a uranium-solution-fueled "Water Boiler" named LOPO) achieves criticality.
- 1945** The world's first nuclear bombs (Little Boy, a gun-type uranium bomb, and Fat Man, an implosion-type plutonium bomb) are proved successful. Norris E. Bradbury is named second director of the Laboratory.
- 1946** The world's first plutonium-fueled nuclear reactor (Clementine) first achieves criticality.

- 1947** The Monte Carlo technique for particle-transport computations is formulated.
- 1948** Helium-3 is first liquefied.
- 1950** A new cyclotron-focusing method ("thomas" focusing) is developed that makes variable-energy machines possible.
- 1951** First thermonuclear reaction is demonstrated in the George shot of the Greenhouse test series.
- 1952** The MANIAC computer becomes operational. The first thermonuclear explosion is achieved in the Mike shot of the Ivy test series. The first facility for handling liquid hydrogen on a large scale becomes operational. Plutonium-244, plutonium-246, americium-246, einsteinium-253, and fermium-256 are discovered in the debris of the Mike shot.
- 1953** The Lady Godiva critical assembly first achieves prompt criticality. The  $S_n$ , or discrete ordinates, method for solving neutron-transport problems is formulated.



*Norris E. Bradbury, 1945–1970*



*Harold M. Agnew, 1970–1979*

- 1954** The first thermonuclear bomb containing solid fusion fuel is demonstrated in the Bravo shot of the Castle test series.
- 1955** The Rover Project to investigate the use of nuclear reactors to power rockets is initiated.
- 1956** The neutrino is detected with the help of a recently developed liquid scintillator. The MANIAC II computer and the Omega West nuclear reactor become operational.
- 1957** The particle-in-cell (PIC) method for numerical fluid dynamics is invented.
- 1958** A helium-3 refrigerator providing temperatures below 0.45 kelvin is developed.
- 1959** Plutonium-238 is used as a power source in space.
- 1960** The KIWI nuclear reactor for the Rover Project is operated at full power.
- 1961** The Stretch computer is developed in collaboration with IBM.
- 1963** Satellite-borne sensors to verify adherence to the Limited Test Ban Treaty are developed. PHERMEX, the world's highest-intensity x-ray facility, is constructed.

- 1964** The world's highest-voltage Van de Graaff accelerator is completed.
- 1965** The Phoebus I-A Rover reactor is tested at full power.
- 1967** The side-coupled cavity is developed for the LAMPF linear accelerator.
- 1968** Funding for construction of LAMPF is approved by Congress and President Johnson.
- 1969** The ultra-high-temperature nuclear reactor (UHTREX) begins operation at 2400°F.
- 1970** Harold M. Agnew is named third director of the Laboratory.
- 1971** Naturally occurring plutonium-244 is isolated.
- 1972** LAMPF accelerates protons to design energy. Isotopes of uranium are separated by selective laser excitation of UF<sub>6</sub>.
- 1973** Around this time insensitive high explosives for use in nuclear weapons are developed.
- 1974** The Laboratory is named a national resource for stable isotopes.
- 1976** A portion of the Laboratory site is designated as a national environmental research park.
- 1977** Fusion neutrons are detected in a plasma confined by radiation from a carbon-dioxide laser.
- 1978** The Hot Dry Rock Program is initiated.
- 1979** Donald M. Kerr is named fourth director of the Laboratory. Universality of the approach to chaos in deterministic systems is discovered.
- 1980** The University of California establishes a branch of the Institute of Geophysics and Planetary Physics at the Laboratory. The Center for Nonlinear Studies is established.
- 1981** The Center for Materials Science is established.
- 1982** The Laboratory is designated as a national resource for flow cytometry. GenBank, the national database for nucleic-acid sequences, begins operation. A heavy-fermion superconductor is discovered.
- 1983** Congress approves long-term visits at LAMPF for citizens of the People's Republic of China.
- 1984** The radio-frequency quadrupole cavity is developed for a neutral-particle accelerator.
- 1985** Siegfried S. Hecker is named fifth director of the Laboratory. A new technique (CORRTEX) is developed to verify yields of underground nuclear explosions.
- 1986** The world's first high-temperature hot-dry-rock system is successfully tested.
- 1987** The first edition of nucleotide-sequence data for HIV samples is published.
- 1988** The Laboratory is designated as one of three national centers for human-genome studies. A new type of chemical bond is discovered in the binding of molecular hydrogen to the central metal atom in certain metal complexes.
- 1989** A beam of energetic neutral particles is created in space.
- 1990** Superconducting tapes and thin films are fabricated.
- 1991** The Laboratory is designated as one of two centers for research on high-performance computing.
- 1993** Cross section for the scattering of electron neutrinos by electrons is determined experimentally.



*Donald M. Kerr, 1979–1985*



*Siegfried S. Hecker, 1985–*