ILL WINDS The Atmospheric Studies in Complex Terrain program, carried out at several of the national labs beginning in 1978, pursued improvements in the modeling of wind flows in hilly or mountainous areas. In this Livermore computer simulation, the white dots represent a pollutant entrained in the nocturnal air flow within a Colorado mountain canyon.

In matters of the environment, public awareness lagged far behind the activities of the energy agencies. As early as the forties and fifties, in an era when most people had never even heard the word "ecology," the AEC was forging an enviable record of environmental and ecological research. The initial catalyst was again the development of nuclear weapons and the two decades of atmospheric testing that followed. Estimating the health effects of released radioactivity depended not only on epidemiology and radiation biology, but also on knowing the fates of the airborne radioisotopes in the first place. Meteorology and oceanography were no less important than biology—as was research into the ecological processes that cycled materials through plants and animals to human beings. Atmospheric and environmental studies thus fell naturally within the purview of biomedical research.

An Eye on the Weather

In the postwar years, responsibility for fallout monitoring was spread among several laboratories. Chief among them was the Health and Safety Laboratory (now the Environmental Measurements Laboratory) in New York City, which established the earliest and most authoritative monitoring network in the world—and ultimately produced an integrated history of the distribution of nuclear weapons debris in the air, on land, and in water, as well as in plants and animals, especially the human food chain. As part of the High-Altitude Sampling Program, for example, instrumented balloons and aircraft were sent aloft to sample the stratosphere and to assess the exchanges of material between the stratosphere and the lower atmosphere. The resulting data contributed in a concrete way to the international moratorium on above-ground testing in 1963.

Beyond measurement, however, lay the more daunting challenge of prediction—a challenge that would naturally breed three distinct research thrusts: inquiries into the transport of radioactive materials released near the ground (a situation that might arise following, say, an accident at a weapons production facility), research into how clouds scavenge radionuclides and then deposit them in rain, and efforts to understand the global transport of materials released during atmospheric weapons tests.

In pursuit of answers to the near-surface question, several of the national laboratories installed meteorological facilities, including several Air Resources Laboratory (ARL) facilities operated by the U.S. Weather Bureau for the AEC. There investigators sought scientific methods to predict how airborne materials are transported in the lower atmosphere and how their eventual deposition depends on the nature of the material and on atmospheric and topographic variables, including the presence of complex mountainous terrain. Using the collective results of these efforts, Frank Gifford and his colleagues at the ARL Atmospheric Turbulence and Diffusion Laboratory in Oak Ridge then developed a set of curves for calculating the spread of pollution from a "point source." In a time when the slide rule was the dominant computational tool, these dispersion models won international acceptance as tools for predicting the fate of nuclear reactor emis-