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Los Alamos Science

LOS ALAMOS NATIONAL LABORATORY

Inside This Issue

EDITOR'S NOTE

Hans Bethe has been a paternal figure to Los Alamos for its entire history. A German refugee in 1935, he first came to Los Alamos in 1943 to head the theoretical work of Project Y and has continued since the end of World War H as an active and much-prized consultant to the Laboratory. In 1954, about six months after the Oppenheimer hearings, he wrote an article refuting the notion, held by many at that time, that the development of thermonuclear weapons was delayed by the influence of Oppenheimer. This candid article, which we are honored to publish for the first time, documents the technical problems that in actuality dictated the pace of H-bomb development. In it Bethe expresses his own very strong reluctance to make this deadly weapon a reality. This story of the inner workings of a top-secret project necessarily reveals a somewhat unfamiliar picture of one of Bethe's oldest friends and associates, Edward Teller. We applaud Bethe's courage, integrity, and sense of responsibility in setting straight—personal considerations notwithstanding—the record of this important period in the history of American science and politics.

In a lighter vein we have an interview with Stan Ulam and Mark Kac, two outstanding mathematicians who, like Bethe, came to this country from Europe before the outbreak of World War II. The afternoon we taped this interview was one of the most delightful I have ever spent. These men spoke of their life and work with old-world wisdom, refreshing insight, and a sense of humor that engages the heart and the mind.

Mitchell Feigenbaum, whose idea it was to record these conversations. is himself a profoundly thoughtful man. His seminal work on chaos in deterministic systems reported in the first issue of *Los Alamos Science* has stimulated a surge of new activity in this challenging field, New results were reported at a conference entitled "Order in Chaos" sponsored by the Center for Nonlinear Studies at Los Alamos. This issue's report of the conference, unlike most such reports, introduces to the nonexpert the main concepts in this field and explains the significance of recent contributions. It is truly educational.

Quantitative theoretical immunology, a field that was born at Los Alamos in 1970 when George Bell applied a mathematical description to an animal's immune system, represents one of the few areas in biology in which mathematical descriptions are directly applied to biological experiments. In this issue we present theoretical work on one of the less fortunate aspects of the immune system. the allergic response. What turns this response on and off? Collaboration between theory and experiment has helped find mechanisms for desensitizing cells to the guilty allergens.

This issue starts out in the "wonderland" created by phase-conjugating mirrors. Acting like a time-reversal machine, these devices send a laser beam back along its original direction with all phase relationships preserved. Thus an incident laser beam, after suffering distortion as it passes through an amplifying system, can be returned through the system by the phase conjugator and re-emerge with its original beam quality. The developers of infrared and ultraviolet phase conjugators describe how these remarkable reflectors work and how they can revolutionize the rich field of laser optics.

Happy reading!

Necia Grant Cooper

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Erratum: Los Alamos Science *apologizes for omission of credit to Ken Lujan for black and white photo laboratory workk in Volume 3, Number 2.*

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On the cover.

A unique "mirror' 'for lasers fluoresces as it reflects the phase-conjugate version of an incident laser beam. Ultraviolet light from a xenon fluoride laser enters a cell of liquid hexane from the left. There stimulated Brillouin scattering generates the reflected beam, which exactly retraces, in reverse, the path of the incident beam. (Photo by Henry Ortega)

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