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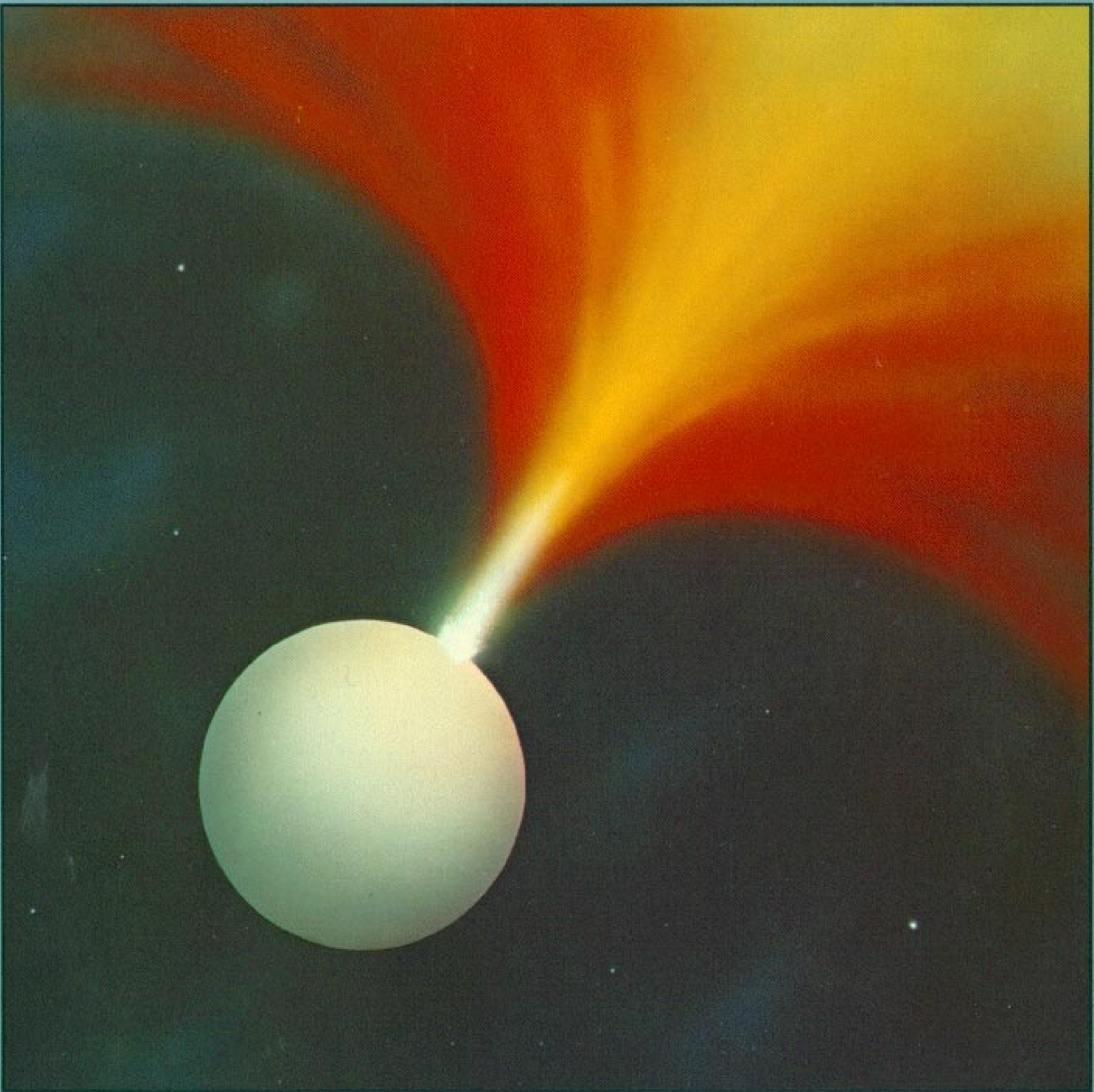
Los Alamos Science

LOS ALAMOS NATIONAL LABORATORY



Inside This Issue

EDITOR'S NOTE

Science and technology try to find and fashion the order in nature, but as much as the planners would have it otherwise, this creative process, rather than being orderly, is tilled with paradox and surprise. That a mission-oriented laboratory, devoted primarily to weapons development, provides an environment where this process can flourish is itself paradoxical. But the facts speak for themselves. This issue presents three exciting research projects that emerged in surprising ways from weapons research and development.

The first is the work on gamma-ray bursts. These dynamic stellar events, clues to our changing universe, were discovered as a result of the Vela satellite-surveillance mission to detect exe-atmospheric nuclear weapons tests. The discovery surfaced unexpectedly from persevering, mission-oriented efforts at Los Alamos to remove ambiguities from the data and to differentiate local from cosmic events. The same care and caution that characterized the surveillance studies is present in this issue's article on the current understanding of gamma bursts. While the editors are privy to the authors' lively speculations, the authors preferred to omit them from the article because as part of a national laboratory they see themselves as more vulnerable to criticism than their counterparts in academia. This curious blend of boldness and caution is a fact of life at the Laboratory. It can be both a virtue and a handicap in the process of discovery.

The nuclear microprobe, a new instrument to examine the elemental composition of very small objects, is the second subject in this issue. This instrument, together with other techniques, has given a new lease on life to the Van de Graaff accelerator. Once an indispensable tool in the weapons program for studying low-energy nuclear reactions, its continued importance for this purpose is under discussion. In the meantime it has given birth to a new and very sensitive tool for materials analysis. The nuclear microprobe uses the ions from the Van de Graaff to probe the subsurface region of geologic, biological, and synthetic materials. Interpretation of the data, which depends, of course, on the vast body of low-energy nuclear data collected at the Van de Graaff by nuclear physicists, is leading to greater understanding of the formation of geologic materials, the operation of technological devices, and the synthesis of new materials.

The third subject is an intriguing experiment to measure the solar neutrino flux over geologic times as a test of the standard models of stellar evolution. The experiment entails isolating and counting very rare isotopes of technetium produced by the interaction of solar neutrinos with deeply buried molybdenum. The commercial molybdenum recovery process goes a long way toward isolating these isotopes. The final counting, however, will require drawing on and adding to analytical techniques developed over the years for weapons diagnostics.

These tales of synergy are common at Los Alamos and are appreciated by the new leader of our Life Sciences Division, Mark Bitensky. With bold vision Mark has outlined an astounding array of exciting opportunities in biological and biomedical research made possible by the unique combination of talent and facilities in the Laboratory's forte—the *physical* sciences. What combination of boldness and caution can see through the present tight budgetary climate to the realization of these dreams of synergy?

Necia Grant Cooper

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Errata: Los Alamos Science *apologizes for the misspelling of Roy Feber's name (Volame 3, Number 1, page 34) and for omission of credit to Sheila Satkowski for black and white photo laboratory work in the same issue.*

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SCIENCE IDEAS

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On the Cover.
Artist’s conception of the source of a gamma-ray burst. In this hypothetical model a neutron star ejects a fountain of plasma whose base, at a temperature of several billion kelvins, emits gamma rays. Typically, neutron stars are about the size of a small town whereas the plasma fountain may extend the length of the state of New Mexico.

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