In contrast to the postwar era in which the United States (blue) and Russia (yellow) were the two dominant powers, the rapid growth in technological, economic, and perhaps military power of Japan (green), China (red), Western Europe (brown), and other regions is making those nations into world powers as well. A conference sponsored by the Laboratory on “The Future of Nuclear Weapons—The Next Three Decades” explored this theme as well as the impact on nuclear weapons policy of public opinion (top), economic trends (upper left), military needs (left and bottom), and science and technology (right). The last theme is represented by a seismic recording of an actual underground nuclear test, a technology of key importance to verification. (Cover art by Gloria Sharp.)
Los Alamos is known worldwide as the birthplace of the atomic bomb. For the last forty-six years the Laboratory has remained the leader in development of nuclear weapon technology—leadership meant to guarantee a world safe from global conflict. The paradoxical role of nuclear weapons (peacekeeping through the threat of mutual assured destruction) is hard for any one to fathom without developing a simplistically polarized viewpoint. As the world grows more complex it appears to many that world stability must come to rest on other limits.

What will be the future of nuclear weapons? Will the public continue to support their role as a peacekeeping force? Are there any immediate alternatives? If not, can the Laboratory maintain its preeminence alongside growing perceptions that nuclear weapons may become irrelevant or too difficult to maintain?

When Sig Hecker became Director of Los Alamos in 1986, he faced the challenge of guiding the Laboratory through an evolving political climate. To understand that climate and to forge an appropriate and necessary role for the Laboratory, Sig created the Center for National Security Studies. The Center is a mini think tank that will help to shape technological decisions through careful consideration of change. The Laboratory sees its role as being much broader than weapons development in which it is just one among a number of programs in conventional and non-nuclear weapons development in which the Laboratory is involved in conventional weapons for many years, but that role is now increasing. In this issue we report on one of the areas in which the Laboratory is making a significant contribution—the area of conventional tank warfare. It is well known that the Soviet Union relies heavily on the strength of its armored forces and invests heavily in modernizing those forces at regular intervals. In contrast, the United States lags behind in deploying the technology developed at research laboratories such as Los Alamos. Don Sandstrom, the inventor of a new type of ceramic armor, reports here on the major advances in the development of materials for armored vehicles and for the projectiles that penetrate armor. In “Armor/Anti-Armor—
THE FUTURE OF NUCLEAR WEAPONS—THE NEXT THREE DECADES

An Introduction
by Paul C. White

In today’s complex and changing strategic environment, a new Center at Los Alamos will help focus the long-term direction of technical programs through objective studies of national security issues.

The Center for National Security Studies

Debating the Future
by Patrick J. Garrity and Robert F. Pendle

Political, technological, and military trends will influence the future of nuclear weapons over the next three decades. A recent conference chaired by Brent Scowcroft, John Foster, and Joseph Nye explored a continued but changing role for nuclear weapons as the world’s balance of power comes to rest on not two dominant nations but on many.

The Laboratory View

with Sig Hecker, Director of Los Alamos National Laboratory

Nuclear weapons cannot be designed from first principles alone. Even if the nuclear stockpile were substantially reduced, the maintenance of a credible deterrent would require a significant research and development effort, including the continuation of nuclear testing and increased initiatives in non-nuclear and conventional weapons.

CURRENT RESEARCH ON CONVENTIONAL WEAPONS

Armor/Anti-Armor—Materials by Design
by Donald J. Sandstrom

Materials-by-design is the key phrase to describe the development and dynamic testing of new materials for the armor and the bullets of conventional warfare.

ATAC and the Armor/Anti-Armor Program
by Richard Mah and Phyllis Martell

A unique environment, linking private contractors, the military, and the new Advanced Technology Assessment Center at Los Alamos, has been established to push developments in conventional weapons off the laboratory bench and into the field.

A Comment by General Starry.

Studying Ceramic Armor with PHERMEX by Ed Cort
Modeling Armor Penetration by Ed Cort
THE FUTURE OF NUCLEAR WEAPONS