

Fermi and the Bomb, and Physicists and the bomb since Fermi

History references

A Peril and a Hope: The Scientists' Movement in America, 1945-47 by Alice Kimball Smith
[MIT Press, 1965]

The Advisors: Oppenheimer, Teller and the Superbomb by Herbert F. York (Stanford University Press, 1976)

The Making of the Atomic Bomb by Richard Rhodes (Simon and Schuster, 1986)

Dark Sun: The Making of the Hydrogen Bomb,
by Richard Rhodes (Simon and Schuster, 1995)

Franck Report's opposition to use of bomb on Japan

"If we consider international agreement on total prevention of nuclear warfare as the paramount objective...

"It may be difficult to persuade the world that a nation which is capable of secretly preparing and suddenly releasing a weapon as indiscriminate as the rocket bomb and a million times more destructive, is to be trusted...

"The best possible atmosphere for...an international agreement could be achieved if America could say to the world, 'You see what sort of a weapon we had but did not use. We are ready to renounce [it] if other nations join us...and agree to...efficient international control.'"

--James Franck, Donald Hughes, J.J. Nickson, Eugene Rabinowitch, Glen Seaborg (chairman of the Atomic Energy Commission), Joyce Stearns, and Leo Szilard.

**Compton, Fermi, Lawrence, and Oppenheimer
advise *for use***

“Those who advocate a purely technical demonstration would wish to outlaw the use of atomic weapons and have feared that if we use the weapons now our position in future negotiations will be prejudiced.

“Others emphasize the opportunity of saving American lives by immediate military use, and believe that such use will improve the international prospects...[T]hey are more concerned with the prevention of war than the elimination of this special weapon.

“We find ourselves closer to these latter views...”

General Advisory Committee on H-bomb development

Can we do it?

“an imaginative and concerted attack on the problem has a better than even chance of producing the weapon within five years.”

Should we do it?

“it is not a weapon which can be used exclusively for destruction of material installations of military or semi-military purposes.

“Its use therefore carries much further than the atomic bomb itself *the policy of exterminating civilian populations...*

“We are all reluctant to see the United States take the initiative in precipitating this development...”

[emphasis added]

Fermi and Rabi's separate "opinion"

"we believe it important for the President of the United States to tell the American public, and the world, that we think it wrong on fundamental ethical principles to initiate a program of development of such a weapon. At the same time it would be appropriate to invite the nations of the world to join us in a solemn pledge not to proceed..."

Could we detect a violation?

"it appears highly probable that an advanced stage of development leading to a test by another power could be detected by available physical means."

Could we respond to a violation?

"we have in our possession, in our stockpile of atomic bombs, the means for adequate 'military' retaliation for the production or use of a 'super.'"

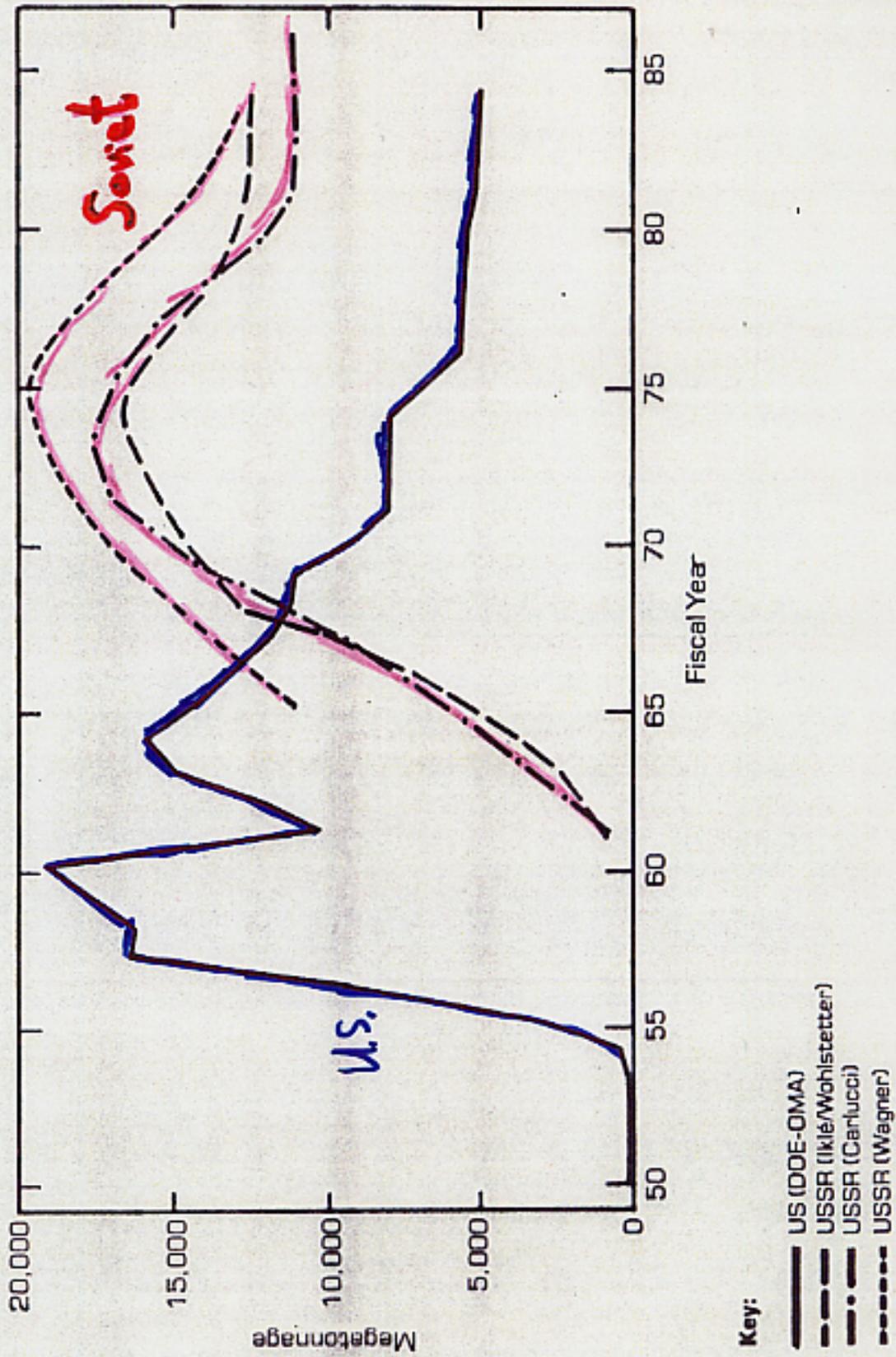


Figure 2.16 Best comparison of Soviet and United States megatonnage, 1950-1987.

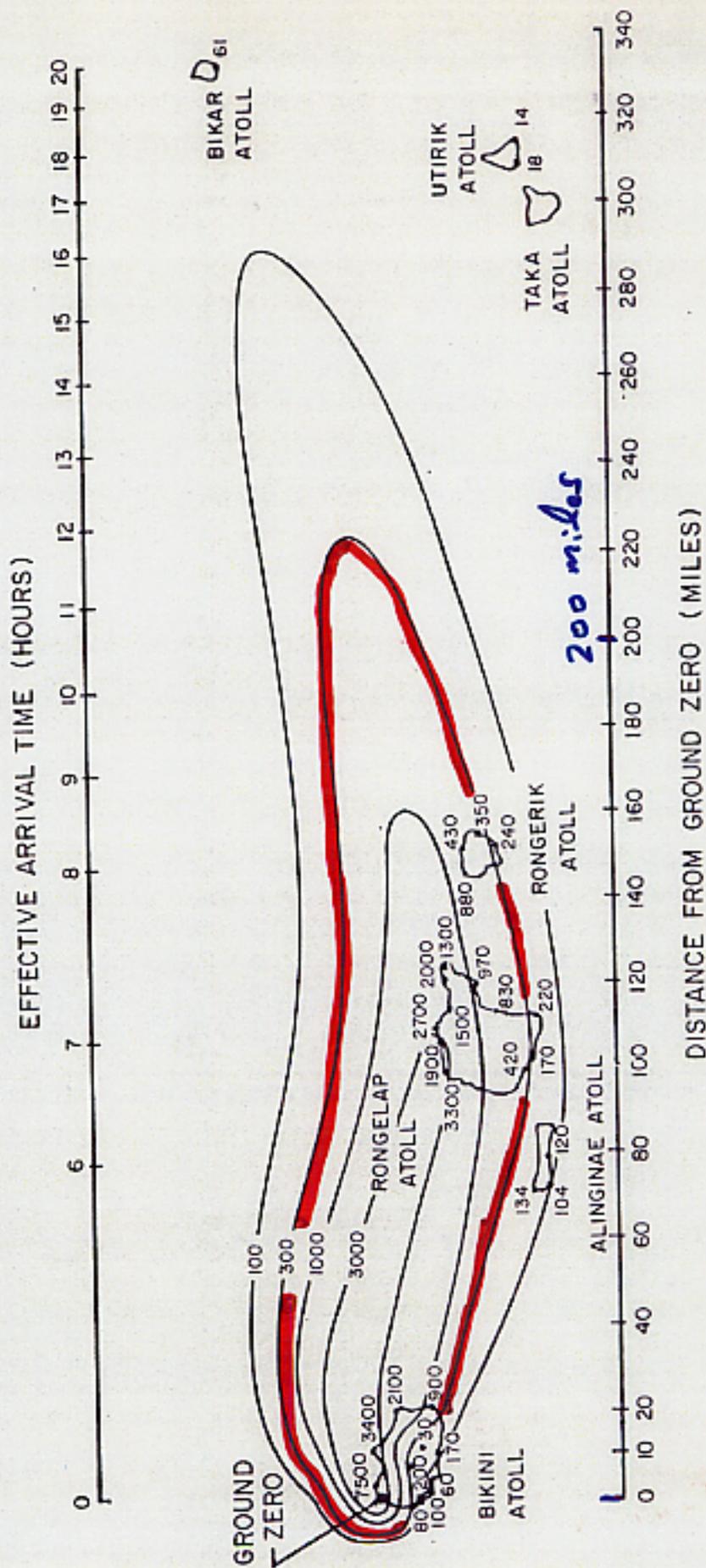
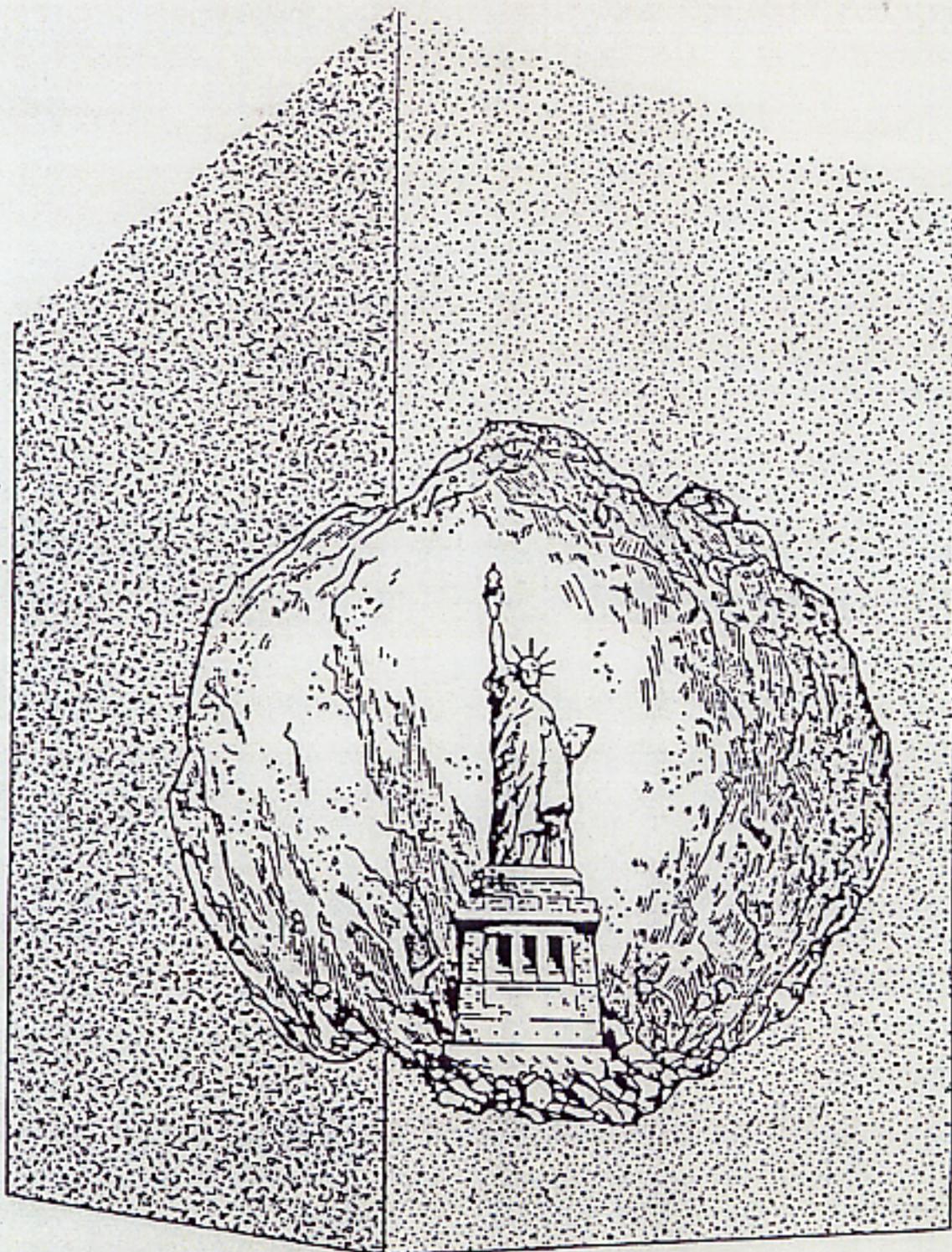


Figure 9.105. Estimated total (accumulated) dose contours in rads at 96 hours after the E.3.5VO test explosion.

FIGURE 1 Minimum Cavity Size Required To Decouple a 5 kt Nuclear Explosion



To fully decouple a 5 kt explosion in salt, a spherical cavity with a radius of at least 43 meters would be required. The height of the Statue of Liberty with pedestal (240 ft) is 85% of the required diameter (282 ft).

SOURCE: Office of Technology Assessment, 1988.

Anti-Ballistic-Missile Systems

The U.S. is now building a "light" ABM system. The authors argue that offensive tactics and cheap penetration aids could nullify the effectiveness of this system and any other visualized so far

by Richard L. Garwin and Hans A. Bethe

Last September, Secretary of Defense McNamara announced that the U.S. would build "a relatively light and reliable Chinese-oriented ABM system." With this statement he apparently ended a long and complex debate on the merits of any kind of anti-ballistic-missile system in an age of intercontinental ballistic missiles carrying multi-megaton thermonuclear warheads. Secretary McNamara added that the U.S. would "begin actual production of such a system at the end of this year," meaning the end of 1967.

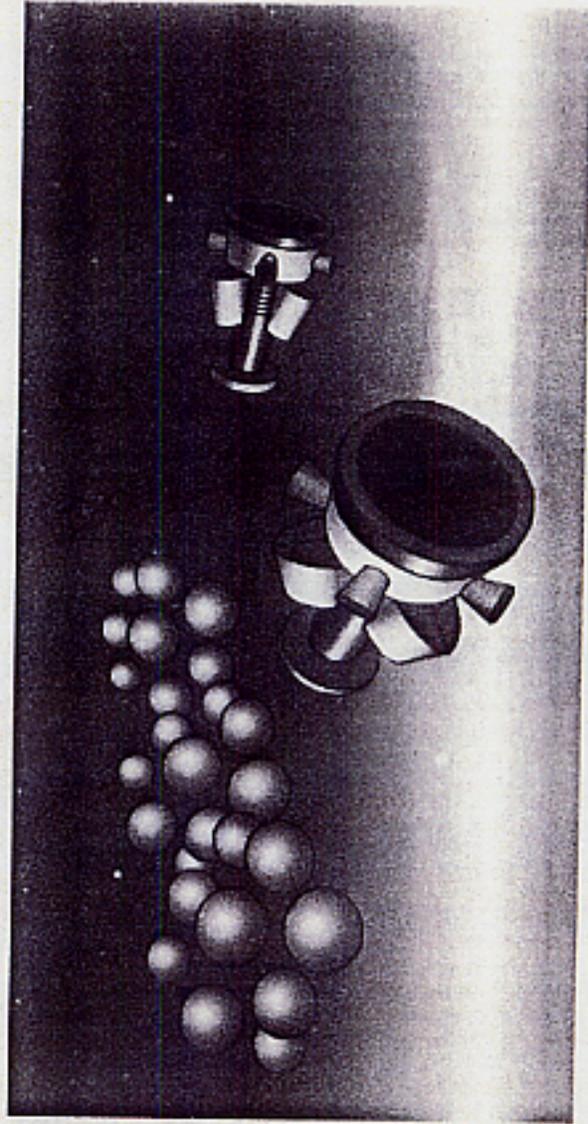
A. L. GARWIN AND HANS A. BETHE

missiles is possible and will lead almost inevitably to demands that the light system, the estimated cost of which exceeds \$5 billion, be expanded into a heavy system that could cost upward of \$40 billion. The folly of undertaking to build such a system was vigorously stated by Secretary McNamara. "It is important to understand," he said, "that none of the [ABM] systems at the present or foreseeable state of the art would provide an impenetrable shield over the United States... Let me make it very clear that the [cost] in itself is not the problem: the penetrability of the proposed shield

great cost to reduce the effectiveness of an ABM system even more elaborate than the one the Chinese will face. First, however, let us describe that system.

Known as the Sentinel system, it will provide for long-range interception by Spartan antimissile missiles and short-range interception by Sprint antimissile missiles. Both types of missile will be armed with thermonuclear warheads for the purpose of destroying or inactivating the attacker's thermonuclear weapons, which will be borne through the atmosphere and to their targets by reentry vehicles (RV's). The Spartan missiles,

Countermeasures



A Technical Evaluation of the
Operational Effectiveness of the Planned
US National Missile Defense System

**Exerpts from Fermi's message to the
conference on atomic energy
at the University of Chicago, September 19-20, 1945**

“There is general agreement, I believe, on the following points:

“That the new weapon has such destructiveness that in case of a war between two powers both armed with atomic bombs, both ... would have their cities destroyed....

“That the balance between defensive and offensive is strongly shifted in favor of the second....

“The possibility of an honest international agreement should be explored energetically and hopefully. That such agreement may prove possible is, I know, the most fervent hope of the men who have contributed to the development. In their optimistic moments they express the view that perhaps the new dangers may lead to an understanding between nations much greater than has been thought possible till now.”