

A US-centric History of Physicists' Nuclear Disarmament Advocacy (Matt Evangelista will do Pugwash)

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International Workshop on the Increasing Danger of Nuclear Weapons:

How Physicists Can Help Reduce the Threat

International Center for Theoretical Physics, Trieste, 23-25 October 2023

Outline

1945. Whether to use nuclear weapons at the end of World War II

1954-96. Stopping nuclear testing, 1954-96

1967-72. Stopping a ballistic-missile defense-offense race

1982-87. Ending the nuclear arms race and cutting back from insane to obscene levels of nuclear weapons.

**1999-?. The nuclear military-industrial complexes are back in control.
What are we going to do about it?**

Concerns of the physicists in the secret US World War II Nuclear Weapons Project

- Fear Nazis were mounting a major effort to develop nuclear weapons (until 1944).
- Ethics of using nuclear bombs against the Japanese.
- Fear of a nuclear arms race with the Soviet Union after WW II.
- That even more powerful nuclear weapons could be developed.

How did they respond?

1. Only *one* physicist left Los Alamos after it became clear that Germany did *not* have a serious nuclear-weapon program.



Joseph Rotblat escaped from Poland to the UK and helped launch the UK nuclear program – which helped launch the US program.

Decided to leave Los Alamos after General Groves stated the new objective of the US nuclear-weapon program was to “subdue” the Soviet Union.

Rotblat was accused of being a Soviet spy. He was allowed to leave after exposing that as a fabrication – but only after he promised not tell other Los Alamos physicists why he was leaving.



Rotblat founded and sustained of the international **Pugwash Movement** (initially mostly physicists) which pioneered nuclear/biological/chemical/conventional arms control.

Shared 1995 Nobel Peace Prize with Pugwash.

2. Foreseeing a possible nuclear arms race after World War II



Niels Bohr, *most eminent physicist at Los Alamos*, met in 1944 with UK Prime Minister Winston Churchill and with US President Roosevelt to raise “*the question of an eventual competition about the formidable weapon, and on the problem of establishing an effective control*”.*

Churchill’s reaction to Bohr’s proposal to reveal the US-UK nuclear weapons program to Stalin was, “*Bohr ought to be confined or at any rate made to see that he is very near the edge of mortal crimes*”.



Ted Hall, *the youngest physicist in Los Alamos*, feared a future in which the United States – perhaps with its own fascist government – would be the only nuclear-armed country.

During a visit his family in New York for his 19th birthday, he found a Soviet spy and described to him the implosion design on which he was working. (See the 2022 film, *The Compassionate Spy*.)

* <https://ahf.nuclearmuseum.org/ahf/key-documents/bohr-letter-churchill/#:~:text=It%20was%2C%20indeed%2C%20far%20from.all%20in%20the%20most%20brotherly>

A demonstration instead of a surprise attack on Japan?

In May 1945, at *University of Chicago's "Metallurgical Lab"* where US plutonium-production reactors were designed, a group of physicists including gadfly genius, Leo Szilard, met under chairmanship of James Franck and prepared a report on "Political and Social Problems" from nuclear weapons.



They opposed *"an early demonstration of nuclear weapons [to] have the possibility to take into account the public opinion of this country and of the other nations before deciding whether these weapons should be used in the war against Japan. In this way, other nations may assume a share of responsibility for such a fateful decision..."*

"America would be able to say to the world, 'You see what a weapon we had but did not use. We are ready to renounce its use in the future and to join other nations in working out adequate supervision of the use of this nuclear weapon.'"

Oppenheimer-Compton-Fermi-Lawrence recommended against delay.



After Hiroshima-Nagasaki, hundreds of younger project physicists mobilized



First FAS Chairman
(from Los Alamos)



First BAS Editor
(from Chicago)

*Established the **Federation of American Scientists** (FAS, Sept. 1945) and the **Bulletin of the Atomic Scientists** (Dec. 1945) to educate the public and Congress. Their mantra:*

- *”There is no secret!”*
- *”There is no defense!”*
- *”The only solution is international control!”*

FAS helped stop Department-of-War-prepared legislation backed by Oppenheimer and other senior Manhattan Project science administrators for continued military management of nuclear R&D. Instead, Congress created the civilian Atomic Energy Commission (succeeded by Department of Energy).

FAS also worked on the technical basis for verifying a treaty prohibiting nuclear weapons ban treaty.

Alice Kimball Smith, *A Peril and A Hope: The Scientists' Movement in America 1945-47* (1965)

The H-bomb Decision and the Oppenheimer Security Hearing

After detection of the Soviet Union's first nuclear test in September 1949, a group led by Edward Teller proposed development of thermonuclear bombs a thousand times more powerful than the Hiroshima and Nagasaki bombs.

AEC asked its *General Advisory Committee (GAC), chaired by Robert Oppenheimer, for advice* (Conant, Fermi, Rabi were members)

GAC advised: "it is not a weapon which can be used exclusively for the 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 all hope that by one means or another, the development of these weapons can be avoided. We are all reluctant to see the United States take the initiative in precipitating this development."

In the panic over the Soviet nuclear bomb, this advice was rejected. It *inspired, the campaign to remove Oppenheimer as a government advisor on nuclear-weapon policy* and to the 1954 Oppenheimer security hearings.



Radioactive fallout from 1954 US 15-MT test BRAVO drew global attention because of radiation illness of the fishermen on the *Lucky Dragon* 4-day doses. Deaths from radiation illness begin around 300 rads. Based on Chernobyl, 100% lethality is expected above 1000 rads -- even with modern hospital care.

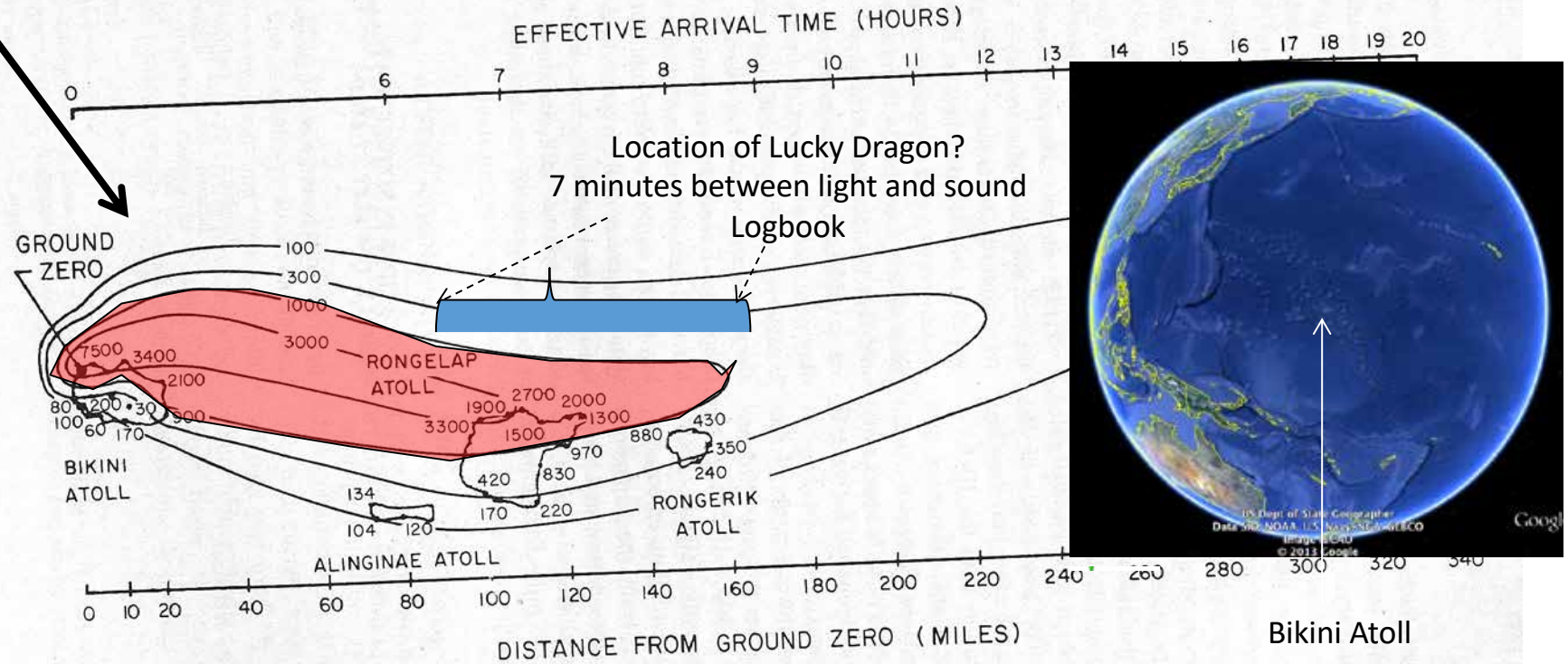


Figure 9.105. Estimated total (accumulated) dose contours in rads at 96 hours after the BRAVO test explosion.

For thermonuclear tests, roughly half the radioactivity went into to the stratosphere and came down over a period of years as global fallout.

St. Louis Baby Tooth Survey measured strontium-90 in 300,000 baby teeth from 1959-70.

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Ending nuclear testing in the atmosphere (1963)

~ 3 million cancer cases— mostly still in future due to (5700-yr half-life) C-14

UN Scientific Committee on the Effects of Atomic Radiation, *Ionizing Radiation: Sources and Biological Effects*, 1982, p. 244.

Linus Pauling

← Nobel Peace Prize, 1963.

Andrei Sakharov →
protested high-yield testing to Krushchev who responded, “I'd be a jellyfish and not Chairman of the Soviet of Ministers if I listened to people like Sakharov!”



In **1986** Evgenyi Velikhov (physicist-arms-control advisor to Gorbachev) and Tom Cochran (physicist with US Natural Resources Defense Council) organized in-country verification of the Soviet unilateral test moratorium, ending impasse over in-country verification, making possible **1996 Comprehensive Test Ban Treaty**.

**University of California
San Diego Seismologists
in Kazakhstan**



**Cochran &
Velikhov in
Kazakhstan**

**Rep. (now Senator)
Markey holding up
first seismogram from
Kazakhstan in
House of Representatives**



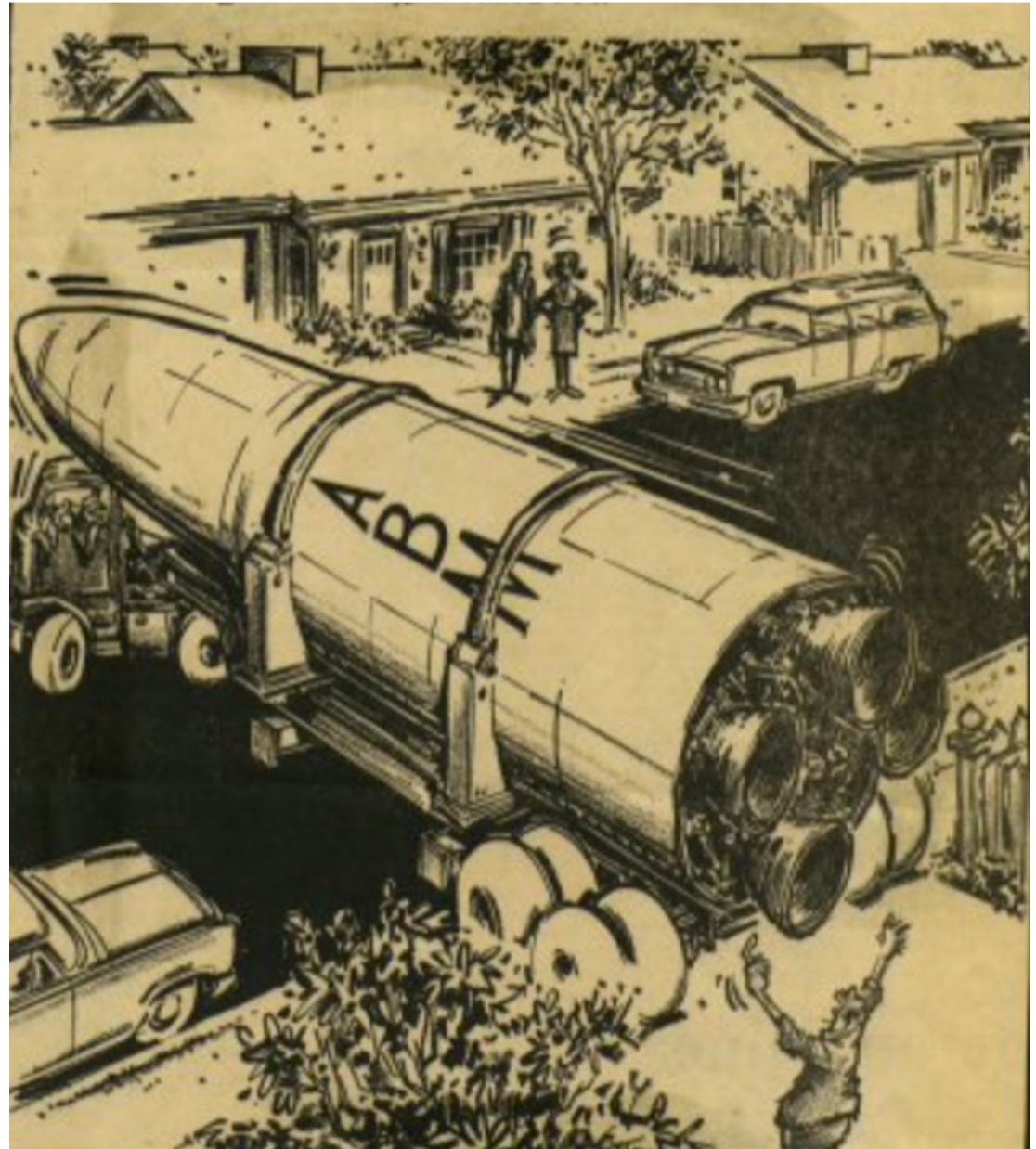
In 1967, Army proposed to locate nuclear-armed anti-ballistic missile interceptors in suburbs of major US cities

“Not in my back yard!”
uprising drew Congressional attention to scientists’ arguments that countermeasures would make it impossible for interceptors to find their targets.

1972 ABM Treaty limited number of interceptors to 200 (later 100).

Soviet Union deployed its interceptors around its capital – politically impossible in U.S.

“Well, there goes the neighborhood!” (NYTimes)



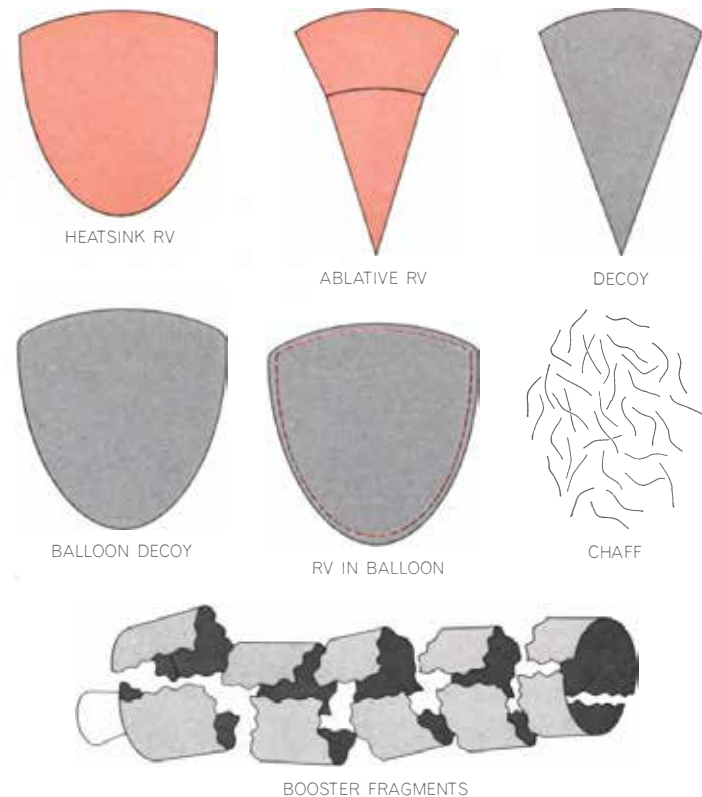
When President Johnson didn't listen to his science advisors, **Garwin and Bethe** wrote a *Scientific American* article in 1968 explaining *how easy countermeasures to ballistic missile defense would be*. Article educated other physicists (including me) to help educate public.

Established 1845 **SCIENTIFIC AMERICAN** March 1968 Volume 218 Number 3

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



PENETRATION AIDS include objects that will reflect radar signals and thus simulate or conceal actual reentry vehicles (*color*). A decoy might be a simple conical structure or even a metallized balloon. RV's could be placed inside the same kind of balloon. Fragments of the launching vehicle and its fuel tank provide radar reflectors at no cost. Short bits of metal wire, called chaff, also make a cheap and lightweight reflector of radar signals.

Statements from Reagan Administration about fighting and winning a nuclear war resulted in a grass-roots movement to “freeze” nuclear arms race. Culminated in 1982 in a million-person demonstration in New York.

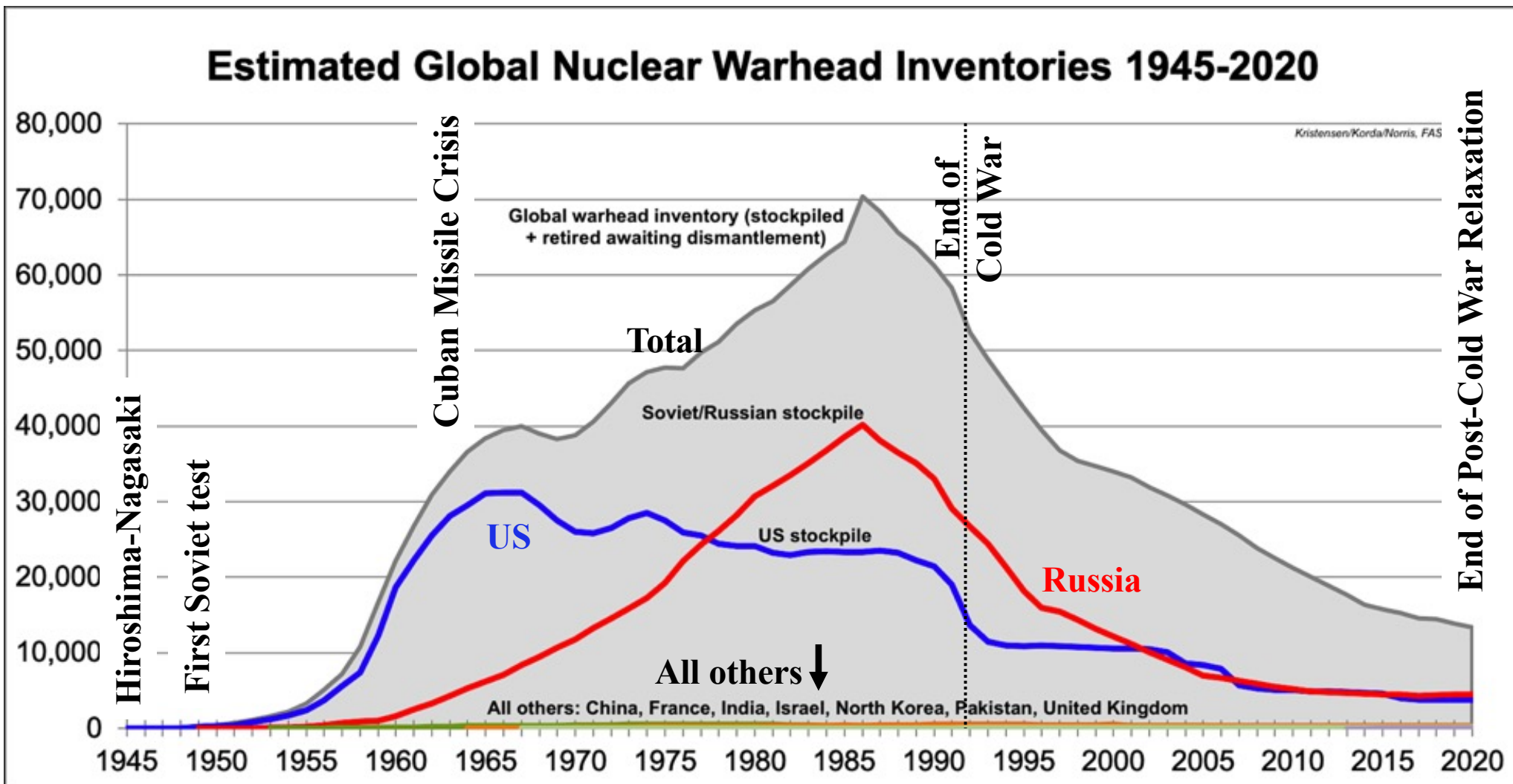


Randall Forsberg proposed focus on the nuclear arms race.

Also, massive European demonstrations against US intermediate-range nuclear missiles (London, October 1983)

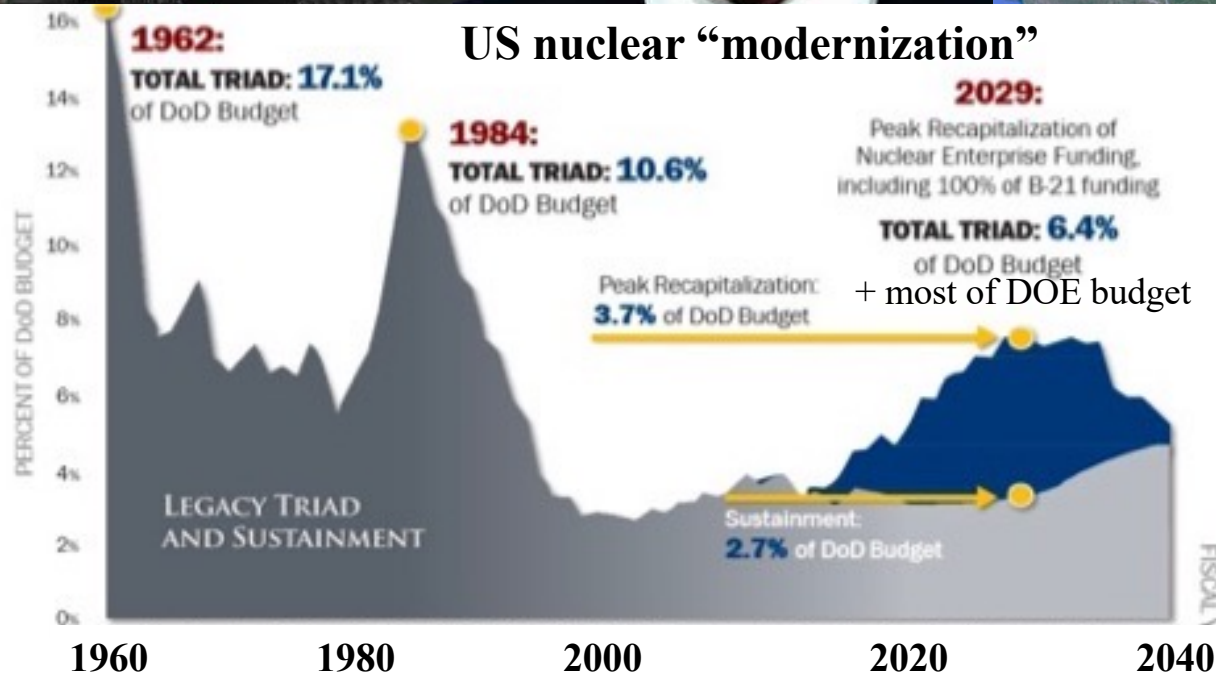


Global warhead stocks have declined but still in overkill range, $\approx 10,000$, and *we may be beginning a new buildup*.



* *Bulletin of the Atomic Scientists*, Nuclear Notebook, <https://thebulletin.org/nuclear-notebook/>

The nuclear military-industrial complex is back! Time to mobilize again!



The role of physicists

- Physicists such as Oppenheimer willingly participated in the effort to pull nuclear weapons out of the box – initially for a good reason.
- Physicists also played important roles in the ending of the Cold War nuclear arms race.
- We thought history had ended and elimination would be at the end of the “glide path”. *We were wrong.*
- A new era of irrationality and war has begun.
- The absence of nuclear-weapons use for almost 80 years (a lifetime) has convinced most people that they will not be used.
- **They *will* be used – unless we help put them back into the box.**