

Thermonuclear Milestones

German A. Goncharov

Citation: [Physics Today](#) **49**, 11, 44 (1996); doi: 10.1063/1.881548

View online: <http://dx.doi.org/10.1063/1.881548>

View Table of Contents: <http://physicstoday.scitation.org/toc/pto/49/11>

Published by the [American Institute of Physics](#)

Articles you may be interested in

[The secret of the Soviet hydrogen bomb](#)

[Physics Today](#) **70**, (2017); 10.1063/PT.3.3524

[Thermonuclear Milestones: \(2\) Beginnings of the Soviet H-Bomb Program](#)

[Physics Today](#) **49**, (2008); 10.1063/1.881549

[Thermonuclear Milestones: \(1\) The American Effort](#)

[Physics Today](#) **49**, (2008); 10.1063/1.2807828

[Thermonuclear Milestones: \(3\) The Race Accelerates](#)

[Physics Today](#) **49**, (2008); 10.1063/1.881532

[Special Issue: New Light on Early Soviet Bomb Secrets](#)

[Physics Today](#) **49**, (2008); 10.1063/1.881526

[Sakharov, Gorbachev, and nuclear reductions](#)

[Physics Today](#) **70**, (2017); 10.1063/PT.3.3525



Small Conferences. BIG Ideas.

Applied Physics
Reviews

SAVE THE DATE!

3D Bioprinting: Physical and Chemical Processes

May 2–3, 2017 • Winston Salem, NC, USA

THERMONUCLEAR MILESTONES:

The creation of atomic weapons, and later thermonuclear weapons, was an event of such epochal significance in the 20th century that its history has preoccupied scientists worldwide and the international community at large. Those who have participated directly in nuclear weapons programs do not, and cannot, remain aloof from revealing the facts of that history. Of special interest is the early history of thermonuclear weapons development in the US and the USSR, the first countries to detonate this most dreadful species of nuclear weapon. In these three articles I present a brief survey and analysis of the principal events that make up that early history.

My survey covers the years 1941 through 1956. It is based on directly confirmed documents of fact and on judgments about the course of events (particularly events in the US) drawn either directly or indirectly from the sum total of existing materials. My sources of information on US participation are papers, articles and books published by American authors. My primary sources on Soviet nuclear history are original documentary materials.

By referring to documentary sources and comparing contemporaneous events in the USSR, the US and other countries, one can work out the interrelationship of events and piece together a total picture of the dramatic if faceless competition between the USSR and the US to discover the principles underlying the construction of a thermonuclear weapon. One can obtain answers to many important questions associated with the history of thermonuclear weapons in the USSR. Among those questions are

- ▷ What directly stimulated the first inquiry into the possibility of creating a hydrogen bomb in the USSR?
- ▷ When and under what circumstances did the Soviet government decide to build a thermonuclear bomb?
- ▷ How did the ideas for building a thermonuclear bomb first emerge and subsequently evolve?
- ▷ What was known in the USSR about US work on the hydrogen bomb?
- ▷ What influence did intelligence secrets have on the work of Soviet scientists?
- ▷ What did reports in the press tell Soviets about US hydrogen bomb projects?
- ▷ How did the avenue chosen by Soviet scientists let them overcome a four-year headstart by the US (in initiating a feasibility study of the building of a hydrogen bomb), attaining a level in 1955 that matched that of the US (and even surpassed that country in certain engineering aspects of the construction and testing of thermonuclear weapons)?

Ongoing historical research has revealed new details of how ideas evolved to culminate in the brilliant American and Soviet scientific and engineering achievements in the

With the opening and discussion of decades-old archives in Russia, we can reexamine many questions about the history of Soviet thermonuclear weapons development.

German A. Goncharov

development of thermonuclear weapons. Today, it is evident that those achievements were based largely on notions and information that already existed in the early phase of research efforts. One might conclude that the knowledge required could not have been cultivated or

implemented in good time in either country. But it is impossible to concur with this point of view. Scientists of both countries did everything possible to solve the problem they faced, one of the most perplexing challenges ever tackled in the history of mankind. The physical processes involved in the detonation of thermonuclear charges were so extraordinarily complex that physicists could develop the required concepts only by attaining a high level of mathematical modeling and comprehension of these subtle physical processes. Several years of concerted effort were required to reach the necessary level in both countries. Today, one can only marvel at the spectacular rate of progress achieved in those long-past but unforgettable years when the events described here took place.

Sources

1. Materials from the Presidential Archives of the Russian Federation, Minatom RF and RFYaTs-VNIIEF [in Russian].
2. N. D. Bondarev, A. A. Keda, N. V. Selezneva, "Special File from the Archives of I. V. Kurchatov," *Voprosy Istorii Estestvoznaniya i Tekhniki* [hereafter, VIET], No. 2 (1994).
3. Ya. P. Terletskii, "Operation Niels Bohr Interrogation," VIET, No. 2 (1994).
4. Yu. N. Smirnov, "Niels Bohr Interrogation: Evidence from the Archives," VIET, No. 2 (1994).
5. "Materials from the Foreign Intelligence Archives of Russia," VIET, No. 3 (1992).
6. US Congress Joint Committee on Atomic Energy, *Policy and Progress in the H-Bomb Program: A Chronology of Leading Events*, US Govt. Printing Office, Washington, DC (1953).
7. H. A. Bethe, "Observations on the Development of the H-Bomb" (1954). [Printed with slight edits in *Los Alamos Science*, Fall 1982, p. 43.]
8. H. F. York, *The Advisors: Oppenheimer, Teller, and the Superbomb*, W. H. Freeman, San Francisco (1976).
9. C. Hansen, *US Nuclear Weapons: The Secret History*, Orion Books, New York (1988).
10. D. Hirsch, W. J. Mathews, "The H-bomb: Who Really Gave Away the Secret?" *Bull. At. Sci.* **46**, 22 (1990). Reprinted in: *Usp. Fiz. Nauk* **161**, 153 (1991); *Sov. Phys. Usp.* **34**, 437 (1991).
11. R. Serber, *The Los Alamos Primer*, U. Calif. P., Berkeley, Calif. (1992).
12. D. Holloway, *Stalin and the Bomb*, Yale U. P., New Haven, Conn. (1994).
13. S. M. Ulam, *Adventures of a Mathematician*, U. Calif. P., Berkeley, Calif. (1991). [Reprinted from 1976 Scribner's edition.]
14. R. Rhodes, *Dark Sun: The Making of the Hydrogen Bomb*, Simon and Schuster, New York (1995).

GERMAN ARSEN'EVICH GONCHAROV is a division head in the department of theoretical physics of the Russian Federal Nuclear Center—All-Russian Scientific Research Institute of Experimental Physics (RFYaTs-VNIIEF). From 1952 on, he was directly involved in the Soviet thermonuclear project, initially working in the Tamm-Sakharov group. He participated in the development and testing of RDS-37, the first Soviet two-stage hydrogen bomb.

These three articles are adapted from a translation of the paper that German Goncharov presented at the Conference on the History of the Soviet Atomic Project ('40s and '50s) in Dubna this year. A less-edited version of James Wood's translation, "Milestones in the History of Hydrogen Bomb Construction in the Soviet Union and the United States," is available on the World Wide Web linked to the PHYSICS TODAY home page, <http://www.aip.org/pt/>.