

From reminiscences about Ya. B. Zel'dovich

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Usp. Fiz. Nauk **161**, 170–171 (May 1991)

In the August number of the journal "Priroda" for 1990 devoted to A. D. Sakharov, I found in the article by Yu. A. Romanov a mention of the fact that the question of producing a hydrogen bomb was proposed in the USSR in a special report by I. I. Gurevich, Ya. B. Zel'dovich, I. Ya. Pomeranchuk, and Yu. B. Khariton submitted to the Government. Calling on I. I. Gurevich I asked him to tell me, insofar as it is now possible, about this report taking into account the supposition of A. D. Sakharov concerning the fact that the problem was "weldless,"¹ (Note by Sov. Phys. Usp. Ed.: i.e., implying possible continuity from U.S. to Soviet effort, as suggested in Ref. 37a of the preceding article on the Hydrogen Bomb). Isaï Isidorovich said that they had no data concerning whether anybody is working on such problems. Simply the deuteron and reactions with light nuclei were within the circle of interests of himself and I. Ya. Pomeranchuk as a source of energy for the stars and a method of obtaining information on nuclear forces. In mutual discussions Ya. B. Zel'dovich and Yu. B. Khariton noted that the realization of thermonuclear fusion becomes possible in terrestrial conditions by heating the deuterium in a shock wave initiated by an atomic explosion (emphasizing in this connection that such a process gives the possibility of an explosion of an unlimited amount of the light element). Thus arose their joint proposal which they presented to I. V. Kurchatov.

"Possibly I might even succeed in showing you this proposal—said I. I. Gurevich,—it has possibly been retained in the archives of the Institute of Atomic Energy." Indeed, in a couple of weeks I held in my hands the certified photocopy of this "Proposal" containing seven pages typewritten with formulas handwritten by the hand of I. I. Gurevich, and the notation "1946" made at the end of the text by I. V. Kurchatov (Archives of the Institute of Atomic Energy. 2-1-368, 1946).

"Here you have graphic proof of the fact that we did not know anything about the American developments, —said Isaï Isidorovich, pointing to the title page of the article. — You will understand with what kind of stamps of secrecy on this proposal and behind how many seals it would have been stored in the contrary case." I agreed with that. However I still could not understand why this proposal was not classified in an appropriate manner (even if it was original). I. I. explained: "I think that at that time they simply waved us away. Stalin and Beriya laid extreme emphasis on the creation of an atomic bomb. Moreover at that time we had not yet commissioned an experimental reactor, and here the scientific "wise guys" are pestering us with new projects, while it is still not known whether they could be realized. I have not busied myself any further with these questions, and I do

not have any exact knowledge how events developed subsequently."

According to the "Memoirs" of A. D. Sakharov, towards the middle of 1948 the theoretical calculations on this proposal were already underway at the Institute of Chemical Physics of the Academy of Sciences of the USSR under the direction of Ya. B. Zel'dovich and A. S. Kompaneets, while to check them the group of I. E. Tamm was formed in which A. D. Sakharov was included. From the article by L. P. Feoktistov prepared for the collection of reminiscences about Ya. B. Zel'dovich I learned that later experimental research on this subject was underway at the "project." Most interesting scientific results were obtained in these investigations (in particular, in a mixture of deuterium and tritium a temperature of more than a billion degrees was achieved). When in the course of investigations it became clear that the initial idea is not perfect, Ya. B. Zel'dovich introduced cardinal changes into the construction of the device.

However, it is important that it is specifically the knowledge by A. D. Sakharov of the calculations which were carried on in the Institute of Chemical Physics on the suggestion of Ya. B. Zel'dovich and his coauthors, that introduced A. D. Sakharov to the idea of the enterprise and led to the birth, as he refers to it in his "Memoirs" of his first idea (which in combination with the second idea guaranteed the success of the first test of the hydrogen bomb in 1953). On the so-called third idea, which led in 1955 to a complete solution of the problem, A. D. Sakharov and Ya. B. Zel'dovich were already working together (and in this connection a tremendous contribution was made by their young collaborators).

Of course, at the present time in the 1990's, for people who grew up in our country in the post-Stalin era (and all the more so, for people abroad), it is very difficult to understand how could such most noble and honest people like I. E. Tamm, A. D. Sakharov, I. Ya. Pomeranchuk, and Ya. B. Zel'dovich and their comrades work so selflessly on the creation of a terrible weapon, devoting to this work all their knowledge and their talent, manifesting unusual initiative and not at the same time realizing what danger for the fate of the entire world (and of themselves) such weapons would present in the hands of a totalitarian system. This was not simply an interest in unusual physics (although, I think, it also meant much to them). The motives prompting these men are well expressed in the "Memoirs" of A. D. Sakharov. Here "there is nothing to add nor to subtract."

¹A. D. Sakharov, *Memoirs* (In Russian), Chekhov Publishers, New York, 1990, p. 129. [Engl. transl. Hutchinson, London, 1990].