

Garwin to Rhodes 08.29.95

Richard L. Garwin
IBM Fellow Emeritus
Thomas J. Watson Research Center
P.O. Box 218
Yorktown Heights, NY 10598-0218
[\(914\) 945-2555](tel:(914)945-2555)
FAX: [\(914\) 945-4419](tel:(914)945-4419)
INTERNET: RLG2 at watson.ibm.com

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(Via FAX to 9-1 [\(203\) 421-5469](tel:(203)421-5469))

Mr. Richard Rhodes
609 Summer Hill Road
Madison, CT 06443

Dear Mr. Rhodes:

I read with great interest Chapter 23 in DARK SUN, "Hydrodynamic Lenses and Radiation Mirrors" where I am quoted on the first couple of pages. Of course, the book is complete and published, and I find it very informative, but this additional information may be of some interest to you. I was at Los Alamos for three months in 1950, four months in 1951, and five months in the summer of 1952, as I recall.

First, I want to point out a clear error of interpretation in the text (page 459), "... if a cube of that flux could somehow be cut out and weighed it would reveal itself to be many times heavier than an equivalent cube of lead." Far from it!

Even if every atom of Pu underwent fission with a release of 150 MeV of energy, that would still constitute a loss of energy from the Pu of about 0.16 amu (atomic mass unit) per Pu. Since each of the Pu nuclei weighs 239 amu, this would be about 1/1500 of the mass of the Pu.

If all of this energy went into radiation, the radiation would have exactly this mass-- so something like 0.01 g/cc for normal-density Pu and 0.02 g/cc for Pu that had been compressed to double density.

In fact for efficiency on the order of 20% (i.e., 20% of the Pu fissioned), the mass density of the radiation is closer

to that of air than it is to that of lead or even aluminum.

I wanted to provide you with a "quotation from a discourse by Edward Teller in 1981

"I want to do so by telling you a story of which I believe no one has heard. In the early 1950's when I had the first crude design of the hydrogen bomb, Dick Garwin came to Los Alamos and asked me how he could help. Actually the design I had in mind was not that of a real bomb but of a model for an experiment. I asked Garwin to change this crude design into something approximating a blueprint. He did so in a short time-- a week or two. That experiment was carried out. Garwin's blueprint had been criticized by many people, including Hans Bethe. In the end the shot was fired almost precisely according to Garwin's design, and it worked as expected."

One of the first things I did at Los Alamos my first summer in 1950 was to learn from Fermi that the thermonuclear reaction cross-sections were not very well known, so I devised and began to build an experiment to measure them. Clearly this needed to be done by people who were full-time at Los Alamos, so the experimental design and conduct was turned over to others, and resulted in the publication referenced below.

I also consulted with the experimenters who were planning the diagnostic experiments on Greenhouse GEORGE. I introduced the technique of placing various materials in the nuclear explosive that would be activated and then collected with the rest of the debris from air sampling to provide detailed information.

I also had a lot to do with various streak camera diagnostics, and many other aspects of weapons and nuclear explosion testing.

Regarding Mike, secrecy has prevented my saying very much, except in a secret session at the 50'th Anniversary of Los Alamos lab 03/31/93.

During the summer of 1950 I was affiliated with the Physics Division at Los Alamos (Jerry Kellog), but my later consulting affiliation was with the Theoretical Division (Carson Mark).

I integrated the ideas current in May 1951 in a report,

proposal, and drawing of Mike, which went into great detail, drawing upon my experience as an experimental Particle Physicist at the University of Chicago. In particular, in regard to cryogenics in the summer of 1951, I found the Los Alamos cryogenics crew to be "burned out" from their efforts on GEORGE, and really very unwilling to help with Mike. So I needed to do a lot of that design myself.

On the large-scale cryogenic aspects of Mike, I worked closely with Ferdinand Brickwedde, who later volunteered to me that my designs and calculations were borne out, and were conservative, if anything.

Herb York alludes to the five or so Emergency Capability Weapons that were built for delivery by B-36, in case the United States needed to deliver large-yield thermonuclear weapons before a solid-fuel design was available. I did the preliminary design for them, too.

I am glad to see Carson Mark receive some recognition in your book. He was a major contributor and resource.

Now I need to find out from DoE whether there is an official description of any of this activity, on which one can rely for unclassified presentations.

Thank you for DARK SUN.

Sincerely yours,

Richard L. Garwin

Encl:

08/14/81 "Defense is Better Than Retaliation," (pages 56-57) by E. Teller. This is an anecdote about R.L. Garwin's role in developing the hydrogen bomb. (081481.ET1)

-02/01/54 "Cross Sections for the Reactions $D(d,p)T$, $D(d,n)He^{**3}$, $T(d,n)He^{**4}$, and $He^{**3}(d,p)He^{**4}$ below 120 kev," by W.R. Arnold, J.A. Phillips, G.A. Sawyer, E.J. Stovall, Jr., and J.L. Tuck in Physical Review

Vol. 93, No. 3, pp. 483-497, Feb. 1, 1954 (020154.WRA).

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