

Dr. Edward Teller explains the need for antiballistic-missile defense

Dr. Edward Teller, the nuclear physicist widely known as the "father of the U.S. hydrogen bomb," spoke Jan. 18 at a Georgetown University forum on anti-missile beam weapons in Washington, D.C. Dr. Teller attacked government secrecy regulations for keeping from the American population knowledge the Soviet leadership already possesses. This speech was part of a campaign by Teller in recent months urging the crash development of high-energy defensive weapons systems capable of knocking down or disarming intercontinental ballistic missiles in flight. Excerpts from his Jan. 18 address follow. Subtitles have been added. The moderator introducing Dr. Teller stated that the physicist would answer questions following his speech.

Thank you very much. Indeed, I will answer any question, provided I am permitted to do so by the rules of secrecy often and wrongly called security.

Here is my first difficulty. It has been printed that I shall talk about beam weapons; I am not *allowed* to talk about beam weapons. Trouble! The President has said—and very rightly—that the American people are certainly entitled to know whatever the Soviet leadership knows, in general terms. What I could possibly tell you in a semi-technical manner about one topic or the other is certainly known to the Soviet leadership. I therefore should not be restricted in what I can talk about. I am, because the bureaucrats who still exist have not completely understood or implemented the President's correct and general statement. This is an exceedingly serious matter, and *how* serious it is will become clear while I am talking.

Incidentally, the timing of my talk is not quite right. Our department of energy has a new, vigorous, and, I believe, excellent leader, Don Hodel. I already see signs that that policy of exaggerated secrecy may be reformulated. I hope it will happen; it is necessary that it should happen.

What I *will* talk about is a more general, and no less important question: the balance between offense and defense.

It is generally believed, and firmly believed, that nuclear weapons are not only *offensive* weapons, but that they are weapons that serve no other purpose—and *can* serve no other purpose—than mass destruction. This statement is wrong. And about this statement we ought to get clearer ideas. But again—largely on account of exaggerated secrecy—the question will not be sufficiently clarified this afternoon. . . .

Defense is not impossible

While in the First World War, the defensive won in practically every instance, in the Second World War it was the offensive that had the advantage in practically all phases—culminating in the atomic explosive, which then became the symbol of offensive weapons, promoted into the nonsensical category of absolute weapons, against which defense is impossible.

Defense is *not* impossible. We know—and part of the evidence is even publicly available—that the Soviets have made great strides toward civil defense, an area where we do much too little, to our greatest danger. There are indications that the Soviets are also deeply involved in active defense.

It is not unusual that with the introduction of a new weapon, it is used primarily as an offensive tool. The very knowledge of the weapon, the great variety in which the weapon can be used, makes it difficult to prepare for defense in every possible way. And the more powerful the weapon, the more consistent the situation becomes.

So, behind the idea of nuclear weapons being just offensive weapons, there are good, thoroughly worked out, generally accepted arguments. These arguments have culminated in the MAD doctrine, in the doctrine of Mutually Assured Destruction. There is no help except the possibility to prevent war by deterrent.

And once you begin to think in that direction, you are apt further to exaggerate the consequences of nuclear war, consider it the end of mankind, call it unthinkable, and lose touch with reality.

That Mutually Assured Destruction—the idea that the people of the opposing nations should be mutually held hostage and thereby give assurance that war won't occur—I don't think this is an idea that anybody can be happy about, and nowhere less than that where we talk about a balance of terror. The terror is certain; the balance is not. Because one clear point about the developing, evolving technology—is that it is full of surprises, and the next step can hardly ever be predicted, even by the best people.

Such surprises can all too easily become destabilizing.

Now all of this has been expressed and has gained force under the name of the nuclear freeze movement. If nuclear weapons are only offensive weapons, if they are actually terror heaped upon more terror, what else to do than to stop? The objectives, the work connected or brought about by the nuclear freeze—these really are most simply expressed by saying that we consider nuclear weapons absolute. The Soviets do not. In New York three-quarters of a million people demonstrate for a freeze, but if a handful demonstrate in Moscow, they go straight to the Gulag Archipelago. That under these conditions, the freeze movement is not any better a solution to our problem than is Mutually Assured Destruction seems to be obvious.

Now, as we become more familiar with the detailed technology, not only of nuclear weapons, but with the various delivery systems of nuclear weapons, with the various potentialities in a war, for which we all know one has to prepare in some way—as we understand the details, we begin to see what are the elements against which we ought to be ready to defend ourselves. And once we know these elements, defense may become, again, much more strong than offense. Why?

In the past the aggressor had to walk a lot; his foot grew tired. Today, we have rockets; they don't get tired, but they cost money. The longer the range, the more [they cost]. The defender can stay closer to home, thus has some inherent advantage. He also has some real difficulties, because the initiatives are with the offense, and the defense must be prepared practically for every eventuality. But if you have a complete review of what can happen, and the closer you come to it, and the more you look into the details of it, the more there is a chance that defense by intelligence, by imagination, by foresight, can win. And if we get into the state where defense wins, this I believe is a most desirable state. If we have a defense which cannot be defeated except by much greater effort on the side of the offense, then war will really not be winnable for the side that starts the war. Defense is by far the best deterrent, if it works. . . .

These are not technical points. This seminar should be technical; I want to talk about technical subjects. But overclassification prevents me almost completely from doing so. I therefore have to limit myself to a couple of really poor examples of defense. There are more. There are brilliant examples. Not any that I am proposing, but quite a few that

my younger colleagues in the weapons laboratories, particularly at Livermore, are proposing.

We have all kinds of evidence—I believe conclusive evidence—that the Soviets are thoroughly familiar with these proposals. They learn about them from peculiar sources. I forget the name of this famous publication—*Aviation Week*—which you know is not always right. But when the Soviets write about it, they correct the mistakes of *Aviation Week!* And we learn that the Soviets know. But I cannot correct the mistakes; I am not allowed to tell you.

If there are any representatives of the press here, they might want to take note, that is they might have a campaign to let democracy work. [President] Madison has remarked that democracy without information is a farce, a tragedy, or worse. And I believe that this is even more valid today than it was in the time of Madison. And as I told you, there are even signs that we are at least moving in the right direction.

But now let me talk to you about a couple of relatively weak, obvious, trivial examples, not only of defense but of nuclear defense. One is well known, and not quite correctly discussed, by the name of the neutron. What I need to tell you about the neutron bomb, and what I am allowed to tell you, is that it is a very small nuclear explosion, detonated a few hundred feet over the surface of the Earth. Now nuclear explosion has essentially four effects: shock, heat, long-lasting fallout, and very-short-duration, instantaneous radiation, which comes and goes in not very many seconds. Of these four, three are almost exclusively the important ones in any *big* nuclear explosion, but when you get down to a kiloton or a few kilotons, or even below a kiloton—a few hundred tons equivalent—and detonate above the ground at an appropriate altitude, the villages right underneath are not damaged, people in cellars are not hurt, a person not in the middle of the battle, half a mile away, will not be seriously hurt, and a mile away will not be hurt at all. Fallout, shock, heat, are all unimportant but a short burst of radiation does kill the people right underneath, and the walls of a tank are no protection.

The neutron bomb is an excellent defense against a massive tank attack, against troop confrontation, against mass movements on the surface. They are purely defensive instruments which render great Soviet preparations, and expensive Soviet preparations, useless; hence, the passionate protests emanating from the Soviet Union. And that this protest should have a response on our side is to a great extent due to misinformation, and lack of information, which our own policy of secrecy has fostered. . . .

Ballistic missile defense

A second example, ballistic-missile defense, is not an easy business. We know that together with incoming missiles, with re-entry vessels, there will arrive a great number of decoys, so we won't know what to shoot at, except that a really expensive operation is to lift a rocket and deliver it thousands of miles away. Whatever is heavy is suspicious,

expensive, and therefore not too numerous. What is light burns up in the atmosphere very quickly upon reentering. What hasn't been burned up at once on re-entering we should and can shoot at, and that solves the problem, in an oversimplified fashion—and therefore in the wrong fashion.

To go into further details may take too much time and may begin to violate some secrecy rules as well. But very careful, long-term investigation of ballistic missile defense has shown that it can be done. Not easily, but it can be done—and probably done less expensively than the expense of increasing the attack.

In the MX debate, which of course is of great immediate importance—I like the MX, although in general I do not like retaliatory weapons. I like the MX for two reasons: the MX can be used to launch satellites into orbit. We need the satellites—we need them desperately—to warn us of a Soviet attack. But satellites are vulnerable, and at the beginning of an attack the first thing that may happen would be that our eyes, in our satellites, will be put out. Then we have to redeploy them. MX is an excellent way to do this in a great hurry.

However, MX as a retaliatory weapon—which I like less—does not make much sense unless it is defended by ballistic missile defense; if it is, then it makes some sense. And if you pack all of them together—if you have the densepack—and if you have spent \$30 billion on a small amount of real estate, you should defend that real estate, and therefore MX would be a wonderful opportunity to begin to develop a defensive system which could grow and become much more comprehensive later.

I told you that there are examples of truly remarkable and ingenious defensive systems. These I am not allowed to mention, although I am certain that it has nothing to do with security. I hope that in a few weeks this difficulty will be cleared away; unless it is cleared away, I don't see any way to stop the nuclear freeze movement, and if the nuclear freeze movement succeeds, it will succeed here, not in Moscow. The lack of balance will become complete, and I believe our very existence will have exceedingly poor chances. This is how important the question of exaggerated secrecy happens to be.

I would like to mention one more topic, seemingly unrelated, and this is a topic which at least I can mention and explain. It is called EMP, which stands for electromagnetic pulse. I am not going to explain it, except for saying that connected with some nuclear explosions, very strong electric fields appear—electric fields in a very general way, and only in a general way, similar to the electric fields which accompany and precede lightning strokes.

There are a couple of stories about EMP that I can tell you. We performed a test in the Pacific, a few hundred miles from Hawaii. As a result, the electricity in Honolulu failed. We were all surprised about it, and then we found out that the explanation—that was new to us—had already been pub-

lished in the Soviet open literature. So EMP is one of the topics where we have good evidence that the Soviets are ahead of us. We pretend that there are secrets, but they are only secrets from the American people.

Another story. Do you remember the Soviet plane that was flown by a deserter to Japan? You may have seen news items about how primitive their electronics system is, it still consists of tubes in the electronics age where every reasonable person works with transistors. Later it was found, and less conspicuously published, that that MiG did have transistors—deep inside the plane in a well-protected place. On the outside there were these antiquated tubes. It so happens that the tubes are not sensitive to EMP; the transistors are. So not only were the Soviet planes *not* less developed; they took into account an effect which we are just beginning to realize.

These are some of the questions that make me uneasy, and should make, I believe, all of us uneasy. To publish facts about EMP is extremely important. We begin to realize—and this is public knowledge—that communications command and control, the cooperation of the whole military establishment in case of war, is not only important, it is also vulnerable, and should be defended. And one of the elements in which endangers this command and control are these electromagnetic pulses; and we are beginning to do something about it. That is well known. What is less well known is that very big sectors of our civilian economy are likewise vulnerable, and in some cases more vulnerable, and after all, even in war, our military structure, is supported by our whole civilian economy. . . .

MAD does not provide security

[It is often said that] if we put up more defense, the Soviets will just put up more offense—wrong. We must try to put up such kind of defenses that the offsetting offense will be more expensive. And this is the critical point and I believe it can be done in such a way that the defense will win. Then there will be no more trouble. If we put up more defense, the only way the Soviets can go is that they in turn put up more defense. If both sides become defense-minded, not offense-minded, but really defense-minded, that is the stable situation. Out of that stable situation even peace may come.

I don't believe that peace is just the absence of war. To my mind peace is cooperation and understanding and lots more. But in order to have a chance for cooperation and understanding, one should have a minimum of security. Mutually Assured Destruction does not provide it. Defensive weapons could. There was no time when I did not wish for defensive weapons. They did not come. But now after a lot of labor, there is a real prospect—on which incidentally, only a very small fraction of our scientific community is working—and we should understand this possibility, that scientists and technical people should realize that peace can be stabilized by defense. The public should realize what the ideas are, the common ideas which are surely known

throughout the world but which take a bit of explaining, a bit of intellectual labor. If we understand, if we work, we may yet succeed in preventing the horrible eventuality of a Third World War. Thank you very much.

From the question period following the speech:

Q: Dr. Teller, can the MX densepack system, either by itself or with a ballistic-missile defense system, either defeat incoming Soviet attack or create enough confusion to prevent such an attack?

Teller: If we had a densepack system, it may draw Soviet fire. In fact, the Soviets are not likely to attack unless they are confident that they can prevent a massive counterattack. They could do that by a defensive system on their side . . . they can do it by a strike against one of the portions of our retaliatory force. And the densepack would be a most inviting target. However, it can not be wiped out except by concentrated attack, converging on one point. and since we know the endpoint of the attack, defense becomes a little more easy. I agree that it is a Maginot line mentality, in first approximation. But once we start it, the destruction of incoming missiles should be pushed out at greater distances. There are a considerable number of techniques by which this can be done. And in this sense, densepack is a particularly good place to make a first step toward defensive systems. Incidentally, I hope if we are correct that by the year 2000 of all strategic expenses, 95 percent will go into defense.

The High Frontier proposal

Q: Dr. Teller, within the context of that discussion of ballistic-missile defense, would you suggest whether a space-based system is more practical than ground-based or vice versa?

Teller: There has been a proposal called High Frontier. I participated in all their deliberations. I did not sign it. I agreed with three important statements that they made. Number one, we need defense. Number two, defense means being in space. And number three, it should be done by a conventional method. However, there was a very serious flaw in the proposal. The proposal spelled out that we should pre-deploy our defenses in space. The kind of massive, and not very imaginative, defense that they plan could not be deployed on the spur of the moment. It has to be pre-deployed. Space stations are vulnerable. To maintain even observation stations in space is difficult. To maintain a really massive system in space is impossible. An attacker need not do more than punch a hole in that defense, because the ideas [the High Frontier approach] was to cover the whole sky with satellites so that there should be some available defensive satellites at every place. If even a fraction of these were destroyed by the Soviets in a certain region, they could, so to speak, shoot through that hole and reach us. Pre-deployment in space will not work. This does not mean that space is not important for observation and other purposes. Space is most important. . .

Q: Dr. Teller, I know that you have said that you and your colleagues, your younger colleagues at Lawrence Livermore, are sure that it won't be easy, but that we can develop beam weapons.

Teller: I did not say that. Or, I should not say that. I am not allowed to say that.

Q: Dr. Teller, then you are confident that we can develop defensive weapons of this sort, but yet Dr. Keyworth, the President's Science Adviser, had told Congress, has told the Senate Armed Services Committee in mid-December, that we cannot even make such decisions until the 1990s. How do you explain the differences between Dr. Keyworth's statement and what you are saying here?

Teller: Jay Keyworth is a very ingenious man. He also has to be very cautious. He also is very busy. I have the opportunity to concentrate on nuclear weapons, including defensive nuclear weapons, more than Jay. Also you can be cautious in many ways, and you have to be cautious in a different way depending on where you sit. In the position of the President's Science Adviser it may be very important not to say that something can be done unless you are quite sure that it can be done.

On the other hand, if you don't say that it can be done, or at least a good chance that it can be done, then you are going to lose the political battle with the freeze movement and then you can do nothing. . . .

'I am an optimist'

What we are beginning to do can be employed in a radical way or in a rather elementary and simple way. When employed in a radical way, they will solve the problem. Whether that can be done I don't know. [It's] fifty-fifty. The simple application, the less ambitious program, I believe can be carried out with 90 percent probability. And there are several of these. And that some of them indeed will work is a practical certainty. Now let me add to all of this a true statement and an immodest statement. The true statement is that I am an optimist. And the immodest statement is that I haven't been always wrong.

Q: Dr. Teller, as you spoke of these near certainties and 90 percent probabilities and so forth, were you speaking of defensive systems generically, or defensive nuclear systems?

Teller: I am talking about defensive systems in general. My overall evaluation is that there are three systems in very general terms about which I feel in a strongly positive way. One is nuclear, about which I am most familiar. Second, the very big class of lasers which can use very strong electromagnetic beams of which there are all kinds. And some of them without any doubt are exceedingly useful. And the third, which Kupperman mentioned, are essentially robotic systems. . . .