Interview: Dr. Robert Jastrow

'No excuse for the incompetence of anti-beam-weapon scientists'

Dr. Robert Jastrow founded the theoretical division of NASA at NASA's Goddard Space Flight Center in 1958. He has been director of the Goddard Institute of Space Studies since 1961. He is now Adjunct Professor of Earth Sciences at Dartmouth College in New Hampshire. Trained as a nuclear physicist, Dr. Jastrow is more known for his work on astronomy. He is the author of Red Giants, White Dwarfs *and several other works. He was interviewed for* EIR *by Robert Gallagher.*

Gallagher: Dr. Jastrow, on March 23, 1983, President Reagan announced a new strategic doctrine based on the development of new technology to render nuclear missiles "impotent and obsolete." This proposal has taken shape in the Strategic Defense Initiative [SDI] program. What are your views on the feasibility of a defense based on lasers and other directed energy technology, and how early could we deploy such a defense?

Jastrow: The estimate is that it would take some years of research to decide which is the best way to go, but no fundamental scientific or technical obstacles stand in the way of a defense against a Soviet nuclear attack on the United States, according to the qualified people who worked with Dr. Fletcher on a study of that question.

You asked about how long it would take: Five years is the time allotted by the administration to research on this matter. Around 1989, the experts feel that it should be possible to choose the best technologies and build a system around them that could be deployed for the defense of Americans in the 1990s.

Gallagher: Last year, Dr. Teller made a statement that a partial ABM defense based on the x-ray laser could be constructed and deployed within five years.

Jastrow: I think that that's generally considered to be about the right estimate. And it would of course require renegotiation of the ABM treaty, but that's a bridge we don't have to cross for a number of years.

Gallagher: Why do you think so many well-known members of the scientific community are opposed to this program? I'm thinking of people like Hans Bethe and Richard Garwin.

Jastrow: That's a question for a psychologist rather than a scientist. I don't understand why nominally competent physicists like Bethe, should lend their names to statements by this group of scientists [the Union of Concerned Scientists] about the technical feasibility of a defense against Soviet missiles—statements which turn out on close examination to be full of errors and seriously misleading.

Gallagher: I remember that in April of 1983, Garwin circulated a petition for a ban on weapons in space that was signed by 30 or 40 scientists, some of whom are serious people as far as I can tell. Many astronomers were involved, for example. I have frequently been asked why scientists get trapped into this kind of thing.

Jastrow: There is a striking similarity in the language of the Soviet draft treaty submitted to the U.N. on the ban of so-

called weapons in space, and the draft treaty or petition that was drawn up by this group of scientists. I think that the reason for all this well-intentioned activity is an implicit assumption that the United States is the greater menace to world peace, and that it's our efforts that spur the arms race. It's a feeling that I think is completely at variance with the facts.

Gallagher: What do you think the major problem is in U.S.-Soviet relations today?
Jastrow: I think that the Soviet Union depends on its nuclear missile arsenal in a fundamental way as a main prop for its superpower status, and so it is most unlikely to give up any element of that arsenal except under heavy pressure. It's a country with an economy that is strikingly unproductive, a people with a lower life expectancy than any country in the Western world including Japan, to my knowledge—I believe it's 63 years for Russian males—and a country with a high infant mortality rate. And there is a lot of alcoholism. It all suggests that it is a miserable place to live, and it's been commented that the Soviet Union would not even be respected as a superpower if it weren't for this fearsome arsenal of weapons. So, that's obviously a plus for the Soviet leaders, the only thing they've got behind them, and a stimulus to the further expansion of their nuclear destructiveness.

Gallagher: Among the litany that has come out against beam weapons is the argument that as soon as they are deployed, or about to be deployed, that this in itself will provoke the Soviet Union to start a war. Now of course this is coming directly out of Moscow, so it's not very credible.
Jastrow: Well, it also comes from Carl Sagan, you know, because he said that to me on the Brinkley hour; we discussed this matter in public. And I think the answer to it is that the technical problems involved in building an operating system for missile defense are substantial, and the pace of movement towards deployment is almost glacially slow, because it involves almost five years of research before we decide which way to go.

Because of this, there's no reason for the Soviet Union to feel threatened suddenly. And as we move in that direction, thanks to the President's initiative, the Soviet Union is and will be moving as fast as it can in the limits of its own technology, so that as we are ready to deploy they will be also, which will result in the joint uselessness of these weapons as the endpoint the President desired and hoped for.

Gallagher: I've spoken to a lot of scientists and engineers, who actually believe that there's a big question as to whether or not this is possible. What do you think about that?
Jastrow: I think that the people involved are mostly nuclear or ex-nuclear physicists whose world experience has been shaped by the nuclear bomb that their profession helped to create, and it has dominated their thinking, and a certain amount of lack of imagination or inflexibility has prevented them from embracing the full implications in the event newer technologies of the computer that led to the smart warhead and the even more accurate antiballistic missile that can shoot down an enemy missile without using nuclear weapons itself. That development makes President Reagan's proposal feasible, and its import is not fully grasped by the technicians themselves who are offering this criticism.

Gallagher: Well, to give an example of the kind of sophism that is used, when I debated Richard Garwin on Cable Network News, he objected that it was impossible to pop an x-ray laser up into space upon warning of an attack in time to intercept ballistic missiles in their boost phase because the curvature of the earth makes the pop-up distance too great for a rocket to carry the x-ray laser there before the boost phase ends.
Jastrow: I think that's a fatuous remark on Garwin's part, because at this juncture in 1984, no one has any idea whether the pop-up x-ray laser is the best way to go or lasers deployed in space are better, or whether chemical lasers are better than x-ray lasers in the 1990s, and so on. None of those matters are worked out. That's what five years and $26 billion have been allotted for, to settle those questions.

Gallagher: What's your evaluation of the UCS report?
Jastrow: It makes the most serious errors on the fundamental issues—in alleging, for example, that calculations show a fleet of thousands of laser-equipped satellites is necessary to provide a defensive screen against Soviet missiles. Whereas defense scientists who have been studying this question, this very question, for more than 10 years, have found, always, at the end of their calculations, that the correct number is less than 100: No more than 100 are needed. And just the significance of that difference, between thousands of satellites and less than 100, is the difference between a practical program and an impractical one; since each satellite will cost about as much as a Trident submarine, and if thousands were needed, the total cost would be many trillions of dollars, but if only 100 are needed, then one can develop and deploy the system at a cost averaged out, spread out, which is well within the present level of expenditure today for strategic defense.

Gallagher: You're talking about the chemical laser system that Max Hunter of Lockheed has worked on?
Jastrow: Yes, the basic technology that is the closest to realization, the least exotic of the exotic technologies. The chemical laser fueled and fired in orbit, and directed from orbit at a hypothetical simultaneous launch of the whole Soviet arsenal, 1,400 Soviet missile silos. I myself looked into that matter [of how many satellites are required] with a globe and some pieces of string and then some more elaborate calculations later, to convince myself by rough estimates that the result of less than 100 is correct, and I arrived at a number between 50 and 100, and there's no question but that that's

the right answer. And there's no excuse whatsoever for a group of nominally competent scientists [the UCS] to make such large errors, an error in this case by a factor of 20.

Gallagher: At the meeting of the American Association for the Advancement of Science earlier in June, you and Garwin had an argument about the weight of shielding required to protect a missile from lasers. In other words, what impact would the shielding required have on the ability of the missile to get off the ground or get off the ground with the desired payload.

Jastrow: Garwin stated at that meeting that 660 pounds of material would be adequate to protect a Soviet missile against our lasers, and the correct number is 4.8 tons. When I announced this figure, he said that I had made an error in forgetting that when the first stage of the rocket burns out you throw it away together with everything on it. But that's not true, because when the first stage burns out, the velocity that the missile has achieved at that point is determined by the mass of the empty shell and everything that sits on top of it; that controls what is called the mass ratio and the burnout velocity. And to maintain that burnout velocity and maintain the range of the missile, which are an absolute essential, you must keep the mass ratio and the final mass of the empty shell constant. So if you smear some weight on the outside of the casing of the skin of the first stage, then you must subtract that weight from what sits on top of the first stage, which includes the payload of warheads. I was so shocked at Garwin's error that I burst out in public and said, "Dick, you've made a terrible error," and that is in fact the case that he did.

Gallagher: So he said that it would only result in a 660-pound decrease in the payload, and you—

Jastrow: Yes, and the right answer was 4.8 tons for the layer of material about half an inch in thickness, which is what is needed. And that's interesting because 4.8 tons is 60% of the 8-ton payload of the SS-18, which means that if the Russians actually implemented Dr. Garwin's suggestion, they would be losing 60% of the destructiveness of the most fearful weapon in their whole arsenal, the monster SS-18. And I would say that's a pretty good return from American science for the President's appeal to make these dreadful missiles impotent and obsolete.

Gallagher: Do you have any other comments on specific points of the UCS report?

Jastrow: Yes, one other, that's a criticism of that report that also applies to the Office of Technology Assessment report authored by Ashton Carter. Both reports stress the fact that the x-ray laser, which is one of the most promising technologies at this stage, can be defeated by a rocket which burns out very quickly in the lower atmosphere where the density of the air is thick enough to block the laser x-rays from penetrating. And it works out that the rocket must burn out below about 40 or 45 miles, which means it must burn out within 50 seconds to do that. But at the present, the time that the Soviet arsenal takes before burnout at the present time—that means all the SS-17s, -18s and -19s, all 820 of them, with their terrifying complement of 5,000 destructive, accurate warheads—their burnout time is no less than 300 seconds. So every one of the missiles that's now out in their silos, in the Russian missile fields, is entirely vulnerable to an x-ray laser. And if you ask whether the Russians might develop a newer and faster-burning missile in time to counter our defense, I will remind you that the next generation of missiles, which the Soviets don't even possess yet, is represented by the MX, and *its* burn time is 180 seconds. So the MX generation of missiles is still terribly vulnerable to an x-ray laser defense. And a kind of missile that would burn out in 50 seconds will not be available in *this* country, according to informed estimates, until the end of the century, and the Soviet Union is thought to be a generation behind us in this kind of development, and it will not have such a missile until the first years of the 21st century at the earliest. So the whole present generation of Soviet missiles, and the generation after that, are vulnerable to an x-ray laser defense. And I will say again, that's a pretty good response by American scientists to the President's call for making these missiles impotent and obsolete.

Gallagher: Let me mention to you that their calculation on the pop-up distance is wrong.

Jastrow: I wouldn't be surprised. You know, Bob, I picked three examples from my analysis that were especially easy to understand and to check, reliably, but that paper is just rife with technical errors.

Gallagher: Do you have any specific comments on the questions that were raised in the Office of Technology Assessment (OTA) report?

Jastrow: The OTA report, or the report *to* the OTA by Dr. Carter, does not have as misleading or exaggerated a set of claims as the UCS report but the exaggerations are still quite substantial, because for example, that report says that as many as 500 satellites would be needed in a defensive screen to counter the Soviets; and the right answer, again, is less than 100. And on the x-ray laser, it doesn't make the mistake that these fellows make in regard to the ablative covering and such matters—it's less fatuous in these respects—but it makes the same mistake in its unwarranted optimism about the ability of the Soviet Union to deploy a fast-burn booster and defeat our x-ray laser defense.

Gallagher: Ashton Carter asserts in the report to the OTA that one gram of ablative material per centimeter squared of missile surface is all that is required to shield a booster from a laser. You calculated 4.8 tons total ablative material required. How much is that per centimeter squared?

Jastrow: The ablative covering has to be at least 2 grams per square centimeter thick, to protect against the presently planned U.S. [chemical] lasers.

Gallagher: One countermeasure against lasers that's been proposed is to spin the missile during the boost phase so that the beam must dwell on the target longer to kill it.

Jastrow: That's another fatuous suggestion. At most it gains a factor of π, which is roughly three; and at this stage the definition of the brightness of our lasers is up in the air and factors of three are a very modest increase; that would not be an effective defense at all. But even if the Russians were foolish enough to go to the trouble of trying to spin their missiles, which would require a complete retro-fit, by the way—it would be a rather elaborate job for them to rebuild their silos to do that—if they did, we would simply concentrate our laser energy in a pulse that caught the spinning rocket at one point of its spin, so to speak.

I'll tell you what another one of these fellows mentioned in their report: to shine up the rocket so that it would reflect the laser beam. But you know the reflection would have to be really perfect; if even a fraction of 1% of the laser energy got in, it would destroy the perfection of the shine, degrade the surface, and even if it did so just a little bit it would let more of the energy get in and that would degrade the surface even more and you would end up with a positive feedback that would quickly eliminate the shine and the rocket altogether.

Gallagher: E. Velikhov at the Kurchatov Institute in Moscow has been directing work there that has been oriented toward nuclear pumping various types of systems for applications from energy production to lasers and particle beam devices. *Aviation Week and Space Technology* magazine has independently reported recently that there is a full-blown Soviet program to develop a nuclear pumped x-ray laser. The program is run by Velikhov's people at Kurchatov and at the Lebedev Physics Institute, also in Moscow, and that they are testing a device at Semipalatinsk—with Lebedev providing the guidance on lasing and Kurchatov on nuclear pumping. Yet this is just part of the story. I know from Rand reports issued over the past 10 years that there has been an intense effort in the Soviet Union for at least that long to develop an x-ray laser pumped by electron beams. At the same time as he is doing this, Velikhov is running around the U.S. lying to Americans about what he's doing and about what other Soviet scientists are doing and saying that a beam defense is not feasible and would be dangerous if ever achieved.

Jastrow: In the Soviet defense structure, there's something, a branch with a name like Ministry of Strategic Deception, headed at one time by the famous Ogarkov, that has mounted this procedure for firing missiles at night in missile tests so that our satellites cannot photograph the tests. And it's interesting that Ogarkov was also the Soviet military representative at the SALT talks. And so I'm not surprised to hear you say that what they tell us is completely contrary to what they're doing. One of the major weapons in their arsenal is deception, according to their own command structure.

The only surprise is that anybody in this country believes these fellows.

NSIPS/Stuart Lewis

At a meeting of the American Association for the Advancement of Science in May, Dr. Robert Jastrow (right) demolished the arguments of the opponents of beam-weapon defense. Also shown here are (left to right) Mathew Meselsen, McGeorge Bundy, and Richard Garwin.