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00: 20: 05: 18

WEISSKOPF Well, I wasmy scientific career started actually in the twenties. So I certainly found a change in the position of the scientist between, the pre-second world war period and the present period.

00: 20: 24: 09 I'm a rather old person, so I lived in science, I was a active scientist from the end of the twenties to today. And so I experience the fate of science between the world war and after the world war. And definitely I found there was a big change of the position of science after the second world war. This has, I think has a main the fact that scientist have contributed important things to the war effort in America and in other countries, in England and so on. And this is the example that everybody knows the nuclear bomb and radar. Both were extremely important. Radar saved England from the invasion by Germany. And the nuclear bomb ended the war.

00: 21: 36: 05 So after the war the scientists were heros, people thought they can do everything. It was very easy to get positions, it was very easy to get money for research. In particular, the armed forces were very much interested.

Since after all, these two things were done for the armed forces. And at that time the.. for example, among other agencies the office of naval research supported a lot of pure physics, and not necessarily, science that can be applied for weapons. No, pure science, very abstract science, because they thought that just those scientists that worked on very esoteric and abstract subjects. Had been very useful in the construction of the nuclear bomb and the construction of radar.

00: 22: 34: 21 This that I'm talking about, the first ten years or so after the war, the first decade. Later on, the armed forces were more restricted and they supported more and more, only projects that have some promise of being important for, for arms, war purposes... That means our reputation in the public was very high. And but things have slightly changed during the..this is now 45 years, and maybe after sort of 20 years perhaps, maybe a little earlier things have changed. People became more suspicious of science, because in my mind, not because of the right reasons. But they did. One reason is after the war there there was this great promise of a of nuclear power is going to be cheap, and change completely our whole, not only industry, but social life. That turned out it had been an illusion. Nuclear power not only wasn't so cheap, but also presented certain dangers, that people were not, even scientist were not aware at the beginning. Possible accidents that have great consequences. Like we unfortunately know from experience now in Chernobyl and Three Mile Island. And also that there are problems connected with environment, with connected with nuclear energy, such as the waste disposal of radioactive substances, etc.. But it's not only that.

00: 24: 35: 17 Also in the second half of this period between the WW2 and today, people became aware, and I think correctly aware, of certain negative effects of the industrialization.

Industry grew enormously here at that time, at least in the developing in the developed countries in the west, and Japan. Due to great increase in living standard, I think an increase in living standard which is unique in the history of mankind. And therefore industry increased, and energy production increased, and everything increased. Then it turned out that this tremendous increase of industry had negative effects. Now that was known and even written about before, but people hadn't paid much attention to it except in the last one or two decades. Now what was it? Well the burning of fossil material, like oil and coal, produces a lot of carbon dioxide. And carbon dioxide may have very negative effects on the temperature of the earth, the so called greenhouse.

Please I say may have, but I come back to it, because we are not sure of it, it may not have, but it may have. And then the danger of influencing the ozone layer on top of the

atmosphere, which protects us from dangerous ultra violet light from the sun. And it turned out, indeed the ozone layer is suffering, there is a big hole in the Antarctic, and this is due to the production of certain substances. Mainly of the so called hydro carbon, the I'm sorry, flouro carbons, which are used in many applications. And so these are two examples, but there are others. The acid rain that the atmosphere is full of stuff produced by bad industrial activities, and this has negative effects.

00: 26: 57: 03 For example, the rain, the water that comes down with the rain is acid. This influences vegetation, the forest ...the climate, you know especially in Germany and in Switzerland and I think in Italy also, that a good part of the forest, mainly on the higher altitudes are sick. Now this has been ascribed but correctly to the expansion of industry. Now the people make a connection between industry and science, well, certainly, most of these industries are in a way science based. Because they are using results of science to produce whatever they produce. And so they accuse them science that that's the cause of the deterioration of the environment. Now this is ..this is why there was some decline of the reputation of science in the second half of that period since the world war.

--- Victor Weisskopf

00: 28: 12: 17 Antonello: In the WWII, the social standards of scientists changed.

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00: 00: 41: 01 Beginning of someone else.....

Well if I look at my own experience, you see before the war, I had a position as assistant at the university of Rochester. It was not a very high position, the salary wasn't very good. After the war I could choose, you know I got offers from many universities, from MIT, and to come and become a professor. And later on, a few years later I got an offer from the university in Zurich, and a few years later from Oxford. So you see, I mean from my personal point of view, I was suddenly considered as a desirable person, which many universities and laboratories were trying to appoint.

And evidently that means also that the salary was a lot higher than before.

--- Victor Weisskopf

00: 01: 44: 21 Antonello: What's the relationship between science and technology?

Now the the relationship between science and technology, is a complicated subject. First of all, fundamentally speaking, and that is in a very general way. I would say science and technology have a very different aim. Science, when I say science, I mean pure science, not applied science. Applied science is almost the same as technology, but the pure science, basic science is ..trys to understand nature. What's going on around it, find the laws of nature to find a phenomenon that are decisive, to get the structure of matter, atoms, nuclei, quartz and so on. Or the astronomy for example was studies, the development of the universe, on the beginning to a possible end. So it's if, I would almost say that it's essentially a philosophic attitude. Actually in the days of Newton, it was called natural philosophy. Technology, in some ways is something completely different.

Technology wants to construct things, artifacts. For what purpose, well, increasing the comfort of life, the quality of life, and I'm afraid also for not so good purposes. Then they.. to improve weapons and to win a war. To build machines, that help us, to prevent us from having too much strenuous manual labor, and to do things we cannot do or to talk by telephone or by radio, or by anything.

Communication, any kinds of communication. Now in order to do this, you have to, in most cases, I say most cases, you need scientific discoveries. How can you develop communication without knowing something about electro magnetic waves, which are used in radio and so on. So you have to know how nature behaves, therefore, most of science, most of technology is based on scientific progress. I say most because there are definite, sometimes goes the other way. For example, in the end of the 18th century when the steam engine was discovered. Now the steam engine was discovered by Watt and other people, not at all on scientific principle. They just tried it out and it worked.

And it (? ? ? ?) the other way, when the steam engine was developed, scientists became interested in well what's really the basis of all of that. And the development of the theory of heat, thermodynamics, was actually engendered it was after the steam engine. So here technology has pushed science. But that is no longer so, at least in most cases no longer so. And now science is helping, is used by technology, and that is what is called applied science.

Now this is not only in physics, I would call medicine, medicine is applied biology. And all the great discoveries of the biology and the DNA, and the biochemistry of the cell. All this is now used in medicine to find cures for many diseases.

00: 05: 46: 12 So in the main difference is the purpose. Of course in many cases the methods are not so terribly different, because in order to apply some scientific discovery you have to do similar experiments that were made when you discovered, then you made the discovery for the sake of discovering. And now the technologist or the applied scientist does it for the sake of constructing something. So his inventiveness is what can I do with it.

How can I build something that is useful for mankind.

Useful...or even useful for war, you see, now that is the great trouble. So in some ways, what we find, what the public finds, correctly, as dangerous in the development of, it's very often say in science is usually a consequence of technology. But the technology of course, was a consequence of science. Without science, technology could not have developed.

--- Victor Weisskopf

00: 06: 54: 10 Antonello: Do you believe that now days the scientist is becoming a sort of engineer?

No, I would say it this way, I would say, there are needed more engineers, because the problems become so wide. But if you look at the scientific establishment, again I repeat, I now mean the fundamental science, basic science, pure science. There are these people, are not necessarily engineers, although, there is a point in what you say. Take an example in Lucerne. The laboratory in Geneva, whose purpose is completely, I call it philosophical, they want to know the deepest structure of matter. Now those people in order to get at it, they need very high energy, they need these big accelerators. In order to build those accelerators, you have to be a little of an engineer, not only a little, you have to be a quite good engineer. And so in this sense you may be right, that the modern scientist have to be more interested in engineering then the scientist before. But I think his basic attitude is different.

--- Victor Weisskopf

00: 08: 29: 07 Antonello: Let me ask you something about Los Alamos. People have the idea that the atomic bomb was built by a small group of scientists. They were sitting together and then they developed the bomb. It was so? ? Well it depends what you mean by developing and making the bomb. You see, constructing the bomb. In some ways it's true what you say and some ways it's not. It is true in so far as the fundamental idea, first of all, how do you get a nuclear explosion? That is certainly the scientist have found this.

And why does ...where does fission or fusion come from? These are nuclear phenomenon, nuclear physics, and that's pure physics. Then even when you go a little further in Los Alamos we physicists had to be a good deal of engineers. In other words we had to think about how can we make this explosion effective? How can we build it so that it explodes at all the ..plutonium for example, explodes at the same time, so that it isn't lost, the energy isn't lost. So these are applied science questions, in other words engineering questions. And indeed, there were a great deal of engineers in Los Alamos.

But now I say we did not construct the bomb. All that we did was say this is the way the construction must be done. And then came all the factories and the industries that did what we proposed, and that needed a lot of development you know. I mean our proposals were not just up go and do it, you know you have to develop a method, you have to develop industrial processes and so on. So at the end, the bomb was a product not only of scientists, but of engineers and industries.

--- Victor Weisskopf

00: 10: 34: 21 Antonello: After the Trinity test...When did you start thinking that it could be dangerous? At least if I speak for myself and my friends, I would say we knew this from the beginning, that this is a dangerous thing. And did some of us including myself, question ourself, shall I accept the offer to collaborate in such a murderous murderous activity. And I did think about this, and I answered myself, first of all the great danger that Hitler would make it before us. And I myself am from Austria, that means I, my family had seen Hitler from close distance and we knew how terrible it would be if Hitler would dominate the

world. And if he had the bomb he would and if the west did not have the bomb, so that was the first and main reason. The bomb is a terrible thing, but in view of Hitler, the west must have it first. The second reason was, well I lived in, it was at that time only five to six years in this country, this was my guest country, I was received with great, very well. I had a certain feeling of debt to this country, and if they asked me to help them in their war effort, I couldn't say no. But I knew and so did my friends, that this is not an easy problem, that it's going to be a very difficult problem after the war. And well, during the war we didn't have much time to think about these things, it was hard enough to find enough time to develop the bomb. And we were in a hurry, because we were afraid that Hitler would get it before. But later on, when Hitler was defeated, then the war was over, of course then these problems came like a wave towards us, you know, and filled all our thinking.

00: 13: 41: 10 After the war, we were all very much aware of the problem, on the contrary, we felt (???) about it. You see, because we thought if the ...especially under the influence of Niel Boer, who was my teacher before the war and a kind of intellectual father. And he came over to America at the end of the war, and he was very much more aware of the dangers, he was always much more aware of everything than other people. And he very definitely said, the only way of avoiding final catastrophe, is to go together with the other side, with the Soviet Union. And the only way to avoid a catastrophe is to have a common international, not only the Soviet Union also the European countries, an international administration of nuclear concerns, bomb, energy, etc.. And he said, ... now he tried to convince statesmen he was not really lucky, many people especially here in the states thought that we had a monopoly, and the Russian will take twenty years or more if they were not able to make a bomb. We scientist tried to tell them, that's not so. The Russians are very good scientists, and the only secret is that it's possible to make a bomb and that we have given to them, because we showed them. And so they will have, ..actually we predicted, they will have it in three to five years, they had it in four years. Now in

--- Victor Weisskopf 00: 15: 31: 14

Antonello: After Trinity test, before Hiroshima, did you have any discussion in Los

Alamos?

We had discussions in Los Alamos since the beginning of '45, the Trinity test was in summer of '45 So indeed we did discuss but, there were small circles of people, and after Trinity test of course much more. Between Trinity test and Hiroshima, there isn't much, there are only three weeks and part of them I spend in vacation because we all were completely exhausted.

00: 16: 34: 03 Well we started discussing, the so to speak, the political consequences for the world of the bomb. Already at the beginning of 1945, but not very much in small circles, we're very busy, we hadn't much time. And then only after Hiroshima we really discussed much more, and in particular under the influence of Nils Boer, who thought about it much more thoroughly than we did. And we had a number of discussions and we gave talks to the public, they founded the federation of atomic scientists, which is now federation of American scientists. Which is, devoted to these problems, they founded the bulletin of atomic scientists which is a magazine that still appears that deals with problems of this kind. In other words, then we really actively were interested in it, and we tried to push very hard for an internationalization. But there were terrible resistance against it, though in this country people said, the Russians won't have before twenty years, why should we we the west give up it's secrets, it's strongest weapon? Now that was of course a silly argument, because it's clear that the Russians will have it very soon, these scientists knew that. And of course on the other side, Stalin was suddenly not the right man to have international agreements with, he didn't want it. He knew that he will have the bomb himself pretty soon. And then happened what Nils Boer has actually predicted in an open letter published in 1950, where he said, that if we don't have any international organization, there will be an arms race. And which would present one of the greatest dangers for mankind. And indeed that happened. The world war bombs were built and better bombs, H-bombs, and improved types of bombs between then and now. Today we have 50, 000 nuclear war heads in....ready together on both sides, which is absolute madness, because only a few hundred would be enough to destroy the whole world. So to my mind, and the mind of many people this is what I call a collective mental disease, that has gripped mankind. Why build these 50, 000 warheads? It, it it makes no sense.

Fortunately of course in the last five years, mainly because of Gorbachev, the situation is somewhat changed. We go a little back to the old idea, let's work together on this, and have an effective arms control. This is in the interest of the Soviet Union and US, and all the tremendous events that happened in the last years, especially in the last year, promise that maybe we will find a solution. And we will reduce this idiotic number of 50,000 warheads.

--- Victor Weisskopf

00: 20: 12: 18 Antonello: Did the issue of the social responsibility of the scientists come up?

Oh yes, right from the beginning, I mean that it was quite clear that even before Los Alamos, with such things, the scientists have a social responsibility. In other words they will be, of course not during the war, but because we're not suppose to talk about it, but then after the war we will have to inform the public and the governments and congress, and all the influential people. Not only in America, but also in Europe, and all over, about the dangers of the nuclear bomb. Now at that time you see the other dangers.

The environment problems have not yet been, did not yet come up, they could have also been predicted but they weren't.

--- Victor Weisskopf

00: 21: 11: 04 Antonello: You said before that the bomb ended the war. What did you mean by that, because the war was already finished. The war was finished in Europe. And there were still Japan.

Now I personally cannot tell whether Japan would have given up also without the nuclear bomb. This a perfectly... it's possible. There were very...we saw their weakness, it was a hopeless situation, but their government, just like the Nazi government was a terrible government, and terrorist government and would probably, would maybe have continued to fight until the last Japanese. And that would have cost a lot of lives, not only Japanese, but also other American and European lives. So in this sense, you can say that the nuclear bomb has given a good excuse for the Japanese to give in already in August 1945, and in this sense I would say the bomb has ended the war. --- Victor Weisskopf

00: 22: 34: 22 Antonello: Was the war won by the bomb or by mass production? And the war effort of this country?

You're absolutely right in saying that the bomb concluded the war, that's perhaps much better. The bomb didn't win the war it concluded the war. And of course you're right by saying that the industrial power of America and of Western Europe, fundamentally won the war. That is true. And I mean the Japanese couldn't come up against it, neither could the Germans.

--- Victor Weisskopf

00: 23: 33: 01 Antonello: Can you say something about the problems of technology and the environment?

Well as I said before, roughly twenty years ago, about, two decades ago. People began to be aware of the fact, that this steady increase of industrialization that has taken place, has negative effects. Let's be sure that it has a lot of positive effects. And um in Europe it is visible, what has happened...see, Europe was essentially destroyed by the second world war. It was really a miracle to everybody to see how fast Europe again could be rebuilt and could resume its leading position industrially, culturally and otherwise.

I know that the Marshal Plan played an important role, but certainly that Marshal Plan is not the whole explanation, it just shows a resilience of Europe and tremendous power of European culture and European life. And I say this with great conviction, because I still feel to be half a European. And.....now this at .. had a lot of very good effects. Not only the living standard was increased but let's not forget as I've said before, medicine is the technology of biology. The medical development was enormous and we lived twice as long as we did before. We have almost eradicated any kind of epidemics, at least in the developed countries. We have made life more interesting, communication more easy, travel much more easy infinitely easy, easier than before. Not only for the rich but for many people. So in some ways the whole technological development has very large part of beneficial effects which are usually forgotten nowadays. But they should not be forgotten.

00: 26: 00: 02 But on the other side, it has it's negative effects, pollution. The atmospheric pollution, the destruction of ozone, the destruction of the forests, and I will even go a little further that what I call spiritual pollution. I mean for example, the building of 50, 000

warheads is a kind of craziness that comes from the industrial development. But even more I mean there is a certain attitude in many of the developed countries of what is our aim in life, we are only after pleasure, after quick pleasure. And that has brought about in developed culture the danger of AIDS etc.. These are what I call spiritual pollutions, pollution of the mind. And there we have to be very careful.

--- Victor Weisskopf

00: 26: 56: 06 Antonello: Talking about the pollution of the mind...militarization of the university ...do you think this is a kind of intellectual pollution?

Well yes, but one has to be a little careful and not exaggerate it too much. That really depends of what country you speak. It has a good justification, and I will say more about it in the US. In Europe I see much less, in Europe I do not..well..there is..money spent in Europe for armaments and for the armed forces is very very small, it's less than a tenth of America, and therefore, there is less military pollution. And this is probably the reason why the living standard now in Europe is higher than here, and that's good.

00: 28: 01: 01 In this country I'm afraid, your remarks are much more justified. I would say to universities, it is not as bad as one may think of what the way you expressed it. The military have a certain influence on what's going on in the universities. But it is not overwhelming. Most of the support of university research does not come from the military, but it comes from the department of energy for example, it comes from the national science foundation, and from private sources. So that I would say, true enough there is a certain amount of military pollution in universities, but I am not yet really extremely worried about it. The industry, that's something else. Now in industry I think I can not guarantee the figure, but certainly something like 50 percent of our industrial activities are at least in the development not in the actual production, not the actual production no. It's military, well anyone can easily see it, I mean, the military budget is 300 300 billions, and the GNP is 3 trillion, so it's about 10 percent. But as far as the intellectual activities, it's much more than 10 percent. For example, the number of physicist working in military laboratories is almost half of the physicists. So enormous intellectual capital is used to improve weapons, which of course is

part of the reason why the US has lost their competitive edge, commercially speaking towards Europe and Japan. And Europe as I said this thing is much better, in Europe ... the ancient years and scientists are one of the very few who are working in the military establishment.

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00: 00: 36: 07 I have seen what I call intellectual pollution, military pollution among the students. Of course, I mean the students are thinking of their future, and what kind of jobs they'll get, and if they go to military laboratories, the salaries are very much higher, and this attracts a lot of people. And also the problems and the problems are interesting from the purely technical side. And it may be more interesting than improving an automobile, you know. But of course there are students, there are many students who can see the damage done. And who would say, I will never in spite of the higher salary, I will not go to a military establishment. But there would part of students who would. So that's one thing.

00: 01: 36: 23 Now there comes the question, we hope in the immediate future there will be... arms control, and disarmament, not complete disarmament I'm sure. That figure of 50.00 warheads I hope will be reduced by a large factor, not only half, because half wouldn't be enough. But but more. Now then, and this is not only nuclear bombs, I mean.. this tremendous kind of military buildup that both the US and Soviet Russia, and European Nations, have built up against the so called danger of East West conflict. It's slowly disappearing. East west conflict now is one of the least probable events for the future. And therefore people ask now can we reduce armaments. Is it possible to change the character of industry. Now I think it would be difficult, but sure it is possible, I mean after all during the war, all the countries that were in the war, not only the US, have changed their industry the other way, and that was done within a very short time even. Now surely there was a tremendous pressure, but it changed in the other direction, I'm sure it's possible but difficult, and will take time. And there'll also have political differences, people will say how do you know there won't be an east west conflict, and shouldn't we keep up our armaments. That would be a very bad thing. It depends all on the developments, the political developments

in the Soviet Union and then Eastern Europe, which nobody can predict.

Nobody in his right mind has ever predicted what happened this year in '89, last year in '89.

Now I wouldn't dare to predict what happens in '90, 1990 is probably going to be the most interesting year in the history of modern world.

That may go good, it may go bad. But imagine it goes well.

00: 04: 08: 19 Then I do think that this transfer of industry to peaceful purposes will be a necessity. Sure it can be done, after all, a factory that provides bombsites and other high technology products can produce tv sets and can produce microwave ovens, which are all bought from Japan in this country and also Europe. No Europe has it's own production. So I do not see the impossibility but it all depends on the political development.

--- Victor Weisskopf

00: 04: 54: 08 Antonello: the fear of peace...people will be out of business..

But the fear of peace doesn't, I hope, the fear of peace wouldn't prevent peace from coming. It will make a few people less rich, which I think from my point of view, that's only desirable, and it may be hard on the workers because there will be probably unemployment, a period of unemployment. And that is not so easy, that's not so good.

But I mean if peace breaks out, it breaks out. But you see there is of course a connection there, therefore your remark about fear of the fear of peace is justified, because the fear of peace of course has a political influence. Those people who had been in power in industry and congress, they see that danger and therefore, whether they want it or not, they may slow down the development towards peace. Even unconsciously.

--- Victor Weisskopf

00: 06: 18: 23 Antonello: Was the scientific community in Los Alamos homogeneous around the issue of social responsibility?

No, I mean...no group is homogeneous. And especially when you look at the scientist, not only in Los Alamos, but also anywhere. I would almost say anytime, you have groups that are very interested in the social questions, and you have groups that are not interested in the

social questions. And usually the majority is not interested, not that they are against. Let's take two examples, Edward Teller in Los Alamos on the one hand....and let us say, I don't know Phillip Morrison or somebody else on the other side in respect to peace and so on. Okay, you have differences, and the differences were also in Los Alamos, but the majority is just doing their job and is interested in the scientific details are usually not participants. It's always a minority who is vocal in such matters. No, I am certainly with the minority. All my life I've tried to be vocal. Not very efficiently, but I tried it.

--- Victor Weisskopf

00: 08: 04: 22 Antonello: Since the scientific revolution the idea of progress..

The idea of progress..it's a very deep problem. We have learned a lot. Very often you see people ..we try to play a kind of game. What time of history do you want to live, want to have lived, you know? And my choice it's always the second half of the 19th century. Why? Of course not as a poor worker, but as an intellectual as the university for example. Why, because at that time the world was full of optimism in Europe and in this country, full of optimism. The technical progress was astounding, the scientific progress was overwhelming. And people thought now we.. you know, the future will be wonderful and the past the power base..in the past, in the old days it was a past that was ideal and the paradise, and now the future is going to be a paradise by science and technology. And we will have means to feed and clothe the whole world, and crime will disappear. Now that turned out to be all wrong.

00: 09: 41: 20 And in other words, in the second half of the 19th century, people believed in progress. That progress will solve everything. Now it turned out it isn't so. Now that doesn't mean that progress is negative. And as I mention before, one should never forget in these discussions, the positive sides of the scientific, technological progress, mainly in medicine but also in others And ..but we know now very well that the human psyche is a complicated matter, that science and technology does not deliver something which the human psyche needs, it's a kind of aim in life, philosophy, that what religion gave them, in the old days. As a friend of mine says, there is a big hole hole in the belly, religion is taken

out or you have less influence, let me say, it's not completely taken out.

But science and technology has not put anything in place.

And therefore we have all these things I mentioned before, problems of the human society, poverty, homeless, center of city troubles drugs, etc....

00: 11: 19: 12 So in other words, see progress had its dark sides and we must see whether there is a possibility to solve, to improve it will never solve. It will never have a paradise. But how to make it such that humanity can have a decent life. Now I think what makes me more optimistic than I was perhaps ten years ago, is just the change, the political change that the great danger of nuclear war is now much less, it is more in the background.

And is probably no longer such a great danger, it's not excluded, but not such a great danger. And then come of course the other dangers, the pollution, the material pollution, and what I just described the intellectual pollution. Now the point is that if the nuclear question is no longer the important question, we have more possibilities. Because in respect to the material pollution there is no west and east, there is no ideology conflict.

What's good for one side is also good for the other side. So there is hope of a more productive collaboration, and we see a lot of good signs beginning of international activities to reduce pollution, they begin. Then of course the whole international idea has become more attractive in Europe, especially due to the EC, the common market, after all, that's not neglect, it's a great thing that Europe is really talking ...a common economic unit. This is completely new, that's great. I remember when I was a Cern, director at Cern, this is in the beginning of the 60's. At that time Cern was, that is by the way why I went there, because I was attracted by the idea that here is an institution at least in physics establishes a united Europe. That was my great idea there, which they were practicing. Now we don't need this anymore, now we have... we really have that idea conceived and perhaps even realized in it, in a few years. So that is the hopeful element.

00: 14: 10: 03 On the other hand, we have a something which is extremely dangerous, namely an increase in what is called in this country, fundamentalism. Namely, fundamentalists, religious or otherwise, which is essentially a view that only accepts one

way of thinking and excludes everything else. And we have it in good parts of the Muslim world. Khomeiny and Ghadaffi and so on, and now this fundamentalism raises its ugly head in the Soviet circle, you know nationalism. It's understandable, they were all oppressed before, but I am very much afraid that it will work to the other side, and nationalistic fanaticism may take the place, and that is just as dangerous as communist fanaticism.

--- Victor Weisskopf

00: 15: 16: 06 Antonello: During WWII a group of great scientists got together..Do you think the same thing could happen today in the fight against pollution? Why isn't this happening? It is happening..I mean, I wish it would happen much more.

But look, you see here's a problem I mention before that among, you're speaking of the scientists, that this is a guess. Only ten percent of the scientist are interested in more than just their science, and or that profession or to earn money and so. But there is the so called progress movement, you know, your compatriot Caligieri is now the chairman.

They are very strong, in the past they fought for arms control. And now their main emphasis is on environment.

There are many other groups of this kind, scientific collaboration, international scientific collaboration.

There is a Russian, European, American foundation for the salvation of mankind, ..name like that. Which also emphasizes these aims. Now I would like to have much more of this, and I'm trying to do it actually. And small as my influence is, I mean I try to excite this and to make people work on it, but it is there. One can not say that none of these things exist. Indeed it is much stronger than it was before the war.

--- Victor Weisskopf

00: 18: 27: 08 Antonello: Why two bombs not just one?

The question why the Americans dropped two bombs, instead of one, I don't understand myself. In some ways, let me defend a little. One bomb. I mean there was a big discussion. You know there were groups of scientists that proposed, especially in Chicago under Fuillard and James Frank. It proposed one should demonstrate the bomb, in an uninhabited place,

island and so. And instead of throwing it over a city,we at Los Alamos did not know much about it. If I had known about it, I would also of signed up. But I didn't hear about it. They kept us, on such matters pretty much separated.

00: 19: 31: 23 Now I must say however, that I can see at least arguments on the other side. Namely one argument that I always like to quote, is that, our General Groves, you know who was the head of the Manhattan Project. Saw the Trinity explosion, and on the Trinity explosion I've seen myself, I was there. And went afterwards there, so did he, to the place, about 18 hours later. And there you could see, first of all the tower, was completely gone. But there was a whole sand, it was a desert, you know. The sand was glazed, like.. almost like a mirror. A green glaze, it was because the temperature was so hot that the sand melted and then glazed again. Now, and too there wasn't with Grove, that Groves said when he saw that, "Is that all? " He thought there would be a hole through the center of the earth or something. So in other words, you know, the Japanese generals may have also reacted that way. That's one thing.

00: 20: 43: 13 In other arguments in favor of dropping the bomb is, you see the bomb is a terrible thing, and if you are fully idealistic as I hope I can say about myself, and say that this bomb we had to do because of Hitler. But we hope this bomb will the national license, we end all wars.

That's what we thought at that time. Because wars with these bombs are impossible, and this is why ...if you really thought that this a possibility, I think strangely enough one bomb has to be demonstrated. People don't believe stories, they must see it or they hear about it. In pictures.... So for this reason that was to some extent Oppenheimer's argumentation, which I find probably has a certain justification. It could defend one bomb.

00: 21: 44: 13 The second bomb to my mind, was a crime. And I've said it before. And I think, I know why the military did it.. Because you know the first bomb was a different principle as a uranium bomb, the second was a plutonium bomb, and although Trinity was a plutonium bomb and should have convinced the military that it works. But the military had

this mind, as long as you don't show on the battle field, you don't know whether it works. So my belief was that that was one reason, and also perhaps the psychology, that if you only threw one bomb they believe you haven't got another one. If you throw two then they think you have many, in fact, they didn't have many. So but these are all silly things, I believe the second bomb was unnecessary, it was murder, that's my opinion. But the first bomb maybe was perhaps justified. Now if you look at the present situation in 1990, you know I'm so glad that I'm still alive. After all I'm 81 years, I could have died earlier. And that I still can have seen the change in the attitude in the last five years. Maybe it is true that the existence of the bomb and also a demonstration is going to make wars big wars, world wars, impossible. There will never wage small wars, it's impossible, I don't think it can be done at all. But big wars. So maybe it wasn't quite in vain what we did. But this is an optimistic hope, I may be wrong.

--- Victor Weisskopf

00: 23: 44: 02 Antonello: Do you think another possibility was that so much money was invested in the bomb? ?

That wouldn't have prevented one bomb, then they could have just exploded one bomb. Maybe, maybe, maybe. And it's just, certainly. But on the other hand, I mean, Trinity has shown what it is. But it did play a role, I know, And then there are other things. Let us not forget, maybe they wanted to impress the Russians and so on. I mean there are all these many reasons, but let's not forget, you know, we are living now 40 years, 45 years in peace. And we do not anymore understand the psychology of war. I mean you weren't even born at that, I don't know. Oh, you're 54, you were under the bombs in Italy. So you remember that time, one thinks differently when you are in a war. And this must be counted in you know, the idea of destroying a city is now a terrible idea, and should be a terrible idea. But look what we did, I mean we the allies, how many cities we destroyed not with nuclear bombs, but with ordinary bombs. For the victims, it makes no difference. We killed many more people than the atomic bomb killed, and consciously, you know these firebombing of Japan. And then the terrible bombing of Germany, and Italy. It was an inhuman action, unnecessary to a great extent, as you know. Now you see our conscience towards human

lives have been very weakened. And I think Hitler is guilty of having started that. But we are guilty in following. And that also explains somehow, you see, that the decision wasn't that terrible as it seems now, in the psychology of a war atmosphere. It's not a defense of the action, it's only an explanation.

--- Victor Weisskopf

00: 26: 30: 04 Antonello: I believe another factor that influenced the decision was racism. Now you bring up the question of racism. Certainly the Japanese were depicted as infernal race, but there was reason for that, let's not forget that the Japanese fascism was one of the worst that they did in China. Now of course we also, on the other side think terrible things for example, the way America treated the Japanese in the west coast during the war. But never mind, anyway I'm not completely convinced of this because of the following reasons, I have often asked myself and my friends have asked also, if the nuclear bomb had been developed before the defeat of Hitler, would we have used it over Germany? And I think the answer is yes. And that of course would not have been racist.

00: 29: 11: 11 Look, I think you're right. There was racism involved, I just say it wasn't the only thing. However these attitudes have changed. Now even the word Japs, you couldn't use anymore in the US. I'm glad about that. Of course, that this isn't the reason, because they turned out to do much better making television sets, that so they are not animals..you know, on the contrary, commercially they are much better than we are. We Americans. Europe is different. But I ...there was a racial element but I would say it is not, it was not the real decisive one.

--- Victor Weisskopf

00: 30: 04: 12 Antonello: When did you start questioning yourself? ..Los Alamos? Yes and no...you see it was difficult because I felt a certain amount of cool guilt, having been, on the other hand, you see at that time we were rather optimistic. We really thought that the nuclear bomb will end all big wars and maybe that. At that time, we believed very much more in it, at the beginning. Also in the possibility of international administration, and so.

So we were optimistic and therefore had left out guilt feelings. And later on then of course we became more pessimistic, but on the other hand the time distancealso the guilt, you know guilt is such hard to define. I could not imagine having at that time said no. I could not imagine because of Hitler, I could of have said no. I mean half of my family was killed, so how could I be not sensitive to built a bomb, so that Hitler doesn't have it. It's obvious, you had to do it.