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OPPENHEIMER'S TALK TO THE ASSOCIATION OF LOS ALAMOS SCIENTISTS —

November 2, 1945

The remarks which follow have apparently never been published before. Their appearance in the NEWSLETTER may serve as a small memorial tribute to their author, and a salutary stimulus to reflection and an intellectual change of pace for FAS members. The Association of Los Alamos Scientists became the Los Alamos Chapter of the FAS. The NEWSLETTER editor is grateful to William A. Higginbotham for bringing Oppenheimer's talk to her attention and for furnishing the text.

I am grateful to the Executive Committee for this chance to talk to you. I should like to talk tonight—if some of you have long memories perhaps you will regard it as justified—as a fellow scientist, and at least as a fellow worrier about the fix we are in. I do not have anything very radical to say, or anything that will strike most of you with a great flash of enlightenment. I don't have anything to say that will be of an immense encouragement. In some ways I would have liked to talk to you at an earlier date—but I couldn't talk to you as a Director. I could not talk, and will not tonight talk, too much about the practical political problems which are involved. There is one good reason for that—I don't know very much about practical politics. And there is another reason, which has to some extent restrained me in the past. As you know, some of us have been asked to be technical advisors to the Secretary of War, and through him to the President. In the course of this we have naturally discussed things that were on our minds and have been made, often very willingly, the recipient of confidences; it is not possible to speak in detail about what Mr. A thinks and Mr. B doesn't think, or what is going to happen next week, without violating these confidences. I don't think that's important. I think there are issues which are quite simple and quite deep, and which involve us as a group of scientists—involve us more, perhaps than any other group in the world. I think that it can only help to look a little at what our situation is—at what has happened to us—and that this must give us some honesty, some insight, which will be a source of strength in what may be the not-too-easy days ahead. I would like to take it as deep and serious as I know how, and then perhaps come to more immediate questions in the course of the discussion later. I want anyone who feels like it to ask me a question and if I can't answer it, as will often be the case, I will just have to say so.

What has happened to us—it is really rather major, it is so major that I think in some ways one returns to the greatest developments of the twentieth century, to the discovery of relativity, and to the whole development of atomic theory and its interpretation in terms of complementarity, for analogy. These things, as you know, forced us to re-consider the relations between science and common sense. They forced on us the recognition that the fact that we were in the habit of talking a certain language and using certain concepts did not necessarily imply that there was anything in the real world to correspond to these. They forced us to be prepared

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NEWS ITEMS

The Soviet parliament has ratified the space treaty. The treaty, signed on January 27th, had earlier been ratified by the U.S. Senate on April 25th (see the April Newsletter). The four-month delay between the treaty signing and the Soviet ratification had led to fears that Moscow was holding up ratification out of irritation at U.S. policies in Vietnam. The May 19th announcement that the Presidium (executive body) of the Supreme Soviet (parliament) had ratified the space treaty may pave the way for Soviet ratification of the Soviet-American consular convention, already approved by the U.S. Senate. (*New York Times*; 20 May 1967)

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The creation of a European Institute of Science and Technology has been proposed as one way to narrow the technological gap between the U.S. and Western Europe. The proposal was one of several dozen made at a four-day conference of 70 U.S. and European businessmen, scientists, academicians, and public officials at a conference in Normandy. Among observations made at the conference: The "gap" is not all in one direction—Europe leads in some chemical industries, for instance. The "gap" is not exclusively technological, but shows up also in management techniques, education, and marketing. In general, the European educational system must be "democratized"—opened to more people and rearranged to allow a more up to date and flexible mix of subject matters. A particular focus of discussion was the gap in computer technology, and what might be done about it. (*New York Times*; 30 May 1967)

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Another Pacem in Terris conference, sponsored by the Center for the Study of Democratic Institutions, met in Geneva at the end of May. Neither the Russians, the North Vietnamese, nor the National Liberation Front were represented, in spite of invitations. The conferees found themselves confronted not only with the Vietnamese War but the Middle East crisis as well. Martin Luther King attacked U.S. policy in Vietnam; Thailand's Foreign Minister Thanat Khoman defended it. There was controversy over the issue of whether UN Secretary General U Thant should have withdrawn the UN forces from the Middle East so quickly when President Nasser demanded their withdrawal. Relatively few new arguments or practical suggestions appear to have emerged from the conference. (*New York Times*, 30 May 1967. See also James Reston's evaluation of the conference in the same issue of the *Times*.)

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A possible international chain of multi-purpose "nuclear energy centers" that might break the vicious cycle of poverty in underdeveloped countries will be assessed by an AEC study group starting this summer. Envisioned are a number of small-scale atomic counterparts of the Tennessee Valley Authority, producing power, purified water, and (taking advantage of the cheap power) fertilizers and other chemicals. AEC Commissioner Ramey broached the idea in a Washington address to the International Conference on Water

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for the inadequacy of the ways in which human beings attempted to deal with reality, for that reality. In some ways I think these virtues, which scientists quite reluctantly were forced to learn by the nature of the world they were studying, may be useful even today in preparing us for somewhat more radical views of what the issues are than would be natural or easy for people who had not been through this experience.

But the real impact of the creation of the atomic bomb and atomic weapons—to understand that one has to look further back, look, I think, to the times when physical science was growing in the days of the renaissance, and when the threat that science offered was felt so deeply throughout the Christian world. The analogy is, of course, not perfect. You may even wish to think of the days in the last century when the theories of evolution seemed a threat to the values by which men lived. The analogy is not perfect because there is nothing in atomic weapons—there is certainly nothing that we have done here or in the physics of chemistry that immediately preceded our work here—in which any revolutionary ideas were involved. I don't think that the conceptions of nuclear fission have strained any man's attempts to understand them, and I don't feel that any of us have really learned in a deep sense very much from following this up. It is in a quite different way. It's not an idea—it is a development and a reality—but it has in common with the early days of physical science the fact that the very existence of science is threatened, and its value is threatened. This is the point that I would like to speak a little about.

I think that it hardly needs to be said why the impact is so strong. There are three reasons: one is the extraordinary speed with which things which were right on the frontier of science were translated into terms where they affected many living people, and potentially all people. Another is the fact, quite accidental in many ways, and connected with the speed, that scientists themselves played such a large part, not merely in providing the foundation for atomic weapons, but in actually making them. In this we are certainly closer to it than any other group. The third is that the thing we made—partly because of the technical nature of the problem, partly because we worked hard, partly because we had good breaks—really arrived in the world with such a shattering reality and suddenness that there was no opportunity for the edges to be worn off.

In considering what the situation of science is, it may be helpful to think a little of what people said and felt of their motives in coming into this job. One always has to worry that what people say of their motives is not adequate. Many people said different things, and most of them, I think, had some validity. There was in the first place the great concern that our enemy might develop these weapons before we did, and the feeling—at least, in the early days, the very strong feeling—that without atomic weapons it might be very difficult, it might be an impossible, it might be an incredibly long thing to win the war. These things wore off a little as it became clear that the war would be won in any case. Some people, I think, were motivated by curiosity, and rightly so; and some by a sense of adventure, and rightly so. Others had more political arguments and said, "Well, we know that atomic weapons are in principle possible, and it is not right that the threat of their unrealized possibility should hang over the world. It is right that the world should know what can be done in their field and deal with it." And the people added to that that it was a time when all over the world men would be particularly ripe and open for dealing with this problem because of the immediacy of the evils of war, because of the universal cry from everyone that one could not go through this thing again, even a war without atomic bombs. And there was finally, and I think rightly, the feeling that there was probably no place in the world where the development of atomic weapons would have a better chance of leading to a reasonable solution, and a smaller chance of

leading to disaster, than within the United States. I believe all these things that people said are true, and I think I said them all myself at one time or another.

But when you come right down to it the reason that we did this job is because it was an organic necessity. If you are a scientist you cannot stop such a thing. If you are a scientist you believe that it is good to find out how the world works; that it is good to find out what the realities are; that it is good to turn over to mankind at large the greatest possible power to control the world and to deal with it according to its lights and its values.

There has been a lot of talk about the evil of secrecy, of concealment, of control, of security. Some of that talk has been on a rather low plane, limited really to saying that it is difficult or inconvenient to work in a world where you are not free to do what you want. I think that the talk has been justified, and that the almost unanimous resistance of scientists to the imposition of control and secrecy is a justified position, but I think that the reason for it may lie a little deeper. I think that it comes from the fact that secrecy strikes at the very root of what science is, and what it is for. It is not possible to be a scientist unless you believe that it is good to learn. It is not good to be a scientist, and it is not possible, unless you think that it is of the highest value to share your knowledge, to share it with anyone who is interested. It is not possible to be a scientist unless you believe that the knowledge of the world, and the power which this gives, is a thing which is of intrinsic value to humanity, and that you are using it to help in the spread of knowledge, and are willing to take the consequences. And, therefore, I think that this resistance which we feel and see all around us to anything which is an attempt to treat science of the future as though it were rather a dangerous thing, a thing that must be watched and managed, is resisted not because of its inconvenience—I think we are in a position where we must be willing to take any inconvenience—but resisted because it is based on a philosophy incompatible with that by which we live, and have learned to live in the past.

There are many people who try to wiggle out of this. They say the real importance of atomic energy does not lie in the weapons that have been made; the real importance lies in all the great benefits which atomic energy, which the various radiations, will bring to mankind. There may be some truth in this. I am sure that there is truth in it, because there has never in the past been a new field opened up where the real fruits of it have not been invisible at the beginning. I have a very high confidence that the fruits—the so-called peacetime applications—of atomic energy will have in them all that we think, and more. There are others who try to escape the immediacy of this situation by saying that, after all, war has always been very terrible; after all, weapons have always gotten worse and worse; that this is just another weapon and it doesn't create a great change; that they are not so bad; bombings have been bad in this war and this is not a change in that—it just adds a little to the effectiveness of bombing; that some sort of protection will be found. I think that these efforts to diffuse and weaken the nature of the crisis make it only more dangerous. I think it is for us to accept it as a very grave crisis, to realize that these atomic weapons which we have started to make are very terrible, that they involve a change, that they are not just a slight modification: to accept this, and to accept with it the necessity for those transformations in the world which will make it possible to integrate these developments into human life.

As scientists I think we have perhaps a little greater ability to accept change, and accept radical change, because of our experiences in the pursuit of science. And that may help us—that, and the fact that we have lived with it—to be of some use in understanding these problems.

It is clear to me that wars have changed. It is clear to me that if these first bombs—the bomb that was dropped on Nagasaki—that if these can destroy ten square miles, then that is really quite something. It is clear to me that they are going to be very cheap if anyone wants to make them;

it is clear to me that this is a situation where a quantitative change, and a change in which the advantage of aggression compared to defense—of attack compared to defense—is shifted, where this quantitative change has all the character of a change in quality, of a change in the nature of the world. I know that whereas wars have become intolerable, and the question would have been raised and would have been pursued after this war more ardently than after the last of whether there was not some method by which they could be averted. But I think the advent of the atomic bomb and the facts which will get around that they are not too hard to make, that they will be universal if people wish to make them universal, that they will not constitute a real drain on the economy of any strong nation, and that their power of destruction will grow and is already incomparably greater than that of any other weapon—I think these things create a new situation, so new that there is some danger, even some danger in believing, that what we have is a new argument for arrangements, for hopes, that existed before this development took place. By that I mean that much as I like to hear advocates of a world federation, or advocates of a United Nations organization, who have been talking of these things for years—much as I like to hear them say that here is a new argument, I think that they are in part missing the point, because the point is not that atomic weapons constitute a new argument. There have always been good arguments. The point is that atomic weapons constitute also a field, a new field, and a new opportunity for realizing preconditions. I think when people talk of the fact that this is not only a great peril, but a great hope, this is what they should mean. I do not think they should mean the unknown, though sure, value of industrial and scientific virtues of atomic energy, but rather the simple fact that in this field, because it is a threat, because it is a peril, and because it has certain special characteristics, to which I will return, there exists a possibility of realizing, of beginning to realize, those changes which are needed if there is to be any peace.

Those are very far-reaching changes. They are changes in the relations between nations, not only in spirit, not only in law, but also in conception and feeling. I don't know which of these is prior; they must all work together, and only the gradual interaction of one on the other can make a reality. I don't agree with those who say the first step is to have a structure of international law. I don't agree with those who say the only thing is to have friendly feelings. All of these things will be involved. I think it is true to say that atomic weapons are a peril which affect everyone in the world, and in that sense a completely common problem, as common a problem as it was for the Allies to defeat the Nazis. I think that in order to handle this common problem there must be a complete sense of community responsibility. I do not think that one may expect that people will contribute to the solution of the problem until they are aware of their ability to take part in the solution. I think that it is a field in which the implementation of such a common responsibility has certain decisive advantages. It is a new field, in which the position of vested interests in various parts of the world is very much less serious than in others. It is serious in this country, and that is one of our problems. It is a new field, in which the role of science has been so great that it is to my mind hardly thinkable that the international traditions of science, and the fraternity of scientists, should not play a constructive part. It is a new field, in which just the novelty and the special characteristics of the technical operations should enable one to establish a community of interest which might almost be regarded as a pilot plant for a new type of international collaboration. I speak of it as a pilot plant because it is quite clear that the control of atomic weapons cannot be in itself the unique end of such operation. The only unique end can be a world that is united, and a world in which war will not occur. But those things don't happen overnight, and in this field it would seem that one could get started, and get started without meeting those insuperable obstacles which history has so often placed in the way of any effort of cooperation. Now, this is not an easy thing, and the point I want to make, the one point I want to hammer home, is what an enormous

change in spirit is involved. There are things which we hold very dear, and I think rightly hold very dear; I would say that the word democracy perhaps stood for some of them as well as any other word. There are many parts of the world in which there is no democracy. There are other things which we hold dear, and which we rightly should. And when I speak of a new spirit in international affairs I mean that even to these deepest of things which we cherish, and for which Americans have been willing to die—and certainly most of us would be willing to die—even in these deepest things, we realize that there is something more profound than that; namely, the common bond with other men everywhere. It is only if you do that that this makes sense; because if you approach the problem and say, "We know what is right and we would like to use the atomic bomb to persuade you to agree with us," then you are in a very weak position and you will not succeed, because under those conditions you will not succeed in delegating responsibility for the survival of men. It is a purely unilateral statement; you will find yourselves attempting by force of arms to prevent a disaster.

I want to express the utmost sympathy with the people who have to grapple with this problem and in the strongest terms to urge you not to underestimate its difficulty. I can think of an analogy, and I hope it is not a completely good analogy: in the days in the first half of the nineteenth century there were many people, mostly in the North, but some in the South, who thought that there was no evil on earth more degrading than human slavery, and nothing that they would more willingly devote their lives to than its eradication. Always when I was young I wondered why it was that when Lincoln was President he did not declare that the war against the South, when it broke out, was a war that slavery should be abolished, that this was the central point, the rallying point, of that war. Lincoln was severely criticized by many of the Abolitionists as you know, by many then called radicals, because he seemed to be waging a war which did not hit the thing that was most important. But Lincoln realized, and I have only in the last months come to appreciate the depth and wisdom of it, that beyond the issue of slavery was the issue of the community of the people of the country, and the issue of the Union. I hope that today will not be an issue calling for war; but I wanted to remind you that in order to preserve the union Lincoln had to subordinate the immediate problem of the eradication of slavery, and trust—and I think if he had had his way it would have gone so—to the conflict of these ideas in a united people to eradicate it.

These are somewhat general remarks and it may be appropriate to say one or two things that are a little more programmatic, that are not quite so hard to get one's hands on. That is, what sort of agreement between nations would be a reasonable start. I don't know the answer to this, and I am very sure that no a priori answer should be given, that it is something that is going to take constant working out. But I think it is a thing where it will not hurt to have some

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Chairman Jay Orear

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reasonably concrete proposal. And I would go a step further and say of even such questions as the great question of secrecy—which perplexes scientists and other people—that even this was not a suitable subject for unilateral action. If atomic energy is to be treated as an international problem, as I think it must be, if it is to be treated on the basis of an international responsibility and an international common concern, the problems of secrecy are also international problems. I don't mean by that that our present classifications and our present, in many cases inevitably ridiculous, procedures should be maintained. I mean that the fundamental problem of how to treat this peril ought not to be treated unilaterally by the United States, or by the United States in conjunction with Great Britain.

The first thing I would say about any proposals is that they ought to be regarded as interim proposals, and that whenever they are made, it be understood and agreed that within a year or two years—whatever seems a reasonable time—they will be reconsidered and the problems which have arisen, and the new developments which have occurred, will cause a rewriting. I think the only point is that there should be a few things in these proposals which will work in the right direction, and that the things should be accepted without forcing all of the changes, which we know must ultimately occur, upon people who will not be ready for them. This is anyone's guess, but it would seem to me that if you took these four points, it might work: first, that we are dealing with an interim solution, so recognized. Second, that the nations participating in the arrangement would have a joint atomic energy commission, operating under the most broad directives from the different states, but with a power which only they had, and which was not subject to review by the heads of State, to go ahead with those constructive applications of atomic energy which we would all like to see developed—energy sources, and the innumerable research tools which are immediate possibilities. Third, that there would be not merely the possibility of exchange of scientists and students; that very, very concrete machinery more or less forcing such exchange should be established, so that we would be quite sure that the fraternity of scientists would be strengthened and that the bonds on which so much of the future depends would have some reinforcement and some scope. And fourth, I would say that no bombs be made. I don't know whether these proposals are good ones, and I think that anyone in this group would have his own proposals. But I mention them as very simple things, which I don't believe solve the problem, and which I want to make clear are not the ultimate or even a touch of the ultimate, but which I think ought to be started right away; which I believe—though I know very little of this—may very well be acceptable to any of the nations that wish to become partners with us in this great undertaking.

One of the questions which you will want to hear more about—and which I can only partly hope to succeed in answering—is to what extent such views, essentially the view that the life of science is threatened, the life of the world is threatened, and that only a profound revision of what it is that constitutes a thing worth fighting for and a thing worth living for can this crisis be met—to what extent these views are held by other men. They are certainly not held universally by scientists; but I think they are in agreement with all of the expressed opinions of this group, and I know that many of my friends here see pretty much eye to eye. I would speak especially of Bohr, who was here so much during the difficult days, who had many discussions with us, and who helped us reach the conclusion that not only a desirable solution, but that it was the unique solution, that there were no other alternatives.

I would say that among scientists there are certain centrifugal tendencies which seem to me a little dangerous, but not very. One of them is the attempt to try, in this imperilled world, in which the very function of science is threatened, to

make convenient arrangements for the continuance of science, and to pay very little attention to the preconditions which give sense to it. Another is the tendency to say we must have a free science and a strong science, because this will make us a strong nation and enable us to fight better wars. It seems to me that this is a profound mistake, and I don't like to hear it. The third is even odder, and it is to say, "Oh give the bombs to the United Nations for police purposes, and let us get back to physics and chemistry." I think none of these are really held very widely, but they show that there are people who are desperately trying to avoid what I think is the most difficult problem. One must expect these false solutions, and overeasy solutions, and these are three which pop up from time to time.

As far as I can tell in the world outside there are many people just as quick to see the gravity of the situation, and to understand it in terms not so different from those I have tried to outline. It is not only among scientists that there are wise people and foolish people. I have had occasion in the last few months to meet people who had to do with the Government—the legislative branches, the administrative branches, and even the judicial branches, and I have found many in whom an understanding of what this problem is, and of the general lines along which it can be solved, is very clear. I would especially mention the former Secretary of War, Mr. Stimson, who, perhaps as much as any man, seemed to appreciate how hopeless and how impractical it was to attack this problem on a superficial level, and whose devotion to the development of atomic weapons was in large measure governed by his understanding of the hope that lay in it that there would be a new world. I know this is a surprise, because most people think that the War Department has as its unique function the making of war. The Secretary of War has other functions.

I think this is another question of importance: that is, what views will be held on these matters in other countries. I think it is important to realize that even those who are well informed in this country have been slow to understand, slow to believe that the bombs would work, and then slow to understand that their working would present such profound problems. We have certain interests in playing up the bomb, not only we here locally, but all over the country, because we made them, and our pride is involved. I think that in other lands it may be even more difficult for an appreciation of the magnitude of the thing to take hold. For this reason, I'm not sure that the greatest opportunities for progress do not lie somewhat further in the future than I had for a long time thought.

There have been two or three official statements by the President which defined, as nearly as their in some measure inevitable contradictions made possible, the official policy of the Government. And I think that one must not be entirely discouraged by the fact that there are contradictions, because the contradictions show that the problem is being understood as a difficult one, is temporarily being regarded as an insoluble one. Certainly you will notice, especially in the message to Congress, many indications of a sympathy with, and an understanding of, the views which this group holds, and which I have discussed briefly tonight. I think all of us were encouraged at the phrase "too revolutionary to consider in the framework of old ideas." That's about what we all think. I think all of us were encouraged by the sense of urgency that was frequently and emphatically stressed. I think all of us must be encouraged by the recognition, the official recognition by the Government of the importance—of the overriding importance—of the free exchange of scientific ideas and scientific information between all countries of the world. It would certainly be ridiculous to regard this as a final end, but I think that it would also be a very dangerous thing not to realize that it is a precondition. I am myself somewhat discouraged by the limitation of the objective to the elimination of atomic weapons, and I have seen many articles, —probably you have, too,—in which this is interpreted as

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follows: "Let us get international agreement to outlaw atomic weapons and then let us go back to having a good, clean war." This is certainly not a very good way of looking at it. I think, to say it again, that if one solves the problems presented by the atomic bomb, one will have made a pilot plant for solution of the problem of ending war.

But what is surely the thing which must have troubled you, and which troubled me, in the official statements was the insistent note of unilateral responsibility for the handling of atomic weapons. However good the motives of this country are—I am not going to argue with the President's description of what the motives and the aims are—we are 140 million people, and there are two billion people living on earth. We must understand that whatever our commitments to our own views and ideas, and however confident we are that in the course of time they will tend to prevail, our absolute—our completely absolute—commitment to them, in denial of the views and ideas of other people, cannot be the basis of any kind of agreement.

As I have said, I had for a long time the feeling of the most urgency, and I think maybe there was something right about that. There was a period immediately after the first use of the bomb when it seemed most natural that a clear statement of policy, and the initial steps of implementing it, should have been made; and it would be wrong for me not to admit that something may have been lost, and that there may be tragedy in that loss. But I think the plain fact is that in the actual world, and with the actual people in it, it has taken time, and it may take longer, to understand what this is all about. And I am not sure, as I have said before, that in other lands it won't take longer than it does in this country. As it is now, our only course is to see what we can do to bring about an understanding on a level deep enough to make a solution practicable, and to do that without undue delay.

One may think that the views suggested in the President's Navy Day speech are not entirely encouraging that many men who are more versed than we in the practical art of statesmanship have seen more hope in a radical view, which may at first sight seem visionary, than in an approach on a more conventional level.

I don't have very much more to say. There are a few things which scientists perhaps should remember, that I don't think I need to remind us of; but I will, anyway. One is that they are very often called upon to give technical information in one way or another, and I think one cannot be too careful to be honest. And it is very difficult, not because one tells lies, but because so often questions are put in a form which makes it very hard to give an answer which is not misleading. I think we will be in a very weak position unless we maintain at its highest the scrupulousness which is traditional for us in sticking to the truth, and in distinguishing between what we know to be true from what we hope may be true.

The second thing I think it right to speak of is this: it is everywhere felt that the fraternity between us and scientists in other countries may be one of the most helpful things for the future; yet it is apparent that even in this country not all of us who are scientists are in agreement. There is no harm in that; such disagreement is healthy. But we must

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Editor's Note —

Problems of scheduling and space have excluded from this *NEWSLETTER* the usual summaries of developments in areas of FAS interest. The June *NEWSLETTER*, which should appear soon, will bring the news and the list of items of interesting reading relatively up to date. —H. L. P.

OREAR-HORNIG EXCHANGE OF LETTERS ON CBW PETITION

FAS Chairman Jay Orear has contributed to the NEWSLETTER the items which follow. The first letter from Donald F. Hornig, Special Assistant to the President for Science and Technology, is in response to an earlier letter Orear wrote to the President asking what effects the CBW petition (see the March 1967 and earlier NEWSLETTERS) may have had on U. S. policies.

June 9, 1967

Dear Dr. Orear:

On behalf of the President, I would like to acknowledge your letter of May 29 concerning the petition to the President on chemical and biological warfare which was delivered on February 14.

As I informed Dr. Meselson in my letter acknowledging receipt of the petition, the petition has been called to the attention of the interested government agencies and is being taken into consideration by them in their current study of this problem. I also pointed out to Dr. Meselson that the entire problem of chemical and biological warfare has been the subject of continuing study within the government for some time.

Our present policy does permit the use in Vietnam of riot control agents that are widely used by police forces throughout the world and herbicides that are commonly employed in many countries. The reason for the use of these agents in Vietnam has been explained many times and it does not, I believe, require further justification.

I can assure you that the Administration is deeply concerned about the problem of chemical and biological warfare. I would like to call your attention to our support last fall for the United Nations General Assembly Resolution which called on all States to observe the principles and objectives of the Geneva Protocol of 1925.

Sincerely,
DONALD F. HORNIG

* * * * *

June 16, 1967

Dear Dr. Hornig:

Thank you for your prompt reply to my letter of May 29 concerning the Feb. 14 petition of 5000 scientists to the President. The Federation of American Scientists has sent a copy of your reply to each of the 5000 signers, but we fear that many of them will not be very satisfied with it. Not only will they be disappointed that the petition has not resulted in any policy changes, but that we have not received an explanation or justification of the present policy.

Your letter says "the reason for the use of these agents (presumably the anti-personnel and anti-crop chemical weapons) in Vietnam has been explained many times and it does not, I believe, require further justification." If such explanations do exist, we would greatly appreciate it if you could send us the appropriate documents, or at least a list of references. We will then send copies, as promised, to each of the 5000 signers. We realize that preparation of the response we desire might require some efforts on the part of the appropriate agency; however, one might expect that such a distinguished group of leaders in American science is deserving of such effort.

As you may realize, many of the 5000 signers find the present U.S. policy on chemical weapons confusing and inconsistent. In order to give some idea of the scope and detail of the response we are requesting, I have enclosed a sheet containing just a few of the points which we find confusing in the present policy.

Sincerely,
JAY OREAR

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NEWS ITEMS

(Continued from page 1)

for Peace and said that this innovation, following on the spectacular growth of atomic power reactors, might be brought about in less than a decade. Ramey noted that the planned nuclear desalting plant near Los Angeles should produce fresh water at about 20¢ per thousand gallons, compared with current desalting costs of about a dollar. But bigger nuclear plants now being designed might reduce the cost to as little as 8¢, allowing the use of desalted water in agriculture. Heading the study will be Edward Mason and Manson Benedict, both of M.I.T. The Indian Government has already expressed interest in staying in close touch with the twelve-member study group and will supply a liaison team. (*New York Times*; 26 May 1967)

* * * * *

The Space Science Board of the National Academy of Sciences has strongly opposed the orbiting of giant reflectors that might light the Vietnamese jungles at night. Last year NASA, acting on a Defense Department request asked five aerospace companies to study the feasibility of putting huge reflectors into orbit and using them for tactical military purposes. Various proposals emerged for single (half a mile in diameter) and multi-mirrors. Astronomers and biologists strongly opposed the concept. Donald Hornig, White House Science Advisor, has assured the NAS that "the Government is not interested in the (mirror) concept at the present time and no activity on it is visualized." (*New York Times*; 26 May 1967)

* * * * *

The British are planning a new effort to counter the "brain drain" to the United States. Minister of Technology, Anthony Benn, announced that recruiting offices will be set up in New York and London, and later in San Francisco and Toronto, to attract graduates of American universities, especially scientists, engineers, and business school graduates, to jobs in British industry. The aim will be to attract both Americans and Britons who have studied in the United States. There is no hope that Britain can match American salaries, nor are British tax rates likely to be reduced. But Benn hoped that the challenge of working in England, of making a contribution to European technology, and of traveling and working in a different part of the world should appeal to some Americans.

A Ministry of Technology team reported that the U.S. would probably continue to seek out British graduates, because of the gap between the output of the American educational system and the expanding demands of industry. It was noted that a graduating Ph.D. in England might start at about \$4200 per year compared with as much as \$15,000 in the United States, although the relative differential might be expected to drop somewhat later on in the careers of individual scientists. (*New York Times*, 2 May 1967)

* * * * *

Some recommendations on the proposed 200 Bev accelerator have been made by a sub-committee of the Congressional Joint Committee on Atomic Energy. The sub-committee, chaired by Representative Price of Illinois, suggests: that the design intensity of 3×10^{13} protons per pulse—rather than a version scaled down by about an order magnitude—be maintained; that the AEC study the possibility of constructing the accelerator to permit a possible later increase in energy to 300 Bev or higher; and that the AEC supervise carefully the choice of organizations for designing and constructing the accelerator, and approve all major design changes and procurements affecting the machine. The AEC has requested \$10 million in architect-engineering funds and an additional \$2.65 million in operating funds for further R&D work on the facility in its fiscal year 1968 budget. The Joint Committee has not yet made its recommendations to Congress on the AEC's author-

ization request. (News Release of the Joint Committee on Atomic Energy; 8 May 1967)

* * * * *

Former Undersecretary of State George Ball has suggested that Britain renounce her status as a nuclear power. Ball said that this would be "a positive act of statesmanship" that might facilitate progress toward a non-proliferation treaty (NPT). Ball argued that such a British move would "dramatically disclose the fatuity of the argument that nuclear bombs are a key to world status." (*New York Times*; 4 May 1967)

* * * * *

The United States has apparently suppressed for nearly 22 years confiscated Japanese films showing gruesome after-effects of the 1945 atomic bombing of Hiroshima. The Japanese Government has asked at least twice that restrictions on the films be lifted, but the U.S. Government has refused on the grounds that it might damage relations between the two countries. According to reports, Tokyo University scientists rushed to Hiroshima soon after the bombing and began filming. The Japanese cameramen were still at work in the devastated city when U.S. officials arrived and confiscated their film. But the Americans decided to finish the documentary film and used the same Japanese cameramen on the job. There is reportedly now some sentiment in Washington for letting the Japanese decide what, if any, restrictions should be imposed on showing of the film, if the Japanese should renew their request for its release. There are reportedly 30,000 ft. of movie film at issue, and several copies of the film are believed to exist. (*New York Times*; 18 May 1967)

* * * * *

A news release from VITA—Volunteers for International Technical Assistance—reports that Francis C. Bunk, a General Electric engineer, has returned from a six-month tour in Taiwan as a VITA field representative. VITA is an international association of more than 2500 scientists, engineers, educators, and business men in the United States and 50 other countries. VITA volunteers, by offering their talent and free time, have helped people in developing areas to find answers to more than 3400 technical problems. VITA was founded in 1960 chiefly to give persons who cannot go overseas a way to contribute effectively to international development. VITA's address is: Volunteers for International Technical Assistance, Inc., College Campus, Schenectady, N.Y. 12308. (VITA News Release; 11 May 1967)

* * * * *

The Japanese Parliament has questioned research projects in Japanese universities which are partly supported by funds from the United States Army. According to Japanese figures, the Army has given a total of a little over \$1 million to 28 Japanese universities and other institutions for specific research projects since 1959. Grants averaging about \$11,000 were "nearly all" in the field of bacteriology, pathology, and physiology. Japanese Foreign Minister Tako Miki said that if the U.S. Army subsidy was deemed harmful to the national interest, the Japanese Government would intervene, but he said that there was no intention at this stage to prevent such grants to Japanese institutions. (*New York Times*; 22 May 1967)

* * * * *

The Defense Department plans a series of underground nuclear tests in the Aleutians. The tests may be carried out over the next two or three years at Amchitka Island. Amchitka was the site of an 80-kiloton nuclear explosion set off 2400 feet below ground in October 1965. That explosion yielded data on the problem of distinguishing earthquakes from underground nuclear tests. The Aleutians are seismically active. Seismic data in the 1965 test yielded a puzzling error of 25 kilometers in the location of the explosion.

Underwater shots using conventional explosives are to be fired this summer in the vicinity of the Aleutians. Conserva-

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NEWS ITEMS

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tionists in Alaska and elsewhere have expressed concern over the effect of the tests, both conventional and nuclear, on wildlife. But is assumed that precautions will be taken to protect sea otters, Canadian geese, ducks, and other forms of wildlife, and there is no consensus among conservationists and others that significant damage to wildlife will result. (*New York Times*; 29 May 1967)

* * * * *

The AEC now forecasts that U.S. nuclear power plants will have a generating capacity of between 120,000 and 170,000 megawatts by the end of 1980. The change from the AEC's forecast of last year (80,000 to 110,000 megawatts) reflects the surge of orders and plans for nuclear power plants over the past year. (AEC Release; 31 May 1967)

* * * * *

There is newly expressed concern over the genetic hazard to man from many pesticide chemicals. Two British geneticists said the breakdown products of several categories of pesticides—at levels to which man is exposed—were capable of doubling the mutation rate in man. The results were reported at a meeting of the New York Academy of Sciences. (*New York Times*; 4 May 1967)

OREAR-HORNIG EXCHANGE OF LETTERS

(Continued from page 5)

Some Questions on U.S. Policy on Chemical Weapons

Clearly the use of anti-crop chemicals on civilian crops denies food to civilians as well as to the military, and it probably has more of a devastating effect on civilians than on the military. Is not the destruction of civilian crops a violation of the Law of Land Warfare adopted by the United States? (See Field Manual 27-10 (1956).)

(Editor's note: The relevant paragraph, noted by Orear, from the Army Field Manual entitled "The Law of Land Warfare" reads as follows: "It is especially forbidden to employ poison or poisoned weapons. . . . Discussion of this Rule. The foregoing rule does not prohibit measures being taken to dry up springs, to divert rivers and aqueducts from their courses, or to destroy, through chemical or bacterial agents harmless to man, crops intended solely for consumption by the armed forces (if that fact can be determined.)"

We have heard that the main justification for destruction of the civilian crops is not to deny food to the Vietcong, but to use starvation and economic ruin as a means of forcing the local civilian population out into relocation camps. Is there any truth to this? The wording of the leaflets entitled "Compensation for Crop Losses" which are dropped over target areas seem to support this.

Dr. Hornig's letter of June 9 refers to "riot control agents." Although not stated in his letter, the United States is using these (and perhaps other?) agents in non-riot military applications. The *New York Times* of Feb. 22, 1966 discusses an application where CS gas in very large quantities is used to kill enemy troops by flushing them out of bunkers and following with B52 saturation bombing. Isn't such usage lethal in purpose and thereby contrary to the objectives of the 1925 Geneva Protocol for the Prohibition of the Use in War of Asphyxiating, Poisonous, or Other Gases, and of Bacteriological Methods of Warfare? All this seems to be in contradiction to the United States support of the December 5 United Nations resolution calling upon all States to observe the principles and objectives of the Geneva Protocol.

JAY OREAR
Department of Physics
Cornell University
Ithaca, N. Y. 14850

THE PRESIDENT AND BASIC RESEARCH

Following is the text of some comments entitled "LBJ: Praise for the Value of Research" by Daniel S. Greenberg in the 5 May 1967 issue of SCIENCE.

If words are to be taken at face value, all should now be well between the basic research community and President Lyndon Johnson, who last year aroused considerable concern by asking whether basic research was bringing a good return on its costs. When the President asked that, gloom ensued at points throughout the scientific community, and since then he has been taking some pains to assure scientists that he actually thinks well of them and their work.

The most emphatic of these assurances came on 6 April when he sent to Congress the 16th annual report of the National Science Foundation and accompanied it with a letter that, in effect, said there is nothing like basic research for making this a better world. "Scientific research," declared the President, "is the key with which we unlock the doors of the future. As a nation we have learned this only recently." Stating that now "the quality of our research is second to none," the President said, "We intend to maintain this high standard. The task we have set for ourselves is to wrest from Nature the intellectual treasures with which we will build the world of tomorrow."

The President went on to cite a great number of devices, materials, and techniques that have resulted from scientific research. And he added, "We know that we can continue this flow of benefits to mankind only if we have a large and constantly replenished pool of basic knowledge and understanding to draw upon. . . . We intend to maintain such a pool with all our talents and resources, so that we can apply it to our needs. Perhaps most important, we intend to maintain this pool of basic knowledge and understanding because of the stimulus it provides to our young minds in this challenge of ideas. Knowledge, as we have learned from our rich experience, is not a laboratory curiosity. It is a critical tool for our national health, our national growth, and the sound education of all of us." NSF, he continued, "is entrusted, more than any other single national institution, with the responsibility to expand our reservoir of scientific knowledge through research, and to promote excellence in our scientific education."

A similarly strong statement of support for research was contained in a telegram the President sent on 18 April to the 48th annual meeting of the American Geophysical Union, in Washington, "The AGU," the telegram stated, "is especially aware that mankind cannot fully share in the earth's abundance without stimulating the development of its resources."

Praising the international Upper Mantle Project, the President's telegram stated that "the need to treat the earth as a whole makes international cooperation imperative."

On 26 April, just a few hours after returning from Konrad Adenauer's funeral in Germany, the President appeared briefly before the American Physical Society. "I wanted to meet with you," he said, "because no group of Americans is more important or has more to offer our country than the American Physical Society."

As kind as these words are, there are many scientists who

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THE PRESIDENT AND BASIC RESEARCH

(Continued from page 7)

believe that the overall picture of federal support for research reflects an incongruity between the President's praise and his budgetary decisions. The view from the White House, however, is that in a time of tight budgets research has fared relatively well, and, in comparison with other federally supported programs, such is the case. In virtually every field of research, the Johnson administration has annually increased the amount of federal support. The problem is that the pace of increase has not kept up with the appetites of the old-time recipients and the hopes of new competitors for shares of the money that the federal government provides for research.

If there is any disappointment as a result of the President's statements it is likely to be among those who will take exception to his emphasis on the usefulness of research. For the basic research community this poses a delicate issue in its relations with a President who is understandably eager to solve innumerable pressing problems. In an introduction to the annual report, NSF director Leland J. Haworth touched on the subject of utility in noting that generous public support for research and interest in its applications are "not always accompanied by an understanding of the fact that great caution must be practiced in this area lest attempts to mold basic science in the direction of immediate usefulness not only hurt basic science itself, but also, at least in the long run, thwart its very purpose."

Three years ago, Haworth put the matter somewhat more strongly, in a speech to the National Academy of Sciences. Addressing his fellow scientists, Haworth said, "We . . . know the great cultural and intellectual value of science. But we are not good salesmen. The cultural argument, of course, competes with similar arguments for other fields of learning. And we would, in my opinion, be hard put to prove uniqueness for science in this sense. Large federal sums for culture's sake can only come when all culture is heavily supported. So for the present our best drawing card for financial support is the ultimate usefulness of science. I do not defend that this is so; I simply state it as a fact."

It was a fact in 1964, and the President's messages indicate that it is still a fact.

FAS NEWSLETTER

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OPPENHEIMER'S TALK

(Continued from page 5)

not lose the sense of fraternity because of it; we must not lose our fundamental confidence in our fellow scientists.

I think that we have no hope at all if we yield in our belief in the value of science, in the good that it can be to the world to know about reality, about nature, to attain a gradually greater and greater control of nature, to learn, to teach, to understand. I think that if we lose our faith in this we stop being scientists, we sell out our heritage, we lose what we have most of value for this time of crisis.

But there is another thing: we are not only scientists; we are men, too. We cannot forget our dependence on our fellow men. I mean not only our material dependence, without which no science would be possible, and without which we could not work; I mean also our deep moral dependence, in that the value of science must lie in the world of men, that all our roots lie there. These are the strongest bonds in the world, stronger than those even that bind us to one another, these are the deepest bonds—that bind us to our fellow men.

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