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## FOURTH GENERAL ASSEMBLY



BERLIN

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*Presidential Address*

## Prospects for World Science

*In the absence of Professor Joliot-Curie, Professor J. D. Bernal gave the presidential address. After thanking our hosts, the Gewerkschaft Wissenschaft, for the excellent arrangements and generous hospitality, Professor Bernal said:*

**W**E ARE MEETING for our Fourth Assembly in conditions which hold out far brighter prospects for humanity and for science than any we have experienced in our earlier meetings, and indeed far better than we might have expected even a year ago. But the happier atmosphere should be no temptation for complacency for us, but rather an inspiration to continue and extend our work.

I would like to welcome the affiliations to the Federation since our last Assembly; the *Gewerkschaft Wissenschaft* and the *Association of Democratic Scientists of Japan*. We feel that these two additions to our strength give us a greater scope as a representative world organization. We hope that it will be the beginning of bringing the scientists of all Germany into the Federation, and we also

warmly welcome the scientists of Japan whose united struggle against the use of atomic weapons since the tragedy of Hiroshima has roused our admiration.

The period since our last General Assembly in 1953 has been essentially one of consolidation and recovery from the difficulties we faced in the worst period of the cold war. We have learned to work better together and the mutual relations between our Associations have increased. We have resumed old activities and undertaken new ones. Of these the most important is the *Bulletin*, whose new appearance had been so welcome and which is carrying out one of the main tasks of the Federation, that of making the activities of our associated organizations known to each other and creating a general background for international activity. Six issues of the

*Bulletin* have appeared since the last Assembly and it is produced in four languages, English, French, Russian and Chinese.

### "Science and Mankind" will meet a need

The *Bulletin* has served us well for our day-to-day communication, but we have felt the need for a publication which would express the more permanent and wider aspects of the work of the Federation. For this purpose we have been able to take steps to resume the publication of *Science and Mankind*. The first number is now virtually completed under the editorship of Dr. Josue de Castro and is to deal with the major question of world food supply. It should appear early next year and further numbers are in preparation. We may count on the further issues of *Science and Mankind* to give us a valuable addition to our knowledge of the major problems of science and of its influence on world affairs.

The Federation has also notably assisted in increasing the intercourse between scientists of different countries. Apart from a large number of meetings and individual visits, it has furthered visits of scientists to Czechoslovakia, Hungary and the holiday centre in France and in the next few weeks also to England. We hope that this activity will spread still further.

I would like to say something of the part that the Federation has taken, in accordance with the resolutions of the last Assembly, to further international discussions on the dangers of atomic weapons and on the need to use atomic energy for peaceful purposes. Since the last Assembly there have been great and hopeful developments in this field and we can claim that we have done something to further them as a Federation. At the same time constituent organizations have stimulated the large number of meetings and discussions on these questions which have taken place in different countries. There is no doubt that there is to-day a far wider appreciation, certainly among scientists, of the dangers of nuclear warfare and that appreciation has recently spread still further to the general public.

We particularly welcome the letter which was signed, on the initiative of Bertrand Russell, by Albert Einstein just before his death, calling for an international meeting of scientists to discuss the dangers of nuclear warfare. This letter was also signed by two members of our Federation, our President, Professor Joliot-Curie, and our Vice-President, Professor Powell. The preparations for such a conference of scientists are now being actively pursued and there is every reason to believe that it will take place.

The Federation has been set up now for nine years. How far can we say that it has justified its early promise? I feel myself that the seven organizations that took part in the original foundation of the Federation and are still with us deserve to be proud of their work. For despite certain defections due very largely to the cold war they have not only maintained their activity but have added substantially to their numbers and efficiency. The affiliation in 1952 of the Union of Cultural Workers of the Soviet Union has brought us a great accession of strength. Together with the original membership of Associations in Britain, the United States, France, India and China, it entitled us fully to be considered as a world-wide organization.

### The only world-wide body

Such an organization was in those years almost unique. Indeed, the growth of the Federation in the extremely difficult time through which we have passed is a tribute to the determination and sense of responsibility of its member organizations. It was a notable achievement that through the period of the cold war such an organization could exist at all, but now that tension has relaxed we may look forward to a far brighter future. The major objective which we sought then, that of the

ending of the danger of war, is beginning to be realized. We must pass on now to the realization of further objectives, of the utilization of science for peaceful purposes. The main purpose of my address to-day, which will deal with the future rather than the past, is to discuss how the Federation can work to secure these objectives.

We are meeting under the influence of the success of the Geneva Conference of the Heads of the four Great Powers. That Conference has resulted not so much in detailed diplomatic agreements, though these will need to come, as in the creation of a new atmosphere which is felt everywhere and not least in the field of science.



The words Geneva Conference, I think, for scientists to-day, call up more than one association. Scientists are indeed almost more likely to think of it as that devoted to the peaceful uses of atomic energy rather than is the great Conference of Heads of States, though the outcome of the second conference was a direct result of the success of the first. It could never have achieved that close co-operation between scientists who hitherto had not even been permitted to meet each other, or the exchange of information which only a few months earlier had been state secrets, if it had not been part of a general relaxation of international tension. And these examples are now being multiplied.

### Increasing international co-operation

Real international co-operation, extending between countries of different social and economic systems, is now being resumed with renewed cordiality and success. I need only cite the co-ordinated international cosmic ray investigations which have been directed with such success by Professor Powell, and which now embrace practically every country in the world. Another example is the active preparation for the Geophysical Year which will take place 1956-57. Here again co-operation is world wide and already very cordial. It is along such lines of co-operation that we must look for a future for international science. It appears that science may recover its original completely international character and work for the world, and this without loss of the valuable contribution of the national traditions in each country. We as a Federation welcome all these initiatives and we will give them through the Associations and through the Federation itself our full support, and we will also encourage further enterprises of the same kind.

Nevertheless these great achievements in various branches of science are not everything that is required. There is still more work than ever for the Federation to do. In the first place we have to see that the resolutions of the Geneva Conference of the Heads of States are effectively implemented. In particular we want to see the Geneva spirit spread over the field of science. That means in the first place putting an end, and the sooner the better, to all the numerous restrictions that still cripple the international intercourse of scientists. It is absurd in the present state of the world that these restrictions are still allowed to exist, that scientists in many countries in Europe are not allowed to visit the U.S.A., and that scientists from the United States are not permitted by their Government to visit a number of countries in Europe and Asia.

This is a matter which has deeply affected our Federation itself. It is intolerable that we should be forced to meet under conditions such that not all our associated bodies can attend. Although our meeting here is a very wide one we very much miss our colleagues from the United States. We would like to be able to meet in every country in the world and to have the attendance of scientists from all countries. We would like to see the Federation go back for its next Assembly to its original meeting place in London under conditions of complete freedom of access. One of our first tasks therefore will be to try to achieve that freedom of movement for scientists which is already implicit in the decisions of the Geneva Conference.

### Need for exchange visits at all levels

Interchange of scientists can be increased in numbers and duration. Not only must we secure permission for such interchanges but we must find practical means for effecting them. This is primarily a question of financing travel and residence in different countries. Such facilities should by no means be limited as they are now to eminent scientists, but should be available for all scientists of different grades. The scientific world badly needs exchanges of students, of research workers, of professors, so that the value of the experience gained in one country can be shared by all. Here the World Federation of Scientific Workers, through its knowledge of the scientific organizations in different countries, should be of invaluable help.

We must restore the internal freedom of science. Now that most of the alleged reasons for secrecy in science have been abandoned there is little excuse for maintaining it or for the security screening or thought control that went with it. Much of the secrecy of science is now admitted to be a myth: the Geneva Conference has shown how widely the "know-how" on nuclear fission is spread. Our constituent Associations will have the support of the Federation in urging the removal of internal restrictions on science as was urged by Niels Bohr some years ago.

Although the world situation has so improved that we can discuss such perspectives rationally and hopefully, we must not forget that we are still faced with the dangers which occupied us so much in our previous Assemblies. We cannot forget that there exists in the world to-day in the hydrogen bomb a weapon of power capable of doing destruction on a continental scale. Nor on the other hand should we be carried away by exaggerated pictures of the destruction of the whole of humanity. Nevertheless it is clear that the scale of damage that could be done by weapons already in existence is one that is totally intolerable on humane grounds and represents a complete distortion of the whole purpose of science.

Our most important and urgent task remains to do what we can to stop the outbreak of war and the use of nuclear weapons of mass destruction. We still have need of a scientific conference at which these dangers can be fully and competently discussed and where the possibilities of control

can be examined free from the restrictions which diplomatic exchanges are bound to have. We welcomed the conference which was held in London at the beginning of August, called on the initiative of Bertrand Russell and others, to discuss the dangers of nuclear weapons and the means of control and inspection needed to secure their abolition. It was particularly good to see at that conference representatives from the Soviet Union, the United States and Britain, under a neutral chairman, discussing in an amiable and business-like way questions of control and inspection, and reaching a considerable degree of agreement at least as to what were the real problems.

But this is only a beginning; the conference to which we look forward must be a much larger one. It must include organizations of interested scientists from all countries, and here we can say that as a Federation we are prepared to work with any and all organizations or individuals who, though not necessarily agreeing with us in any of our other aims, are deeply concerned with preventing another world war. We do not wish for a conference of our own; we wish to take part in a conference in which the maximum support from world science can be given to a cause which is that of all humanity. Out of this international meeting we can look forward to a far greater organization which will embrace all international bodies of scientists and will enable the scientific world to express itself with a sense of responsibility on major questions in which science is likely to affect the future of society.

Such developments if they can be brought about would enhance rather than diminish the importance of a World Federation of Scientific Workers. In the present hopeful situation it may seem that many of our objectives are already achieved. But we must consider that we are a body with special responsibilities which concern the duties and rights of scientists as laid down in our Charter. This is still the case even if the danger of war is averted and we escape economic disaster. The first stage of the removing of the danger of war has been at Geneva. But the second and even more vital stage has yet to be passed. It is essential that the negotiations that are soon to take place should lead to an international agreement on the vital questions of disarmament and security.

We have still, as scientists, the responsibility of adding our voice to the popular demand that such agreements should be made and implemented. We will continue to urge the effective prohibition of nuclear weapons and the promotion of all measures which will serve to maintain a durable peace. If, as we all hope, the danger of war is averted, the World Federation and its constituent bodies can turn to its original purpose, which was: "to work for the fullest utilization of science in promoting peace and the welfare of mankind, and especially to ensure that science is applied to help solve the urgent problems of the time." This aim is all the more our concern in that in the last few years we are becoming aware that the basic conditions of our life are being rapidly changed.

### A "Scientific Revolution"

We are already in the first stages of one of the major transformations in the history of mankind. Some have called it the second Industrial Revolution but this is rather belittling its importance as well as, to a certain extent, obscuring it. For the change that is occurring now is of very much larger scope than the Industrial Revolution, and, although it has industrial aspects, its guiding spirit is more truly scientific than technical. It might even be called the Scientific Revolution for not only is science being used in the transformation of industry but it is actually leading and directing this transformation. The industries of the future will be scientifically conceived, scientifically planned and scientifically operated, to a degree that we cannot yet imagine.

The three major characters of this revolution

are those of the use of atomic energy, the development of control mechanisms and automatization, and a vast increase in biological knowledge and control. It is true that it is not limited to these main fields, it will contain as well auxiliary developments which link all major fields together and extend them into almost every corner of human activity and life.

One difference between the present change and all those that have occurred in human history is its speed. It is already evident that it is coming quickly in terms of human life, that enormous changes will occur in our generation—in a matter of twenty or thirty years. Since the beginning of the war decisive steps have been taken: atomic energy is already being converted into electric power; control mechanisms are already in operation in many industries; many of the new biological developments such as antibiotics have been used. But these are only forerunners of the greater changes that are to come.

On the question of the utilization of atomic energy, nothing that I can say can replace Professor Joliot's contribution had he been well enough to be with us. We know from his previous speeches the attention he has given to this aspect of the scientific knowledge of atomic processes. But though no nuclear physicist myself, at least I have seen within the last few days one of the first peaceful practical expressions of this new age, the atomic power station which has now been operating for more than a year in the Soviet Union. I have seen that this is not only a power station but a laboratory in which future developments of atomic power generators, some of which are already under construction, are being evolved. I know something of the similar developments that are reaching completion in Britain and now in other countries. The discussions at Geneva have shown that the field of atomic engineering is already a well-established one, that the atomic engineers are now masters of their trade and have achieved substantial results.

### Atomic energy a necessity

As it happens, these results have been achieved only just in time. Atomic energy has indeed become a necessity. It is evident that with the present increase of industrial activity in the world, and particularly in the highly industrialized countries, involving ever increasing consumption of electricity, that in the next few decades the older sources of fuel would be quite inadequate. Certainly in Britain, they are showing signs of being so already. The use of atomic energy is an absolute necessity for maintaining the rate of increase of electrical energy on which the whole of industry depends, and we may look forward in a matter of thirty or forty years to the older sources being largely replaced by the new fuels. Not only that, but new countries are coming into industrial production and setting up new demands for energy. Only with atomic sources would it ever be possible to secure that sufficient energy was available for all the countries, the underdeveloped as well as the developed countries of the world.

The use of atomic energy should make possible the levelling up of the cultures of all countries so that the standard of life enjoyed in the most favoured countries can be enjoyed in all. I myself have seen something of the first steps in this direction in China. Here there is a determination, in order to raise the standard of living, or indeed to prevent its collapse, to increase industry at a rate never before considered possible. Such transformations which are bound to spread over all the underdeveloped parts of the world will put the heaviest demands on sources of energy old and new. Beyond the use of uranium and thorium fuel we are beginning to see the possibilities of the controlled use of the hydrogen-helium reaction, the reaction of the hydrogen bomb. At the moment this is still in the speculative stage but it would seem that Sir John Cockcroft's prediction

that it will be discovered in the two thousand years for which uranium sources will be available, is a very conservative one. Most experts seem to agree, though they cannot name a date, that it may very well come in our own generation. If this happens, we shall be in a situation in which there is no question of limitation of atomic energy. It will not be a question of how much energy we produce, but how much energy we can consume.

We have only begun to envisage the possibilities of a world of free energy. It means the production virtually of unlimited food, even by the crude method of pumping water on to the hot desert belt. It means unlimited metals, such as iron and aluminium. It means free transport and travel, as well as far more things than we can yet imagine. These possibilities need now to be studied scientifically, especially the problem of co-ordinating them to avoid waste and congestion. But energy to-day, however essential, represents only ten per cent of industrial costs; in the future it will be still less, so that the provision of free energy calls for more rather than less attention to efficient machinery and chemical processes.

### The need for automation

The possibilities of the fruitful and efficient use of energy in a world of limited manpower implies a great development of control mechanisms; it is clear that already they are coming into use with extreme rapidity. I still have the vivid recollection that at the atomic energy station near Moscow the whole plant was run by two men at the main controls and four at the auxiliary; apart from these there were only maintenance and repair staff. Automatic controls have come to stay in heavy industry, in blast furnaces and steel mills. Already the manufacture of motor cars and many other mass production products is being transformed by the supersession of the man on the line by automatic handling gear and whole units are being produced, from the ingot to the packaged and tested product, by electronically operated and linked sequence of machines. The era of the automatic factory is very close. It has already virtually been reached in many branches of the oil and chemical industries.

Electronic computing machines are already

### The possibilities of science must be made vivid

*"... in the history of mankind a very important role has often been played by people who, seeing a little further than their neighbours what is now possible for mankind, have made these possibilities vivid and real in imagination by the skilful use of language and the arts. By making these possibilities vivid, by conjuring them up in the imagination, they have enormously assisted in bringing them into existence in reality. Professor Bernal's speech is in this sense a very important contribution, and we should see that it gets into the hands of millions of people all over the world.*

*In the past it has been largely the artists who have realized what is possible, and made it vivid in imagination. Our new task, because we alone have the technical knowledge to know what is now possible, is to learn more skilfully to employ language to conjure up in the people's imagination that which is now possible for mankind, and thus to assist in its realization."*

Professor Powell, as Chairman, after the presidential address.

taking over much of the work of accountancy in large firms, banks and government offices. This is clearly only a beginning. The knowledge has already been acquired which will make it possible, and not only possible but economic, to replace much of the routine tasks in clerical work by automatic electronic machines. Electronic typing and printing is not far away. It is evident that we are seeing here the end of dull repetitive work, just as in the first Industrial Revolution, in principle, there was an end to work involving heavy physical labour. Of course it does not follow that this possibility will immediately become an actuality. There are many economic vested interests that will tend to hold it back but sooner rather than later this will come about by its own intrinsic advantages.

## It is not enough that science improve industry

However, even if the application of technical advances were completely achieved, this would only mark a first stage in the liberation of mankind. What it amounts to effectively is that we are able now to do with a few people and more machinery what we could do before with many men by hand and with a great waste of tedious labour. As far as domestic life is concerned, even in the most industrialized countries, we are, apart from some labour-saving devices, living much as were those of the early civilizations of six thousand years ago when beds, tables and chairs were first invented. Science has been used very sparingly to improve the actual conditions of life. The biological environment of man has, apart from the prevention of the worst infectious diseases, been improved far less than his technical capacities have grown and is still far worse than it need be.

This is a situation which calls for action. The first important objective, and one still far from being realized, is the production of adequate food for a continually increasing population. We have never accepted the pessimistic view that the peoples of the world are doomed to starvation and disease because the population will always be growing faster than the means to support it. We know that this is simply the result of bad use of existing resources due to the retention of out-of-date systems of land tenure and exploitation, as Dr. Josue de Castro has so well pointed out. With the full use of science the land will produce enough for all.

### Present knowledge not applied

The health of the population of the world could, even with the existing knowledge, be immensely improved. But we also know that research in this field is entirely inadequate, that if anything like the effort that has been put into the sciences of destruction was devoted to a serious and fundamental study of the physiology of health and disease the whole situation would be transformed. Not only could we extend the earlier successes in dealing with the infectious diseases, but very much could be done to deal with the diseases of old age, which are to-day taking a toll quite as large as they ever took in the past. It has long been recognized that the diseases due to malnutrition and bad conditions are effectively murders of men, women and children, and that it is the first responsibility of the state to prevent them.

We should now come to realize that many of the diseases of old age are no less so, for here people are dying due to lack of knowledge of what precautions to take against the great killers, heart disease and cancer. A society that does not make sufficient effort in research to find out how to cure such diseases is dooming all its members to painful deaths far before their time. We have now the possibility, through science, of providing for

The introduction of automatic machines is already causing considerable strain and dislocation in employment. It will cause far more unless it is introduced in a socially controlled way so that its benefits are distributed. Our President has pointed out that there is an enormous disparity to-day between what is possible in the use of science and what is actually achieved. As he instanced, we have developed aeroplanes that can fly with one hundred passengers at speeds approaching that of sound, and at the same time many thousands of people are travelling all night standing in overcrowded railway carriages. Our responsibility is to see that not only are technical and scientific advances made but also that these advances are used for the benefit of all and not only of a few.

health and long life for all the people of the world; it is for us to urge that they be fully used.

We know that the changes I have just outlined are already well on their way. Sooner or later these things will happen. But how fast will they happen, how evenly will they happen, how much suffering and how many catastrophes will come between us and their realization? The history of the last fifty years shows how many obstructions—economic, military, political—have occurred to hold up progress attainable in far less time than has been actually taken to reach it.

### The other picture

The fact that the prizes that we see attainable by science are greater than they have ever been before must not close our eyes to the fact that the dangers are also far greater. On one hand we have the possibility of health and plenty, on the other hand we have that of overwhelming destruction. One need not exaggerate the capacity of such weapons to destroy all life on the earth to realize that a hydrogen bomb can in a few instants end the lives of tens of millions of people and undo the work of many centuries of patient effort of the builders of civilization. The world must be secured against the possibility of atomic war. But this in itself is not enough. War and oppression in any form must be arrested and the economic causes responsible for them need to be exposed and eliminated.

Despite the great scientific and technical advances of recent years, the lot of the people of the half of the world that is still under colonial control has not correspondingly improved and in many ways has very much deteriorated. The degree of oppression, misery and actual warfare and killing that is occurring in colonial countries to-day is probably as great as any in the worst days of the nineteenth century. Science cannot be considered to be adequately applied unless this is put an end to and the colonial peoples are given the opportunity themselves of using their own resources for their own benefit which is the benefit of everyone in the world.

The curses of war and oppression can only be removed by the action of the people as a whole through the governments which are answerable to them, but we as scientists have some special responsibility to study the scientific aspects of these questions, and to understand the possibilities and the dangers. The responsibility of all the members of our associations and of those scientists who have the same feeling but who do not yet belong to them is a double one: it is first of all towards other scientists, to draw their attention to these facts, and secondly to the whole people, to inform them of what the possibilities and the dangers are.

I have talked so far of the major trends of science and of things that will happen in ten or

twenty years, but we are also concerned, and even more concerned, with the more immediate problems. Many of the decisions taken now, this year or next, will affect vitally the future of whole peoples. Our Associations have already considered many of these questions: for instance they furnished the main items of the Presidential Address of Professor Newitt this year to the Association of Scientific Workers in Britain. In that address he pointed out the immediate need for a plan to control the use of natural resources which at the moment are being carelessly and often irreplaceably wasted; in particular he pointed out that the knowledge of the existence of atomic energy should not blind people to the need to make the most full use of existing sources of power such as coal and oil, so that the transition from coal and oil energy to an atomic energy programme should be evenly carried out.

Further, he called for urgent consideration of the effect of the transition to automatic industry on employment and training and pointed out that it would not be sufficient to try to examine these problems after the dislocation that they may cause has occurred. The value of the Federation in regard to such questions is that it can make use of the experience achieved in different countries for the benefit of others. The question of rapid industrialization which I have already mentioned is one important example.

### Helping all countries to reach highest level

There is an immediate need to facilitate the transition of all countries to the level of the most advanced. This calls for the maximum use of science and for united efforts not only of the scientists affiliated to our Federation but all the scientists of the world. Here there is no question however of imposing on science any uniformity on a world scale, still less of drawing all the scientific ability of the world, as is happening to-day, to highly industrialized countries and leaving it to decay in many of the countries of its origin. We in the Federation stand for the flourishing of the national traditions of science of the different countries, and I may add the creation of new national traditions in countries which have hitherto been kept from the knowledge and the utilization of science. The great contributions that have been made in the past, as the history of science shows, have been made by men associated together in schools of science which have a long tradition which it would be a tragedy to lose. Nevertheless it is true to-day that for any serious scientific enterprises international co-operation is absolutely necessary. We wish to further that international co-operation to the highest degree without sinking the national contributions and experience already referred to has shown that this can be done.

There is yet another sense in which the transformation of our times urgently concerns the Associations which make up the World Federation of Scientific Workers. The great change towards an era of atomic energy and automatization already needs far more scientists and more appreciation of science among the people than has ever been demanded before. Everybody must become in some sense a scientist, at least as far as understanding the language of science and its mode of thought, and in being able to handle intelligently the new tools which science will offer them. The workers of to-morrow need to know not only how to use these tools, but find out how to improve them. Modern, scientifically designed industrial equipment is now so expensive that to hand it over to workers who from lack of training use it without thinking is a waste. The turnover of modern mechanical equipment has now reached about three years, and it would be worth while giving charge of it only to people with sufficient scientific education. This means a general upgrading of all employment and an enormously greater number of potential scientists. The proportion is growing year by year, and we see at the moment no limit to it.

Now our Federation is largely composed of such scientific workers, and our Associations are primarily concerned with securing for them the social and economic conditions which will enable them to live full lives and to be able to use their abilities to the utmost in their work. This was the function of the oldest member of the Federation, the Association of Scientific Workers of Britain, founded as far back as 1918. But science is now being needed on a scale unimagined then. Science can never flourish unless the individual scientist is given sufficient material support and sufficient status in society to be able to do his work in conditions of freedom from anxiety and to be sure that his work is adequately appreciated and applied.

### The status of scientists

In some countries, it is true, there is already some approximation to ideal conditions for scientific work. In many countries however this is not the case, and very far from the case. In many countries scientific workers have the greatest difficulty in merely existing, and their status is kept so low that they are not considered in framing industrial or government policy. Here it is that the Federation can help. The Associations where they exist in those countries are fighting against these conditions and demanding the proper place for science. It is the duty of the Federation to help them in this effort by discussing with them how these problems have been solved in other countries and by giving them their support in every way they can for raising the status of science in their country. I know that the Federation and its Associations are doing this now but they will need to do even more in the future.

The justification of a Federation is that each Association can work the better for belonging to it. Nevertheless, the sense in which an Association can benefit from the Federation is not only or even mainly a material one. To a certain extent the individual association gains as much by what it does for the Federation as what the Federation does for it. For by helping scientific workers in other countries we are helping ourselves. The uneven development of industry and culture in different countries is in itself one cause of the strain and poverty that is the curse of the world to-day. For a larger proportion of the world to live on a higher standard does not mean a diminution but an enhancement of the standard of life in the better-off countries, because they will need to produce more goods, and goods of a better quality, for a larger number of consumers.

### Poverty, ill health, ignorance anywhere a danger to us all

The fact is that a poor man anywhere in the world impoverishes everybody, because he is not equipped to produce a small fraction of what he could, nor can he consume what he needs. A sick man anywhere in the world endangers the health of all. An ignorant man anywhere in the world not only is a loss, and in some cases an irreparable loss, to the world's fund of knowledge, but the existence of ignorance is a danger to knowledge. The great intellectual gifts of the Greek philosophers were seriously diminished and indeed distorted by the existence of the ignorant slaves on whose labour they depended. And finally, an unhappy or frustrated man is a danger to the whole of civilization, because he can be exploited, as the example of Hitler well shows, for cruelty and destruction.

It is in the interests of all of us, as well as our duty, to abate human misery and to secure that the fullest use is made of human resources. Nothing that can be done with atomic energy, nothing that can be done with automatization, nothing that can be done with increased use of biological knowledge can equal what can come from the free use of the resources of the human brain and human spirit. For that reason also our

concern is not only for the fully formed scientist, but for the scientist to be. We stand for a greater spread of scientific education and the ending of its restriction to the more favoured classes, indeed this is written into our Charter. We need to ensure that this increase of scientific education comes quickly, and at the same time that it is not narrow, so that the new scientists do not become mere tools but responsible members of a democratic enterprise.

What I have said should be enough to give the outline of the tasks that lie before us in the Federation. We have to continue our struggle against the dangers of the use of science for war and we must redouble our demands for its use for peace, for improving international relations of

scientists, and for ensuring the further education of the scientist for this new work. In all, our task is to develop the full possibilities of science in a new world situation. We will in our discussions consider these questions in some detail, compare experiences from different countries, and devise concrete activities that we can undertake to see that the aims we set ourselves are really achieved.

We meet here as the representatives of scientific associations conscious of the dangers and the possibilities of the world to-day. We hope that we shall be able to find a way to discharge these responsibilities and that this Assembly may be the starting point for a new and happier era in the activity of our Federation.

## Resolutions passed by the Fourth Assembly

### ON INTERNATIONAL COLLABORATION

*This Assembly welcomes with enthusiasm the recent amelioration in the relations between the powers which has followed from the Geneva Conference between the Heads of States, and the possibilities thus created for greatly extending international scientific collaboration. An outstanding example of these possibilities has been provided by the Geneva Conference on "Atoms for Peace."*

*The Assembly expresses its deep conviction that the wide extension of such collaboration is of great importance in contributing to the maintenance of peace, to the strengthening and development of the different national scientific traditions, and to the promotion of human welfare all over the world. Only through such collaboration, and the establishment of friendly relations and mutual respect between the scientists of different countries, will the present possibilities of advance, and the great perspectives which are beginning to open out for the future, be realized.*

*The Federation is therefore deeply concerned to promote international collaboration, with all the means at its disposal and in association with other organizations. The Federation will help to find the wide variety of concrete forms in which the collaboration must be practised, and to assist in removing all the differences which may hinder the free exchanges between scientists in different countries.*

*The Assembly, deeply concerned with the problems of young scientists, urges all scientists of the older generation to assist and support them with the benefit of their experience and advice. It also instructs the Executive Council to take all possible steps to promote international understanding and friendship between young scientists of the world.*

### ON THE NEED FOR AN INTERNATIONAL CONFERENCE

*The use of nuclear and thermonuclear weapons in war would produce a disaster beyond any human history. The full extent of the death and suffering it would cause cannot yet be gauged. Many of its consequences are indeed at present unpredictable. From facts already available, however, we know that it could produce hundreds of millions of victims and serious genetic and other long term effects. Even the experimental explosions of nuclear weapons have caused death and disease. These horrors have been made possible as a consequence of scientific discoveries and it is the first duty of scientists to do all in their power to prevent their occurrence.*

*The Assembly accordingly welcomes the initiatives already taken by numerous scientific organizations and individuals in protesting against atomic war. We join them in urging on all governments the conclusion of negotiations which would make it impossible.*

*The effectiveness of the action of scientists greatly depends on the achievement of co-operation between them. Here the success of the Geneva Conference on the Peaceful Uses of Atomic Energy has already shown what can be done. However, from the very fact that the dangers of the military uses of atomic energy could not be discussed there it is evident that, for the purpose of preventing atomic war, Geneva is not enough.*

*A further conference of comparable importance and authority is still urgently needed. It should examine, in the light of indisputable facts, the nature of atomic warfare and the ways of averting it. It would consider the scientific aspects of the problem of the prohibition of atomic weapons and the possibilities of ensuring their adequate control. The conference, apart from its scientific contribution, would serve the indispensable purpose of providing the public with reliable information of vital importance to them.*

*Such a conference to be effective must be of the widest character embracing scientists in all principal countries and of different opinions.*

*The Federation declares its willingness to give its fullest support to any sufficiently qualified and representative conference. Such a conference was called for in the letter signed by Bertrand Russell, Albert Einstein, Frederic Joliot-Curie and other world-famous scientists. It should give effective expression to the moral responsibilities of scientists. The Federation will co-operate in this with other organizations of scientists to ensure that a conference is held as soon as it is technically possible. It is in this way, we are convinced, that scientists can best contribute to preventing atomic warfare and securing a permanent peace.*

## Increased Number of Countries Represented

Report by P. Biquard.

THANKS TO THE kindness and the efforts of our friends, the *Gewerkschaft Wissenschaft*, the Federation held its General Assembly in the Large Meeting Hall of the German Academy of Sciences in Berlin. All the affiliated organizations were represented except for the American Association of Scientific Workers, and the report of this organization was listened to attentively and greeted with great applause.

Observers from Belgium, Korea, Norway and the German Federal Republic took part in our discussions so that scientists from sixteen different nations, listed by name further on, were present.

Our President, Professor Joliot-Curie, was unable to be present in Berlin because of his health. His message (p. 11) was welcomed with acclamation, and this demonstration was repeated at the end of the General Assembly when he was unanimously re-elected President of the Federation. The Assembly decided to send him a telegram, as to other members of the Executive Council who were unable to take part in our work.

The General Assembly first heard a speech of welcome from Professor Friedrich, President of the German Academy of Sciences, and then, at the proposal of the Chairman of that session, Professor C. F. Powell, paid solemn and heartfelt tribute to the memory of the great Albert Einstein.

Professor J. D. Bernal then gave the opening address, as the Executive Council had requested. The full text is published in this issue of the BULLETIN.

The Chairman of this first session of the General Assembly was Professor C. F. Powell, assisted by Professor Friedrich and Professor Rienäcker, Chairman of the *Gewerkschaft Wissenschaft*.

The Chairmen of the later sessions were as follows:

- 2nd Session** G. Rienäcker (G.D.R.) assisted by J. Fukatko (Czechoslovakia) and G. P. Nørregard (Denmark).
- 3rd Session** K. I. Kishore (India) assisted by D. Smolenski (Poland) and J. Hevesi (Hungary).
- 4th Session** Chou Pei-Yuan (China) assisted by P. Ahmad (Pakistan) and W. J. S. Pringle (Great Britain).
- 5th Session** F. Netter (France) assisted by I. M. Kulchov (U.S.S.R.) and A. Torben Lund (Denmark).
- 6th Session** K. Matsui (Japan) assisted by J. Z. Jakubowski (Poland) and M. Rodinson (France).
- 7th Session** A. I. Oparin (U.S.S.R.) assisted by J. D. Bernal (Great Britain) and W. Hartke (G.D.R.).



Dr. Ahmad (Pakistan), Professor Chou Pei-Yuan (China) and Dr. Biquard

During these sessions the Assembly first considered the recent work of the Federation, when it discussed and adopted the reports from the Provisional Secretary General, P. Biquard; the Treasurer, W. A. Wooster; the Editor, E. G. Edwards; and from E. H. S. Burhop, who had been put in charge of the work relating to an international scientific conference on the dangers of atomic weapons. Previously, however, the Assembly unanimously ratified the proposal of the Executive Council that Dr. Josue de Castro be accepted as corresponding member of the Federation for Brazil.

The reports on the activities of the various affiliated organizations and the contributions of the observers gave as usual valuable information of mutual interest. Before the Assembly divided into Commissions for a more detailed study of immediate problems, the following general reports were given:

Professor C. F. Powell (Great Britain) on International Scientific Co-operation (see p. 8);

Professor A. Torben Lund (Denmark) on Patents and Authors' and Inventors' Copyright (see p. 9);

Engineer I. M. Kulchov (U.S.S.R.) on the Legal and Economic Status of Scientific Workers in the U.S.S.R. (see next issue).

The Fourth General Assembly of the W.F.S.W. was held at a time when the international situation had improved, as the Geneva Conference on the Peaceful Uses of Atomic Energy made quite clear to scientific workers in every land, without making them lose sight of the importance of following up this success. Thus there is a poss-

ibility of tackling problems in a more concrete way and drawing up a programme of activity, the principal points of which are the economic and legal status of scientists, the perspectives of international scientific co-operation, and the action to be taken to ensure that a scientific conference on atomic dangers is called. As our Vice-President, Academician A. I. Oparin, remarked in his closing speech, the Federation has reached manhood.

We have then to develop our activity on the lines of the decisions that were taken. We must strengthen our Federation, both by seeking new affiliations and by collaborating with other national and international organizations, and keep ever in our minds this phrase from our Constitution which, in four languages, adorned the Hall where our Assembly was held:

"Science for Peace and the Welfare of Mankind."

In addition to the General Assembly work, following the decision of the Third Assembly, one session was devoted to the problem of the popularization of science. Professor K. T. Bratanov, Secretary of the Union of Scientific Workers of Bulgaria, took the chair; an introductory statement was made by Maurice Goldsmith (Great Britain) and contributions were made by Academician Oparin, M. von Ardenne (G.D.R.), Dr. P. Ahmad (Pakistan Association of Scientific Workers) and several German colleagues.

We must also report that at a special public meeting for students held at the Humboldt University, Professors C. F. Powell, A. I. Oparin and Chou Pei-Yuan outlined the present situation in science and the future possibilities.

Finally, many delegates and observers gave specialist lectures on their own scientific research both in Berlin and elsewhere in the G.D.R.

## OFFICIAL LIST OF DELEGATES AND OBSERVERS AT IV ASSEMBLY

## BRITAIN

BERNAL, J. D., Professor, FRS	<i>Vice-President WFSW</i>
POWELL, C. F., Professor, FRS	<i>Vice-President WFSW</i>
WOOSTER, W. A., Dr.	<i>Treasurer WFSW</i>
EDWARDS, E. G., Dr.	<i>Honorary Secretary WFSW</i>
CROWTHER, J. G.	<i>Member Executive Council WFSW (Secretary General 1946-55)</i>
BURHOP, E. H. S., Dr.	<i>Secretary to WFSW Commission for Internal Scientific Conference</i>
GOLDSMITH, M.	<i>Press Officer WFSW</i>
RIMEL, Miss A.	<i>Assistant Secretary WFSW</i>
PRINGLE, W. J. S.	<i>Delegate Association of Scientific Workers</i>
WELLS, L. H.	<i>Delegate Association of Scientific Workers</i>

## BULGARIA

BRATANOV, K. Ts., Professor	<i>Delegate Union of Scientific Workers of Bulgaria, Member Executive Council WFSW</i>
UNDZHIEV, I. K., Professor	<i>Delegate Union of Scientific Workers of Bulgaria</i>

## CHINA

T'U CHANG WANG, Professor	<i>Honorary Secretary WFSW</i>
HUA LOO-KENG, Professor	<i>Delegate All-China Federation of Scientific Societies, Regional Member of Executive Council WFSW</i>
CHOU PEI-YUAN, Professor	<i>Delegate All-China Federation of Scientific Societies</i>

## CZECHOSLOVAKIA

MALEK, I., Academician	<i>Honorary Secretary WFSW</i>
NEMECS, T.	<i>Secretary to Regional Centre WFSW</i>
FUKATKO, J., Professor	<i>Delegate Commission of Scientific Workers, Czechoslovak Union of Educational Employees</i>
THURZO, V., Dr.	<i>Delegate Commission of Scientific Workers, Czechoslovak Union of Educational Employees</i>

## DENMARK

LUND, A. TORBEN, Professor	<i>Delegate Society for the Protection of Scientific Work</i>
NØRREGARD, G. P., Dr.	<i>Delegate Society for Protection of Scientific Work, Regional Member of Executive Council WFSW</i>

## FRANCE

BIQUARD, P., Dr.	<i>Provisional Secretary-General WFSW</i>
NETTER, F.	<i>Delegate Syndicat National des Travailleurs de l'Energie Atomique (and for Assoc. des Trav. Scientifiques)</i>
RODINSON, M.	<i>Delegate Syndicat National de l'Enseignement Superieur et de la Recherche Scientifique</i>

## GERMANY

HARTKE, W., Professor	<i>Delegate Gewerkschaft-Wissenschaft (GDR)</i>
RIENÄCKER, G., Professor	<i>Delegate Gewerkschaft-Wissenschaft (GDR)</i>
	<i>and 17 observers</i>

## HUNGARY

HEVESI, J.	<i>Delegate Association of Technical and Scientific Societies</i>
VALKO, E., Dr.	<i>Delegate Association of Technical and Scientific Societies</i>

## INDIA

KISHORE, K. I., Dr.	<i>Delegate Association of Scientific Workers of India</i>
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## JAPAN

MATSUI, K., Professor	<i>Delegate Association of Democratic Scientists</i>
NAKAJIMA, S., Dr.	<i>Observer</i>

## PAKISTAN

AHMAD, P., Dr.	<i>Delegate Pakistan Association of Scientific Workers</i>
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## POLAND

JAKUBOWSKI, J. Z., Professor	<i>Delegate Federation of Scientific Workers</i>
SMOLENSKI, D., Professor	<i>Delegate Federation of Scientific Workers</i>

## U.S.S.R.

OPARIN, A. I., Academician	<i>Vice-President WFSW</i>
KUCHARENKO, Mme. L. I., Professor	<i>Delegate Union of Cultural Workers</i>
KULCHOV, I. M.	<i>Delegate Union of Cultural Workers</i>

## BELGIUM

VANDENDRIESCHE, L., Professor	<i>Observer</i>
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## KOREA

CHOU MEN-HAK, Professor	<i>Observer</i>
KIM QUAN-DIN, Professor	<i>Observer</i>
LE KEN-GU, Professor	<i>Observer</i>

## NORWAY

ROSENQVIST, I. Th., Dr.	<i>Observer</i>
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# INTERNATIONAL SCIENTIFIC COLLABORATION

*In his speech to the Assembly Professor C. F. Powell, Vice-President of the W.F.S.W., said:*

**I**NTERNATIONAL scientific collaboration is a great transforming force which can bring fundamental improvements in the condition and prospects of mankind, and one of our most important tasks is to consider practical steps to promote it on the widest possible scale. But experience here is limited, and every practical example, however small and however trivial it may seem, should be treasured. A number of points have already been briefly mentioned. Academician Malek has pointed out that the World Federation helps to make personal contacts which can be very fruitful, and that through its Prague office it has helped to secure visas for foreign scientists to visit his country. I want to try and make another small contribution to this important theme.

From its early beginnings, modern science has, at least until recently, always been an international undertaking in the sense that it has depended upon the free communication of ideas and results between workers in different countries. We now know that conditions in which it can again flourish are beginning to be restored, greatly to the common advantage of scientists all over the world. But in addition to the exchange of information, there have, from time to time, been examples of an even closer international collaboration in which many people have worked together with a single common aim. In 1828, for example, a world-wide magnetic survey was organized by von Humboldt. We get some small impression of the enthusiasm with which this collaboration was viewed from some remarks made by Clark-Maxwell, nearly a hundred years ago, when he wrote: "Bacon's conception of experiments in concert was thus realized. The scattered forces of science were converted into a regular army, and emulation and jealousy were out of place, for no man's observations were of any value until combined with those of others." An international effort of a similar character is now being organized in connexion with the International Geophysical Year, and scientists all over the world will welcome the fact that the forces engaged in it will be more widely representative than ever before.

But these are not the only forms of scientific collaboration. Science is transforming human life and is itself changed in the process, and so also the nature and content of international scientific collaboration. When I was asked to make a contribution to this discussion, it was suggested to me that it might be useful to give a few illustrations from my own experience which have a bearing on these questions, and which, in a modest way, may perhaps give some guidance in other fields of study where collaboration may be brought about in the future. If I speak about my own experiences, it is only because of their bearing on this important general problem.

## A practical example

A few years ago, in that branch of physics which concerns itself with the ultimate structure of matter, there appeared to be good reasons for making experiments at great altitudes with free balloons. We wanted to carry our detecting apparatus—blocks of photographic plates—to high altitude so that the tracks of the cosmic rays should pass through them and their effects be recorded. In order to secure these exposures, we found that we had to undertake operations in southern latitudes; in particular we found that

Italy was an appropriate place. For practical reasons which I need not describe, it was found desirable to allow the equipment, after its flight at great altitudes, to fall by parachute into the sea, and to retrieve it with naval assistance.

The cost of this undertaking was such that it could not be met by a single laboratory acting alone, so we approached some of our colleagues in Italian and other universities with a view to establishing a collaboration. As a result we were able to muster sufficient forces to undertake an expedition, and flights were made from the island of Sardinia. For the success of the operations, we were indebted to the contribution of the Italian naval authorities who helped us greatly in recovering the equipment after it had fallen by parachute into the sea.

The second reason for the collaboration was that the investigation of the resulting photographic material under the microscope was very arduous. A serious effort to discover new elementary particles and their properties, which the new experimental material made possible, could only be made if people in a number of laboratories joined together in a common effort. This first enterprise had some success, and was followed a year later, in 1953, by another expedition, also to Sardinia. By this time, the extent of the collaboration had increased so that about twelve laboratories, mostly from Western Europe, were engaged in it. Finally, last year and this, similar expeditions have been made to northern Italy. The latest is still in progress, and I am very happy to say that it is supported by the following among a number of universities—by the Universities of Berne, Bristol and Budapest, of Göttingen and Paris, of Prague, Turin, Moscow and Warsaw. I think it would be generally agreed that these expeditions have played a valuable part in contributing to the discovery of new forms of matter, the mesons and hyperons, and the elucidation of their properties. This contribution could not have been made, or would have been much less effective, without a successful collaboration.

## New possibilities

In considering the experience gained in this work, I think the first point to notice is that there was a genuine need for a collaboration on a new scale. It was possible for us to attack our problems only if we worked closely with one another. A sufficient effort could not have been made by the members of a single laboratory working alone. The collaboration was therefore established in response to a real need, and enabled us to attack problems which without it we could hardly have approached.

The second feature of the collaboration was the advantages which followed from it. There was first of all, of course, the great increase of power brought about by mere numbers alone. But a more important point was that, through collaboration, we were able to bring to bear upon a common problem the capacities, the skills, the scientific traditions, of scientists from many different countries. Every national scientific tradition has its relative strengths and relative weaknesses. When we work together for the solution of common problems, we are able to ensure that these weaknesses are corrected, and that we present a common front of strength.

A third feature of the collaboration is that it has allowed members of small laboratories to be engaged in important experiments at the centre of interest of contemporary physics. The collaboration ensured that they could make a valuable contribution to the progress of the work. They, and all the members of the collaboration, were



strengthened and sustained by the fact that they were not alone, that they had friendly colleagues who were concerned for the progress of their work and who appreciated the efforts which they were making. In science, as in all aspects of human affairs, nothing is so fruitful as a little humanity; a little solicitude goes a very long way.

## Priority not so important

Finally, another advantage of the collaboration has been that it tends to diminish a certain spirit of competition between workers in a common field of study. This element often arises when people are rushing to secure priority for discoveries, but it tends to disappear between the members of a collaboration where a success for one is a success for all.

Such advantages are, of course, to some extent balanced by disadvantages. There are centrifugal tendencies. But the general development of human society is a manifestation of the fact that, on the broad scale of history, there are great and overwhelming advantages in collaboration, in the establishment of ever more complex forms of collaboration; and that these advantages outweigh all the tendencies which tend to drive people apart. We have found it possible to establish a relation of mutual trust between the members of the collaboration without which it would have failed. A very good rule—it is really a very old one—is that a member of the collaboration should have the same concern and solicitude for the others as he has for himself. In our experience, if this is put into practice, the collaboration is likely to flourish.

I said at the beginning of my remarks that the collaboration was set up in response to a particular, real need but, having established it, we found that there were other important fields into which it could be extended. Today great sums of money are spent in building the great accelerators for producing high speed atomic particles. The most powerful of the accelerators in operation at the present time is the machine producing protons of energy six milliard electron-volts at Berkeley, California. A machine of similar

design, but of greater power, is coming into operation in the Soviet Union in the course of next year."

It is a sign of the times that physicists are still awed by the fact that these machines cost as much as a battleship. I think that it will not be long before this comparison no longer impresses them, but the demands which the construction of these machines makes upon the resources of individual states, especially of the small states, is very great. Indeed, it is hardly possible for any state other than the U.S.A., the U.S.S.R. and one or two others, to undertake the construction of the largest machines of this type. It may also be questioned whether it is desirable for many of them to be built. The field of study opened up by a new machine may sometimes be effectively explored by means of an international collaboration so that a duplication of machines is unnecessary.

In this situation, it is very satisfactory to us who have been engaged in the collaboration I have

described, that it is now being extended to work on the machines. Many laboratories all over the world are greatly indebted to our American colleagues of Berkeley, in California, for the very generous way in which, promptly and without conditions, they have exposed photographic plates to the particles provided by their machine. We may hope that collaboration in this particular field will continue to grow because of the great advantages that it offers, and that it will be extended even more widely than it is at present.

### Transforming force of our times

I said at the beginning of my remarks that international scientific collaboration is going to be the great transforming force of our times. The popular imagination has recently been excited by the possibilities of launching a small artificial satellite which gives us a faint insight into the great advances which are to come. I was reminded

of these possibilities when, during a study of the early history of ballooning, I read of the existence in Standon, Hertfordshire, of a memorial to the man who made the first balloon ascent in Great Britain. The inscription runs: "Let posterity know, and knowing be astonished, that on September 16th, 1784, Vincent Lunardi of Lucca in Tuscany, the first aerial traveller in Great Britain, ascending from the Artillery Ground in London and traversing the regions of the upper air for two hours and fifteen minutes, in this spot revisited the earth. On this rude monument for ages be recorded that wonderous enterprise, made possible by the powers of chemistry and the fortitude of man..."

How shall we celebrate those even greater achievements made possible by our recent technical advances? What memorial shall we raise to those representatives of international scientific collaboration who will be the first to circumnavigate the solar system and return to earth?

## The Protection of Results of Scientific Work

Speech by Professor A. Torben Lund, Faculty of Law, University of Aarhus, Denmark, to Fourth Assembly.

THE WORK of scientists is of such a nature that it is able to give concrete results in different ways. When in the following I use the word Scientist, I am thinking of all scientists in the fields of social science as well as that of natural science.

Concrete working results can appear in different ways. Occupation with thinking or with investigations may result in a *discovery*. Perhaps it may be a discovery of certain laws in nature, or a discovery of a new law of language, a new star or a new way in which social or economic life can be affected. All such thoughts or ideas or findings of facts are included in the term "discoveries."

The technical application of the discovery makes possible its development for industrial purposes, thus opening the way to its practical utilization and economic distribution. The finding of such technical utilization of one or more discoveries is named an *invention*.

Thus scientific work may result in discoveries or inventions but these sorts of working results are not the only ones known in the scientific world. The scientific worker may give an account of his work in writing, in a scientific journal or in a publication which is put on sale, in a verbal communication embodied in the minutes of a meeting of a learned body or in some other way. In this way scientific works result in a *literary work*. Further scientific thoughts may be laid down as *technical drawings*, graphs, plans, sketches etc.

For these different sorts of working results, claims of protection have been put forward, and have been partly satisfied. In the following I shall try to give a brief view as to the protection of scientific work, the results which have been obtained and the claims still remaining. Taking into consideration that I am speaking to an international assembly I shall try to concentrate upon the international aspect of the problem, but to assist the understanding thereof I am obliged



Professor Lund (right) with Dr. Norregard (Denmark)

to introduce the different special problems in a general way.

### Protection not a new idea

The idea of protecting the works of the mind is not a new one. During the Middle Ages and the following centuries a certain protection was given to the creators of certain works, including those in the scientific domain, by means of privileges. As an example it may be mentioned that the famous anatomist Vesalius obtained a privilege for his main work "*De corporis humani fabrica*," published in 1543. But it was only during the French Revolution that the idea of a common law protecting all authors and all inventors was created in Europe. In fact, a common legal protection was granted during the Revolution, both concerning inventions and literary works. A Patent Law was promulgated in 1791, and a general copyright law by the National Convention in 1793. In the report, which forms the base of the copyright law, it is stated: "Among all the properties, the one which is the least fit for contradiction is without doubt the ownership of the productions of the mind."

It is quite clear that the question of giving some protection to the creator of products of the mind is a problem of the greatest interest from the view of the scientist himself. He is a worker, a worker in the domain of mind of course, but for all that a worker, and it must be a matter of public interest to secure him a suitable reward for his achievements. In the U.S.A. the protection of

literary works and of inventions is based only on the thought that it is possible in this way to promote the progress of science. For us it is a general idea, that protection is given not only in the interest of the community but also in the interest of the author, the creator himself. Protection has a double purpose. It is important to promote the progress of science, but it is also important to secure for the creator of a work or an invention some control over his creation. Between the creator and his work exists a tie. He is interested in governing the public use of his work in such a way that he is able to gain some economical profit of this use, and he has a deep interest therein that the use is made in such a way as not to violate his reputation as a scientist. The tie between the creator and his work is not only an economic tie, it is also a tie bearing a stamp of personal interest.

On the other hand this right of control cannot be an absolute one. All progress of science is based upon the results already won, and it is a matter of great importance that it is possible to build upon existing knowledge. The rules given in the domain of intellectual property are based upon the outlines here mentioned. In general, it may be said that the law may give a certain protection to working results, laid out in a way to be useful to the general public, in the form of a patent right. Such a protection is mainly of an economic nature but comprises some elements of personal control.

Further, some protection is given to the literary way in which scientific thoughts are brought to the public. Here we are dealing with copyright protection. It is a protection containing personal and economic elements. Perhaps we might say that the personal factor is predominant. Finally it is a fact that in no country the scientific idea or thought itself enjoys any protection at all, at any rate no protection similar to protection of property.

### UNESCO committee

It is quite clear that the exclusive right granted to the invention or the scientific literary work must be a protection attached to a certain territory. Each state can decide what shall be allowed or prohibited on its own territory, but not on the territory of other states or as to subjects of other states. Therefore the protection is originally a national protection, but by virtue of agreements

between the states a certain international protection may be gained.

In December 1953 a committee of experts met in UNESCO headquarters in Paris in order to deal with the rights of scientists. As a member of this committee I am able to give you some information of this subject.

The committee was of the opinion that, apart from rights which are already protected in various countries by the laws relating to copyright, patents of invention and by various other laws, scientists might have other rights by virtue of their activity in scientific research. However, at present, I shall confine myself to giving you some information as to patents rights and copyright.

In an American book, recently published and dealing with different sorts of intellectual property, it is stated that patents form by far (observe the words "by far") the most important group among those having the appellation of intellectual property. Perhaps it may be right referring to the amount of capital invested in objects attached to the patents rights as compared with works subject to copyright; not even this is certain. But from every other point of view this must be contradicted. It is not correct as to the quantity of works protected in the one or the other way, and as to the importance of the protection we should say that it is impossible to make any comparison between inventions and literary works.

While I am starting with the rights of the inventors it is not because I find these rights more important than the rights of authors. In fact patents are of importance only for a quite small group of scientists, while copyright is a problem interesting all kinds of scientific workers.

The patent is an exclusive right given to inventors of a technical device. It may be a new machine, a new substance having some new quality, or a process. In many countries, it is claimed in the law that only inventions which can be used in industry are patentable. If this be the case it is very doubtful if patents can be obtained for new machines or instruments only destined for use in research laboratories, and having no direct immediate importance for industry.

As said before, every country has its own patent laws, and no patent laws of any one country are exactly the same as the laws of any other. Patent protection has some international features. Patent laws most frequently permit the inhabitants not only of their own country but also inventors from other countries to file an application for patent protection. For instance, a scientist from any country in the world is allowed to obtain an exclusive right to his inventions in Denmark, independently of whether Danish inventors are protected in his country of origin. There is no condition of reciprocity, as is the case with copyright.

### Registration of patents

As to the conditions of protection, all countries which grant an exclusive protection to inventions claim a registration, and the right is only given to new inventions. Some countries, among them the Scandinavian countries, subject a patent application to a thorough examination as to the novelty, before a patent is granted thereon. Some countries, Great Britain and others, examine patent applications but only with respect to domestic patents issued during the last fifty years. In other countries the patent office leaves the examination as to novelty to the courts. This examination is only carried out when a patent becomes involved in litigation. France belongs to this group.

In the U.S.S.R. patents play practically no part at all. There an inventor receives a so-called "Inventor's Certificate," which grants him various privileges and financial remuneration, the extent of which depend upon the importance of the invention. This arrangement has no effect on inventors from countries outside the Soviet Union.

A large number of States have formed an international union for the protection of industrial property, the Paris Union. The Paris Convention of 1883 secures mutual protection for the inhabitants of the States belonging to the union, and it secures a certain minimum protection as well as some other advantages, but it is a drawback, from an international point of view, that there is no uniformity in the systems, and that it is necessary to apply for protection in every single state in which protection is wanted. Further it is deplorable that there are countries which render no international protection at all.

A very important matter is the question of inventions made by an inventor engaged in a factory, a laboratory, a university etc. It should be a rule that the invention always belongs to the inventor unless the rights have been transferred to the institution either expressly or tacitly (as a consequence of his contract). And even in this case it should be a rule that the inventor can always claim a remuneration corresponding to the nature of his invention. Such is not always the case nowadays. A new Danish law, promulgated on 29 April 1955 regulates the position of the inventors, giving them the necessary protection in that respect. Similar laws have been given in some other countries, in favour of the inventor.

### Copyright protection

I shall now deal with copyright protection. When a scientific book has been written, an article has been published in a periodical or a lecture has been given, the author has need of protection against any new publication of his work without his consent. If such protection be granted, he is able to draw some economic profit out of the publication and he is in such a position that he can himself decide the conditions. In this way also his reputation is protected, and in scientific work this side of the protection is perhaps the most important one.

The laws of most states in this world grant the scientific author such protection. In European countries and many other countries the protection arises when the work is created, and no application for the protection and no registration is claimed as a condition of the protection. In this respect the protection is more simple to obtain than in the case of inventions. However some American countries claim a registration also in respect to literary works as a condition for granting them copyright, and amongst these countries are the U.S.A.

The protection is not an absolute one. It is—fortunately—permitted to cite the works of other authors, and several other exceptions are made.

Copyright protection is also extended to technical drawings etc., which are often a part of a scientific work. In the Berne Convention is given an enumeration of protected works. Pertinent to the works of scientists is the following extract of the Convention, Article 2:—"The expression 'literary works' shall include any production in the literary or scientific domain, whatever may be the mode or form of its reproduction, such as books, pamphlets and other writings; illustrations, geographical charts, plans, sketches and plastic works relative to geography, topography or science." The word "or" is strange, but the sense is clear. Also lectures are mentioned.

### Rights of the author

It is very important that the protection is not only an economic one. Certain special provisions show this quite clearly. Article 6 of the Berne Convention states that, independently of the author's copyright (in common sense) and even after transfer of the said copyright, the author shall have the right to claim authorship of the work as well as the right to object to any distortion, mutilation or other modification of the said work which would be prejudicial to his honour or reputation. This protection is also secured for

the scientific author. His work must not be changed without his consent, and he has the right to be mentioned as author in every case of publication of his work. Even if he has transmitted his rights to a publisher or the publisher use the rights to publish the work without consent in some special cases, this right, the so-called *droit moral*, must be respected.

I have mentioned the Berne Convention. This Convention was established in 1886, it has been revised by some international conferences; among other conferences of revision such a conference was held here in Berlin in 1908. In most of the countries of the world copyright is only granted to the inhabitants of that country, and protection is only granted to inhabitants from other countries under the condition of reciprocity. So the Berne Convention is of the greatest importance in that it secures reciprocity among all the countries which have associated themselves to the international copyright union, the so-called Berne Union.

The Berne Convention not only secures copyright protection for all the authors belonging to one of the union countries, but it is also important in that respect that it secures a minimum protection at a rather high level. It deserves to be mentioned that the Convention provides in Article 8, that the authors of the different states belonging to the union, shall enjoy in the other countries of the union, the exclusive right of making or authorizing a translation of their works.

### No copyright in some countries

Unfortunately not all countries of the world are members of the Berne Union. As to Europe, all states are members, both the states of East and West, with one important exception: the Soviet Union. In Asia a number of states are members, but China is not among these. Neither the Soviet Union nor China grant any international copyright protection at all. In America only Canada and Brazil belong to the Berne Union. The other countries, which claim an application for copyright as the condition of granting such protection, are not eligible as the Berne Convention does not allow such a system.

In order to secure mutual international protection among, as far as possible, all the states of the world, UNESCO has taken up the work of elaborating a convention, allowing all countries notwithstanding one or the other system of copyright and notwithstanding a lower or higher level of the protection, to accede. An expert committee has drafted such a convention; I had the honour to be one of its members. In 1952 all states of the world were invited to Geneva in order to adopt the convention, and it was signed by delegates from 40 states. Among the signing states were several states outside the Berne Convention, including the U.S.A. It was decided that the convention should come into force when it has been ratified by 12 states, among them four states which are not members of the Berne Union: the new Geneva Convention has just come into force.

So an international system of copyright available for all countries in the world has been established, and it is to be hoped that the countries which nowadays grant no protection and do not pay for the use of the works of their scientific colleagues abroad, shall give a new example of international understanding and accede to the new convention.

A common problem which affects the international protection for inventors as well as authors is the problem of difficulties rising from the transferring of money from one country to another. Even if the scientist has a right to fees, difficulties with respect to the currency may arise and deprive him of the economic result of his work. Scientific thought is of its nature international, passing frontiers without hindrance, so should also be the case as to the reward corresponding to the enjoyment of the thoughts. The problems of taxation can also give rise to several difficulties.

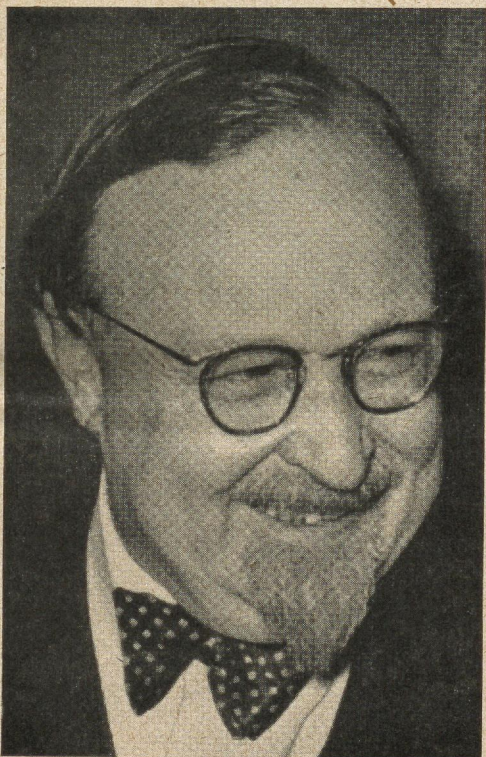
The last question I can deal with now is the problem of the protection of the scientific discovery. The idea of scientific property is that the industry which applies a discovery should have to pay a remuneration to the scientist who has made this discovery. It does not seem just that the inventions should be paid for while the discoveries which form the basis of the invention should receive no reward. The problem has often been mentioned as a problem of scientific property. In recent years there has been a tendency to avoid the word "property" in connexion with this problem. The word might raise false hopes by implying a protection which it might not be possible to give.

*In summing up discussion, Professor Lund added:—*

I can very clearly see that there is one subject which I should have discussed more fully and that is the problem of the invention of an employee in industry, a government laboratory or at a university. The inventor's position is very different in

the different countries of the world. But I am happy to tell you that in Denmark we have recently got a law which makes it quite clear that the invention belongs to the inventor. The right to the invention can be transferred to the industry or the company in which the inventor works but the inventor shall always have a remuneration, a suitable remuneration, and he cannot be deprived of that. If there can be no settlement between the inventor and the company it must be the task of the court to decide the payment. When I said that I am happy to tell this I also mean that I am happy because this law is the idea of our Society for Protection of Scientific Work. We have planned the law and it is our law in practice, so perhaps we have reason to be a little proud of it. But there are more detailed questions. Perhaps we could deal with these questions in the working committee, in the proposals of the working committee, and of course I should be happy to meet there and give all necessary information and take part in the work, if such a decision is taken by this Assembly.

## Let us help the Federation to grow strong



*In his closing remarks Academician A. I. Oparin said:*

Dear friends, the work of our Fourth Assembly is drawing to its close. It seems to me that I shall be right if I say that our general opinion is that we have not worked badly here and that in certain fields we feel satisfied with what we have achieved; and this feeling is based above all on the very pleasant atmosphere which there has been all the time in this hall.

At the last Assembly we had already succeeded in getting firm international understanding between the members of the Federation. But at this Assembly both its official meetings and its commissions were conducted all the time in an atmosphere of great cordiality.

I would say that this feeling of real friendship was also expressed in the unanimity we have seen to-day in all our decisions. It does not follow from this of course that we have not criticized each other and criticized our own organization. On the contrary we can expect there to be a fair amount of criticism.

But there are two kinds of criticism: the friendly and goodnatured sort which has the work of the organization at heart, and that which is born of a wish to destroy those who disagree. It is important to point out that everyone who spoke showed a general attitude of wishing to help the Federation to find the way to grow stronger.

At the same time it cannot be denied that the relaxation of international tension which was first expressed in the Geneva Conference of the Heads of States of the Four Powers gives the Federation great possibilities for more effective action in getting wider international collaboration between scientists of all countries and scientific exchange in the field of the development of science and technique for the glory of mankind. The Federation must make active use of these possibilities.

We must take into account the positive results achieved at the scientific technical conference at Geneva on the Peaceful Uses of Atomic Energy, and create closer co-operation between international scientific organizations and societies, and we must work with them to arrange more independent international conferences to solve various scientific problems in the struggle to use the successes of science for peace.

The decisions and resolutions which we have just adopted make it clear that our Federation has grown not only in size through its new members but in quality. Yes, I would say, with your permission, that our Federation has reached manhood. Our concrete plans make this clear, as you felt to-day when you accepted the resolutions and proposals. The Federation has turned away from general declarations to concrete suggestions for work towards wide international co-operation on the basis of those questions which actively concern all the scientific workers of the world.

Dear friends, soon you will go back to your own countries, and how far our decisions are really adopted and what results they will have depend upon your activity there.

I want to wish you good luck, a happy return to your homeland, and as much success in your own scientific research work as you have had in making decisions here.

## MESSAGE from our PRESIDENT

*(read to the Assembly)*

*My dear friends,*

*For the first time since the foundation of our Federation I shall not be able to take part in the work of the General Assembly! This grieves me all the more since you are meeting at a time when the decisions which you are about to take will have important consequences for the development of the Federation and the effectiveness of its activity.*

*Our Federation has undoubtedly been strengthened by the addition of new organizations, the very place where you are meeting is evidence of this, and I would wish in this message to thank our colleagues of the Gewerkschaft Wissenschaft very sincerely for their kindness in welcoming you to Berlin.*

*The aims which we set ourselves and the means of attaining them which are set out in our Constitution and our Charter are valid as ever. But to-day we must take account of the new important factor of the new climate of international relations.*

*Thanks to the persevering work of all those who for years have not spared their energies in the fight for better international understanding, new and encouraging perspectives are opening before mankind. I sincerely believe that our Federation has played its part in gaining this first result.*

*In all these signs of renewed confidence there is one which concerns scientists particularly—the organization of the Geneva Conference on the Peaceful Uses of Atomic Energy. We must welcome this conference as marking a step of the greatest importance towards dispelling secrecy in scientific matters and restoring international co-operation.*

*It would be just as incorrect to ignore the importance of the change that has occurred as to infer from it that we can relax our activity. On the contrary we must take renewed energy from the first victories.*

*If the importance of the role of science in the life of society is being realized more and more clearly it is true nevertheless that this is often in a superficial way. So long as this remains so we cannot hope to see the community giving scientific workers the status they deserve and the necessary means of carrying out their work. We have then to pursue our task of explanation to the public and at the same time continue our efforts to associate an ever-increasing number of our colleagues with this work.*

*If scientific exchange in the field of nuclear physics has clearly improved, we must not forget that the threat of the use of atomic and thermo-nuclear weapons still remains. From its foundation our Federation has fought against this threat and I am sure that you will seek the best course to be followed in order to lead our work to success, and examine particularly the question of the calling of an international scientific conference on atomic dangers in the present circumstances.*

*My dear friends, I wish the work of your Assembly great success and greet you with confidence and affection.*

F. JOLIOT-CURIE

Paris, 19 September 1955.

Further material from the Assembly, including the reports from the affiliated organizations will be dealt with in the next issue of the BULLETIN.

## WFSW offer to the Foreign Ministers at Geneva

On 29 October, the Chairman of the Executive Council of the World Federation of Scientific Workers sent the following letter to each of the Foreign Ministers, Mr. H. Macmillan (Great Britain), Mr. J. Foster Dulles (U.S.A.), M. V. I. Molotov (U.S.S.R.) and M. A. Pinay (France) at Geneva:

Sir,

I am taking the liberty of writing to you and to your three colleagues, in order to draw your attention to a problem about which the scientists of all countries are particularly concerned: the problem of disarmament and the non-utilization of atomic and thermo-nuclear weapons.

To us scientists the present circumstances seem favourable for relieving mankind from the threat, which we are particularly qualified to appreciate, of the latest weapons of mass destruction. The Geneva Conference on the peaceful uses of atomic energy has given an outstanding example of the possibilities of international scientific collaboration. Immense possibilities for the welfare of mankind could arise in the very near future from this collaboration, and from the full use of scientific discoveries and their applications for peaceful purposes.

However, this cannot be achieved without first alleviating and then removing the intolerable burden of the arms race, and without putting an end to the agonizing fears of the incalculable destruction which the use of atomic and thermonuclear weapons would bring upon mankind.

The hundred and fifty thousand scientists within our Federation are prepared to assist in every possible way in the solution of the technical difficulties set by these problems, and to give their fellow citizens any explanations necessary for them to understand the significance of the agreement which we sincerely hope that you and your colleagues will reach.

I am, Sir,

Yours faithfully,

C. F. POWELL, F.R.S.

### MEMBERS OF THE NEW EXECUTIVE COUNCIL

<i>Office</i>	<i>Name</i>	<i>Country</i>
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<i>Vice-Presidents</i>	Professor J. D. BERNAL	Great Britain
	Professor C. F. POWELL	Great Britain
	Academician LI TZE-KWANG	China
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	Professor L. PAULING	U.S.A.
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Eastern Asia	Professor HUA LOO-KENG	China
Eastern Europe	Dr. E. VALKO	Hungary
Western Europe	Mr. W. J. S. PRINGLE	Great Britain
Scandinavia	Dr. G. P. NØRREGARD	Denmark
U.S.S.R.	name to be submitted	
British Commonwealth	Vacant	
U.S.A.	Vacant	
<i>Individual members</i>		
	Professor W. HARTKE	Germany (GDR)
	Professor L. INFELD	Poland
	Professor K. BRATANOV	Bulgaria
	Academician V. F. NIKITIN	U.S.S.R.
	Mr. J. G. CROWTHER	Great Britain
	Dr. H. TUGE	Japan
<i>Secretary General</i>	Dr. P. BIQUARD	France

AIDE-MEMOIRE

from

C.F. Powell, F.R.S., Professor of Physics in the University of Bristol. Nobel Laureate in Physics (1950). Chairman of the Executive Council of the World Federation of Scientific Workers, (W.F.S.W.).

A.

1. Proposal to secure an independent and authoritative appraisal by an international group of scientists, of the consequences for the future of mankind of hydrogen-bomb tests and of their use in war.

2. Background.

a). Letter was issued in July 1955 by Russell, Einstein and seven other signatories, warning of dangers of warfare with H-bombs, and calling for their renunciation by great powers. Three English signatories - Russell, Powell and Rotblat ; Joliot-Curie from France, Yukawa from Japan, Infeld from Poland, Bridgman and Muller from U.S.A.

b). Shortly afterwards a similar letter was published by 19 Nobel Laureates assembled in Lindau - the 'Lindau Appeal'.

c). A little later, a meeting was held in London by 'Organisation for World Government' of which Lord Boyd-Orr is President. This meeting was attended by many prominent scientists including some from U.S.A. and U.S.S.R. A number of important decisions were carried unanimously, including one to organise, in collaboration with like-minded organisations, an investigation by competent scientists of the dangers arising from H-weapons. Professor Rotblat of London, one of the signatories of the Russell-Einstein letter, was charged with the preliminary arrangements for such a meeting.

3. Nature of the problem.

There is at present no reliable published information on the genetic hazards association with the test-explosions which have already been made, and of how rapidly a serious menace is being built up. Such information is of profound importance for the future of all states and peoples. It is known that war between the Great Powers with H-weapons would be catastrophic in the sense that it would be almost certain to exterminate a large fraction of the world's population, and that the biological effect on the survivors would be profound. But a much closer assessment should be made.

4. Character of the enquiry.

All those interested in its promotion are agreed on the general nature of the proposed enquiry. To be effective, it must be supported by widely representative scientists of the highest integrity, and the aim must be to make a purely objective enquiry into a matter of importance to all powers, irrespective of their political systems. The W.F.S.W. has no desire to play an exceptional role in the matter, but it is anxious to assist, together with a wide range of organisations and individuals, in ensuring that such an enquiry is held.

5. Steps to initiate an enquiry.

a). During the past few months Lord Russell and Professor Rotblat have approached a number of scientists in order to secure support for the proposal. Progress has been slow because in view of the renewal of a degree of tension between the Great Powers equipped with hydrogen weapons, some scientists have found the proposal untimely.

b). Concurrently, the W.F.S.W. has pressed for an enquiry. In particular, Powell approached Yukawa and other Japanese scientists seeking their support. Very favourable reception. W.F.S.W. has been informed that the Science Council of Japan, which operates through the Office of the Prime Minister, has accepted the invitation of the W.F.S.W. to cooperate in this matter. The W.F.S.W. has no desire for any exceptional role, but it is anxious to assist, together with a wide range of organisations and individuals, in ensuring that such an enquiry is held.

6. It is unreasonable to suppose that the Governments of those Great Powers actively engaged in testing H-weapons will take part, at the present juncture in world affairs, in initiating an enquiry of the type envisaged, though they may permit their experts to give evidence before it, once it has been established. In this situation, it would be a great advantage if support, even although semi-official in character, could be provided by some of the most influential of the other Powers not immediately involved. The recent favourable reaction of the Japanese scientists, and the well-known attitude of the Indian and Chinese Governments suggests that such support might be obtained from the Governments of India, Japan and China.

7. At this juncture, a favourable attitude on the part of the Indian Government would probably be decisive in this matter. Should such support be received, the first step would be to set up an initiating Committee which would establish the form of the enquiry and when it should take place. For this purpose, a preliminary meeting would appear to be necessary, at which, should the parties reach agreement on its constitution and main objectives, the initiating Committee could be established. It would then be appropriate to make a public announcement stating the composition of the initiating Committee, the aims of the enquiry, and the type of information sought from individual scientists and from governments.

8. Possible action by the Government of India.

Permission to hold the meeting of the initiating Committee in India. December 1956 is tentatively suggested as a suitable date. There would be some advantages for Indian Science, in the presence in India of a considerable number of eminent scientists immediately before the Science Congress.

July 9, 1955.

A STATEMENT ON NUCLEAR WEAPONS

In the tragic situation which confronts humanity, we feel that scientists should assemble in conference to appraise the perils that have arisen as a result of the development of weapons of mass destruction, and to discuss a resolution in the spirit of the appended draft.

We are speaking on this occasion, not as members of this or that nation, continent or creed, but as human beings, members of the species Man, whose continued existence is in doubt. The world is full of conflicts; and overshadowing all minor conflicts, the titanic struggle between Communism and Anti-Communism.

Almost everybody who is politically conscious has strong feeling about one or more of these issues; but we want you, if you can, to set aside such feelings and consider yourselves only as members of a biological species which has had a remarkable history, and whose disappearance none of us can desire.

We shall try to say no single word which should appeal to one group rather than to another. All, equally, are in peril, and, if the peril is understood, there is hope that they may collectively avert it.

We have to learn to think in a new way. We have to learn to ask ourselves, not what steps can be taken to give military victory to whatever group we prefer, for there no longer are such steps; the question we have to ask ourselves is; what steps can be taken to prevent a military contest of which the issue must be disastrous to all parties?

The general public, and even many men in position of authority, have not realised what would be involved in a war with nuclear bombs. The general public still thinks in terms of the obliteration of cities. It is understood that the new bombs are more powerful than the old, and that, while one A-bomb could obliterate Hiroshima, one H-bomb could obliterate the largest cities, such as London, New York and Moscow.

No doubt in an H-bomb war great cities would be obliterated. But this is one of the minor disasters that would have to be faced. If everybody in London, New York and Moscow were exterminated the world might, in the course of a few centuries, recover from the blow. But we know, especially since the Bikini test, that nuclear bombs can gradually spread destruction over a very much wider area than had been supposed.

It is stated on very good authority that a bomb can now be manufactured which will be 2,500 times as powerful as that which destroyed Hiroshima. Such a bomb, if exploded near the ground or under water, sends radio-active particles into the upper air. They sink gradually and reach the surface of the earth in the form of a deadly dust or rain. It was this dust which infected the Japanese fishermen and their catch of fish.

No one knows how widely such lethal radio-active particles might be diffused, but the best authorities are unanimous in saying that a war with H-bombs ~~XXXXXXXXXXXX~~ might quite possibly put an end to the human race. It is feared that if many H-bombs are used there will be universal death - sudden only for a minority, but for the majority a slow torture of disease and disintegration.

Many warnings have been uttered by eminent men of science and by authorities in military strategy. None of them will say that the worst results are certain. What they do say, is that these results are possible, and no one can be sure that they will not be realised. We have not yet found that the views of experts on this question depend in any degree upon their politics or prejudices. They depend only, so far as our researches have revealed, upon the extent of the particular expert's knowledge. We have found that the men who know most are the most gloomy.

Here, then, is the problem which we present to you, stark and dreadful, and inescapable: Shall we put an end to the human race: or shall mankind renounce war? People will not face this alternative because it is so difficult to abolish war.

The abolition of war will demand distasteful limitations of national sovereignty. But what perhaps impedes understanding of the situation more than anything else is that the term 'mankind' feels vague and abstract. People scarcely realise in imagination that the danger is to themselves and their children and their grandchildren, and not only to a dimly apprehended humanity. They can scarcely bring themselves to grasp that they, individually, and those whom they love are in imminent danger of perishing agonisingly. And so they hope that perhaps war may be allowed to continue provided modern weapons are prohibited.

This hope is illusory. Whatever agreements not to use H-bombs had been reached in time of peace, they would no longer be considered binding in time of war, and both sides would set to work to manufacture H-bombs as soon as war broke out, for, if one side manufactured the bombs and the other did not, the side that manufactured them would inevitably be victorious.

Although an agreement to renounce nuclear weapons as part of a general reduction of armaments would not afford an ultimate solution, it would serve certain important purposes. First: any agreement between East and West is to the good in so far as it tends to diminish tension. Second: the abolition of thermonuclear weapons, if each side believed that the other had carried it out sincerely, would lessen the fear of a sudden attack in the style of Pearl Harbour, which at present keeps both sides in a state of nervous apprehension. We should therefore welcome such an agreement, though only as a first step.

Most of us are not neutral in feeling, but, as human beings, we have to remember that, if the issues between East and West are to be decided in any manner that can give any possible satisfaction to anybody, whether Communist or anti-Communist, whether Asian or European or American, whether White or Black, then these issues must not be decided by war. We should wish this to be understood, both in the East and in the West.

There lies before us, if we choose, continual progress in happiness, knowledge and wisdom. Shall we, instead, choose death, because we cannot forget our quarrels? We appeal, as human beings, to human beings: Remember your humanity, and forget the rest. If you can do so, the way lies open to a new Paradise; if you cannot, there lies before you the risk of universal death.

#### RESOLUTION:

We invite this Congress, and through it the scientists of the world and the general public, to subscribe to the following resolution:

" In view of the fact that in any future world war nuclear weapons will certainly be employed, and that such weapons threaten the continued existence of mankind, we urge the Governments of the world to realise, and to acknowledge publicly, that their purposes can not be furthered by a world war, and we urge them, consequently, to find peaceful means for the settlement of all matters of dispute between them. "

---

Professor Muller makes the reservation that this be taken to mean " a concomitant balanced reduction of all armaments. "

Signed by:

P.W. Bridgman,	(Harvard).
Albert Einstein,	(Princeton).
F.Joliot-Curie,	(Paris).
L.Infeld,	(Warsaw).
H.J.Muller,	(Indiana).
C.F. Powell,	(Bristol).
J.Rotblat,	(London).
B.Russell,	(London).
H.Yukawa,	(Kyoto).