

12 February 1964

To: Academy Committee on P -COSWA

From: B. T. Feld

Re: Report on Udaipur Conference

1. UDAIPUR

The 12th Pugwash Conference in Udaipur, India, Jan. 27 - Feb. 1, took place in surroundings of splendor and elegance. The Conference had two main themes: disarmament and development. Of the four working groups, two were concerned with each of these subjects.

As may be concluded from the enclosed reports of the working groups, the groups on development produced a great deal more, both in quantity and quality, than did those concerned with disarmament. There are a number of reasons: first, too little time had elapsed since the last discussions at Dubrovnik for much new to develop; second, the Russian group was largely new (its leader, Millionschikov, was attending his first Pugwash) and correspondingly tended to be cautious and conservative; third, a large part of the discussions were devoted to attempts at education and clarification -- mainly of the effects of ABM deployment on stability of the arms race and on the nature of the nuclear umbrella -- without attempting to achieve a consensus; the report of Group I hardly reflects the length and depth of these discussions. (Incidentally, although there is a tendency on the part of some of our group to interpret the rather negative attitude of the Russian group to our proposal of an uninspected moratorium on ABM, as indicating that the Russians are in process of deploying an ABM system, I do not believe that there is any evidence yet, one way or another, that this decision has been taken by the Soviet authorities; it seems more likely to me that the group at Udaipur was simply neither knowledgeable nor influential enough to feel it could commit itself to anything like so sophisticated a position as we were urging upon them.) What we did achieve was the beginnings of a useful discussion which, provided we circulate sufficient good material sufficiently well in advance of the next conference, could be fruitfully carried forward next September in Czechoslovakia.

Since the working group reports were only presented to the Conference for acceptance (rather than for adoption) there was relatively little friction in accepting them (with the exception of one section of the Group II report which, apparently, went rather further ahead of current Soviet policy than their group as a whole was willing to go).

The difficulties arose in the discussion of a Conference press release, of which a draft, prepared by a small committee appointed at the start of the Conference, was presented after lunch of the last day. The wrangling over words and phrases was long and at times acrimonious, lasting until about 9 p.m. at which point a long and silly discussion took place over a paragraph about China, and it was finally decided to leave the adoption of a summary of the Group IV report to the Continuing Committee. (Actually, this last summary, an accurate reflection of the content of the Group IV report, except for some emasculation of the section on population control, was adopted on the next day by the Continuing Committee without any difficulty.)

A copy of the final press release will be sent to you under separate cover by Ruth Adams.

One of the results of this session was the agreement by the Continuing Committee that there would be no release from the Conference as a whole at the next Conference.

The Continuing Committee met before and after the Conference. There follows a brief summary of some of its main conclusions.

2. NEXT CONFERENCE - Czechoslovakia, Sept 9 - 19, 1964.

At the suggestion of the American group, the next conference will be both longer and larger than previous ones on the disarmament theme. This should give an opportunity for testing the possibility of more thorough preparation and deeper discussions. Details are given in the enclosed summary of plans for this Conference.

3. FUTURE CONFERENCES

It is suggested that the following Conference be in Bellagio, Italy (on Lake Como) on April 11-16, 1965. The place is contingent on obtaining the use of the Rockefeller Foundation's villa for this occasion. The date is contingent on its not conflicting with the annual Washington meetings of the National Academy of Sciences and the American Physical Society.

An invitation was extended by Prof. Infeld, and accepted in principle by the Continuing Committee, to hold the 15th Conference in Warsaw, Poland, in September 1966.

Following this, there is considerable sentiment for holding another pair of conferences in the US and the USSR.

4. FINANCES

Despite all our best efforts, both our American group and the London office are still in dire financial straits. Of all our applications, we have only succeeded in obtaining \$10,000 per year (\$5,000 each from the Reynolds and Stern Foundations) for four years. We still have three applications pending: one with the Rockefeller Brothers Fund, one with the Ford Foundation (both for \$15,000 per year) and one with the American Academy's Committee on Research Funds for a special grant to enable adequate preparation for Karlovy Vary.

Almost all of the funds available for 1964 have been used up on travel expenses to Udaipur. We are in arrears in our share of the London office budget by \$2,000 for 1963 (we contributed around \$3,000) and the full \$8,000 for 1964.

In addition to the normal expenses of travel to Karlovy Vary (\$5-7,000) and expenses we must incur in order to prepare adequately (\$3-5,000), we have a moral obligation to help the London office to defray any expenses in Czechoslovakia over and above those provided for by the Czechoslovakian Academy of Sciences (their original invitation was for 60 people for 6 days), especially in view of the fact that we proposed and pressed for the enlargement of the Conference. This additional cost is estimated at \$2,500. So we need, for the rest of 1964, approximately \$20,000.

London office	\$10,000
Karlovy Vary	<u>12,500</u>
	22,500
funds on hand	2,500

Having myself run out of ideas on where to go in further fund raising attempts, I can only appeal to the rest of you to take up this problem and find some answers. It seems completely incredible to me that there should not be, somewhere within the American foundation system, an additional source of around \$20,000 per year for this activity.

PUGWASH FANTASIES

Many of the Western scientists who participated in the planning of the Pugwash Conferences, as we suggested in the introduction, had the best of scientific and humanitarian motivation. In the light of experience, however, it would be instructive to compare the sanguine expectations of some of the Pugwash initiators with the stubborn reality that emerged from the record.

In a letter addressed to Senator J. W. Fulbright, chairman of the Senate Foreign Relations Committee, dated April 27, 1959, Mr. Eaton indicated his complete faith in the integrity of Soviet scientists and the usefulness of meeting with them in these words:

From our three Pugwash International Conferences of Nuclear Scientists, I am convinced that agreement can be reached between East and West. * * * Although it had been freely predicted in advance that there would be no meeting of minds with the Soviet participants, the entire group of top scientists of all political points of view succeeded in agreeing unanimously on the dangers of the bomb.

In the Foreign Policy Bulletin of December 15, 1957, pages 52 and 54, published by the Foreign Policy Association, Mr. Eaton described the blissful atmosphere prevailing at the first Pugwash Conference as follows:

Each scientist there believed what the other scientists were saying * * * all of us were convinced that the Russians were being completely honest, completely frank. Therefore, it made for a remarkable community where the cards were all on the table, where everyone was aboveboard with everyone else.

Bertrand Russell, the British mathematician, philosopher, and writer, who was the prime mover of the Pugwash Conferences, justified his hopes and illusions in these paragraphs:

On the one hand, Russia has achieved at least parity in nuclear weapons; on the other hand, Stalin is dead. I think that both these changes have made Russia more amenable to a reasonable compromise. * * * In addition to the actual resolutions passed by the Pugwash conference, it had a further and perhaps even greater utility. Eminent men from both sides of the Iron Curtain and from uncommitted countries met unofficially in a friendly spirit, not to haggle and bargain, but to attempt to diminish the dangers which scientific ingenuity had been creating. In this way a beginning was made of the organized recognition of common human interests in East and West. * * * I see no evidence that the present Russian rulers are more irrational than Mr. Dulles * * * their dealings with countries outside their sphere have shown, since Stalin's death, more reasonableness than has been shown by either Britain or America. There is every reason to feel that they are determined to give no excuse for a world war. * * * I do not think there is any reason to doubt that the Soviet government has no intention whatever of provoking a nuclear war * * *.

Mr. Marseille believes that the Soviet government consists of fanatics who are prepared to take any risk for the spread of the Communist creed. I do not see any evidence for this view. * * * I think there is a very considerable hope that they (Communist countries) would be gradually improved by public opinion from within if the fear of alien hostility were removed.²

² Bulletin of the Atomic Scientists, April 1958, pp. 144, 145, 146.

4 years ago
2 years ago

THE FIRST FIVE

Since 1957 there have been five so-called Pugwash Conferences including, at one time or another, nuclear scientists from Great Britain, Austria, Canada, Communist China, France, Japan, the Soviet Union, East Germany, Hungary, Poland, Sweden, India, Denmark, and the United States. The first was held in the home of Cyrus S. Eaton, wealthy American industrialist and banker, in Pugwash, Nova Scotia, from July 6 to 11, 1957. The second occurred from March 31 to April 11, 1958, at Lac Beauport, Quebec, Canada, while the third took place at Kitzbuehel, near Vienna, Austria, September 14-19, 1958. A fourth conference was held from June 25 to 30, 1959, at Baden, Austria, and the fifth at Pugwash from August 25 to 30, 1959. A number of leading American scientists attended each meeting.

Although invitations for the first meeting were sent out by British Lord Bertrand Russell, the financial cost of all five sessions was borne largely by Mr. Eaton. Without Eaton's lavish assistance, the conferences would not have been possible.

The Soviet Academy of Sciences, in August 1957, endorsed the conference, and its representatives have participated in each session.

Prof. Eugene Rabinowitch, founder and editor of the Bulletin of the Atomic Scientists, published in Chicago by the Federation of Atomic Scientists, was one of the initiators of the Pugwash Conference. He describes its origin as follows:

The atmosphere of suspicion, in which scientists and science have become enveloped since the days of [Alan Nunn] May and [Klaus] Fuchs, made many scientists wary of international contacts.

Two years ago, the initiative of Bertrand Russell led to the first breach in the walls of isolation. Upon his prompting, the Parliamentary Association for World Government sponsored an international conference of scientists. It met in London on August 3-5, 1955. * * * The editor of the Bulletin (Rabinowitch) was the only participant from the United States. * * * For a while after London, it looked as if the idea were doomed to slow death.

Again, it was the initiative—and prestige—of Bertrand Russell that overcame stagnation. He interested Cyrus Eaton, the Canadian-born American industrialist, in supporting a new conference. Mr. Eaton offered for this purpose his home in the old clipper-building town of Pugwash on the Northumberland Straits in Nova Scotia.¹

This statement by Dr. Rabinowitch is illustrative of the good intentions and trust and openmindedness with which the American participants approached the Pugwash Conferences. It is all the more significant because it comes from a man of the greatest scientific eminence, who, as this record will illustrate, has frequently shown a clear understanding of the nature of the Communist conspiracy.

¹ "Pugwash—History and Outlook" by Eugene Rabinowitch, Bulletin of Atomic Scientists, September 1957, pp. 243, 244.

PRIVATE

NOT FOR PUBLICATION

12th Pugwash Conference on Science and World Affairs, Udaipur

27th January - 1st February 1964

Report of Working Group I: Organization for Collective Security

1. Test Ban Treaty

We recognize that the Moscow Test Ban Treaty of August 5, 1963, is a significant step towards general and complete disarmament and the course of events since then has justified the hopeful expectations it has created.

The principles and provisions of the Moscow Treaty should continue to be re-affirmed by the U.N. and should form part of a declaration governing international relations. Violation of these principles and provisions should be condemned and dealt with in the same manner as violation of the provisions of the U.N. Charter.

We attach great importance to the need for observance of the Moscow Treaty by countries who have not acceded to it so far and to the prevention of proliferation of nuclear weapons. We suggest that this could be encouraged by the Big Powers adopting certain measures which should be applied to all countries, like denial of technical know-how and equipment as well as denial of assistance and facilities which may lead nations to acquire the capacity to undertake nuclear weapons testing.

2. Collective Security

We considered the proposal made in the letter of Chairman Khrushchev and the response of President Johnson for an agreement to prohibit the use of force in settlement of territorial disputes and question of frontiers. The participants recommended that an agreement be reached along such lines which would re-affirm the obligations of the U.N. Charter and prohibit the use of force in settling any border or territorial differences. Settlement of such differences should be reached by peaceful procedures.

It was recognized that the Moscow Test Ban Treaty made the acquisition of nuclear weapons capability by other nations more unlikely. The conclusion of the Treaty demonstrated the conviction of the international community that proliferation of nuclear weapons was not conducive to international security. At the same time, the two major powers who continue to maintain nuclear weapons, have heavy responsibility for safeguarding international security. It is essential therefore to strengthen the U.N. system of safeguarding the security of weaker nations by the cooperation of the U.S. and U.S.S.R. assuming special responsibility for that purpose within the framework of the U.N. To the extent that such a guarantee of security and territorial integrity of all nations, particularly of the non-aligned nations, becomes effective, it would stimulate reductions in the armaments of non-nuclear nations thereby releasing resources for advancing their economic progress. It would also facilitate further steps towards general and complete disarmament. In this context, it was suggested by some participants that such a guarantee could be helpful to achieve a gradual withering away of the existing military alliances.

3. Prohibition of use of nuclear weapons

We considered the desirability of prohibiting the use of nuclear weapons. Many of us felt that adoption of the declaration on the prohibition of the use of these weapons and holding of a conference for the purpose of signing a convention in that regard as contained in the relevant resolutions of the U.N. General Assembly was helpful. The opinion was expressed by others that such a convention in the absence of means of control or measures of disarmament would not be useful at the present time.

4. Relief of Tension by Policy of Mutual Example

It is with profound concern that the members of the group note that the arms race is still going on, that most destructive weapons are being continuously developed and that their stock-piling is assuming dangerous proportions. Unless this arms race is checked, it will not only impede an agreement on disarmament but may lead to disastrous consequences to all mankind. At present, when a G.C.D. agreement has not yet been reached, we welcome any steps aimed at the reduction of this disastrous arms race and the creation of conditions favourable to reaching the disarmament agreement. We note with satisfaction that agreement between the governments of the U.S.S.R. and the U.S.A. not to orbit objects with nuclear weapons and the decision of each of these governments to reduce their military budgets serve these purposes.

We believe that the adoption, in particular by the nuclear powers, of equivalent measures requiring no control, by way of the policy of mutual example would make a valuable contribution to the restriction of the arms race and the improvement of the international atmosphere. In our opinion, such measures could include:

The reduction of military budgets and of armed forces, withdrawals or reductions of troops on foreign soil, and closings of foreign military bases.

A discussion took place whether one could effect a cessation of further production and deployment of strategic weapons, by the policy of mutual example. This discussion was not conclusive.

The group also discussed the possibility of renunciation by the U.S. and the U.S.S.R., by way of mutual example, of the anti-ballistic missile defense of cities. No agreement was reached on the possibility or desirability of this step.

It is proposed to return to the discussion of the last two problems at the next conference.

5. Nuclear Umbrella or Minimum Deterrent Proposal

We agreed that the concept of a nuclear umbrella or minimum deterrent force, to be maintained by the two great nuclear powers during the process of general and complete disarmament, is of major importance in providing the necessary guarantees against aggression by means of hidden weapons. We welcomed the proposal of the U.S.S.R. to extend it to the end of the disarmament process. We regard the possibility of agreement on the principle of a nuclear umbrella or minimum deterrent force to offer one of the most hopeful avenues to reach agreement on general and comprehensive disarmament under effective control.

6. Demilitarisation of Space

In discussing the demilitarisation of space, the Group welcomed as a major advance the resolution passed by the General Assembly of the United Nations calling upon States to refrain from placing in orbit around the earth any objects carrying nuclear weapons or any other kind of weapons of mass destruction, installing such weapons on celestial bodies or stationing such weapons in outer space. The Group also welcomed the declaration approved by the United Nations General Assembly for the control of space, but felt that the scope of the declaration should be extended to provide for:

- (a) a procedure for seeking the opinion of the COSPAR Consultative Group on Potentially Harmful Effects of Space Experiments along the lines suggested in the draft proposed by several members of the sub-committee of the U.N. Outer Space Committee in Geneva on 24th May 1963, and
- (b) consultation of the Group whenever experiments are proposed which although they may not interfere with the other peaceful uses of outer space, may still modify the environment of the earth or impede the collection of important scientific information.

The Group welcomes the implicit recognition in the U.N. declaration that outer space in distinction to air space is not subject to national jurisdiction and considers that the boundary between the two spaces should now be clearly defined.

The Group felt that programmes involving international collaboration in the peaceful uses of outer space would be appropriate and desirable.

The desirability of a treaty covering exploration of celestial bodies was recognised, but the group was unable to consider this question.

Report of Working Group II: Implications for Disarmament and World Security of a wider dispersal of military power

Unless steps are taken in the direction of disarmament, new nations will be led to develop their own nuclear weapons.

The dangers of the spread of nuclear weapons are widely acknowledged. Any spread of these weapons is likely to accelerate their further spread. The likelihood of the employment of the weapons by nations other than the major powers increases with the number of States possessing them. While the chance that this will lead to the involvement of the great powers in a major nuclear war may be small, it is quite clearly a chance that we dare not take.

For this reason we should seek by all means to inhibit the acquisition of even small numbers of nuclear weapons by nations not now possessing them. Even if we are only successful in delaying the date when new nations acquire these weapons, we shall have achieved something worthwhile. This should be coupled with steps in the direction of a relaxation of international tensions, and comprehensive disarmament.

The signing of a partial test-ban treaty in August of 1963, placed some obstacles in the way of the spread of nuclear weapons. However, there remains, for a number of reasons, a real danger of the further proliferation of nuclear weapons:

- (1) The treaty has not been signed by all states.
- (2) The treaty does not extend to underground tests.
- (3) The treaty does not place any impediment in the way of the production of untested nuclear weapons.
- (4) The treaty does not prevent the transfer of nuclear weapons or nuclear weapons technology from a nuclear power to a non-nuclear power.

In regard to (3), though we think it improbably today that a nation having agreed not to test, would nonetheless embark upon the elaborate and costly program necessary for atomic bomb production, we can conceive of circumstances where this might no longer be the case. A number of nations are at present moving from the research-reactor stage of development into the large-power-reactor stage. These nations will soon have fairly easy access to plutonium.

If a nation is able to obtain, directly, or indirectly through the cooperation of experienced personnel, assistance in the design of detonation mechanisms, it might take the step of providing itself with a nuclear arsenal. This type of development would be encouraged and made more significant if the same nations had previously been or were subsequently provided with effective means for the delivery of atomic weapons.

In view, then, of the continuing dangers of the spread of nuclear weapons and delivery systems, we believe the following measures to be necessary:

(1) All nations presently possessing nuclear weapons should jointly undertake not to transfer these weapons or technical information relating to them to any other state or group of states.

The group views with concern the proposed establishment of a European multilateral force, while noting that another point of view was expressed. There exists a serious danger that such a force will make permanent the already undesirable dispersal of nuclear weapons in Europe.

(2) The Government of each of the nuclear powers should take whatever measures may be open to it to discourage its nationals with experience in the field of nuclear-weapons technology from contributing to the development of the nuclear weapons capacity of any foreign power.

(3) States which abstain from manufacturing or acquiring nuclear weapons should have their territorial boundaries guaranteed by the United Nations. The United States and the U.S.S.R. should recognize a special responsibility for cooperation to make this guarantee effective. In individual cases, special measures may be necessary. It might, for example, be necessary, with the consent of the countries concerned, to station United Nations forces along disputed boundaries and perhaps also within the country or countries involved, in order to provide for an immediate response to any violation.

If a guarantee of this sort is to be acceptable to recipients as a substitute for the possession of nuclear forces under their own command, the two great powers must continue to demonstrate that they have a strong common interest in avoiding threats to the peace.

(4) We consider it desirable that the Governments of nuclear powers, in order to encourage the policy of mutual example, should seek to limit the nuclear arms race by refusing to accumulate further atomic bombs and nuclear warheads even before the agreement on general and complete disarmament has been reached.

(5) The scientists of nations which do not possess nuclear weapons have the possibility and responsibility of warning their Governments and their countrymen of the dangers arising from the further spread of nuclear weapons.

(6) The possibility of controls over the transfer of offensive conventional weapons (particularly those designed for or adaptable to the delivery of nuclear weapons) was discussed. It was agreed that it would not be practicable to differentiate these weapons from defensive ones. However, the possibility of a world-wide agreement to regulate all traffic in conventional weapons perhaps does merit careful re-examination in the light of the new relationship among states. Consideration should also be given to measures which might be adopted by Governments to discourage their nationals from contributing to the development of advanced military capabilities of other countries.

Report of Working Group III: The Relation Between the Economic Problems of Developing Nations and World Security

The two greatest problems facing mankind today are the achievement of disarmament and the elimination of poverty. Both are of special concern to scientists: it is the advance of science which has opened up the vast possibilities of destruction and production that lie before us today. Both require for their solution a new sense of international responsibility; members of each nation must acknowledge by action that their fate is bound up with the security and prosperity of the members of all other nations.

The tasks of disarmament and the elimination of poverty are interconnected in various ways.

Background

So far the progress of the underdeveloped countries has been slow and halting; the gap between them and the advanced nations is still increasing.

In the underdeveloped countries total military expenditure appears to have been about \$7 to 8 billion a year in 1959 (1). It has risen since. In most of these countries it represents about 2 to 5 per cent of the gross domestic product. This expenditure usually has a high proportion of imports; it also absorbs scarce qualified manpower - technicians, administrators and leaders; it does not yet absorb much research and development.

In the advanced countries of the world, total military expenditure amounts to more than \$100 billion a year. In these countries, the average proportion of the gross domestic product devoted to military expenditure is nearly twice as high as in the underdeveloped countries.

The total flow of non-military loans and aid to underdeveloped countries is about \$4 billion - about 1/3rd of one per cent of the total domestic products of the advanced countries.

The Contribution of Disarmament to Economic Development

Disarmament and the creation of better collective security arrangements are the responsibility of all nations, developed and underdeveloped. There is no reason why all disarmament and collective security measures amongst the underdeveloped nations should wait upon the progress of the advanced nations, or vice

(1) Figures (which do not include China) from the U.N. Report on the Economic and Social Consequences of Disarmament.

versa. Both can contribute to world security and to economic development by disarmament.

In some countries the military establishment is among the factors preventing social change, and its gradual reduction will by itself speed up economic development. There are also instances where substantial cuts in military expenditure can hardly be expected unless nations cease to regard large military establishments, rather than farsighted development programmes, as important symbols of nationhood. Thus we wish that nations would refrain from the use of military parades and military symbols for prestigious and ceremonial purposes.

The conclusion of an agreement on general and complete disarmament would make it possible for advanced nations to divert large resources to the development of underdeveloped nations. For example, an increase in aid by an amount equivalent to even one-fourth or one-fifth of the total saving in military expenditure, as a consequence of general and complete disarmament, could, if accompanied by good planning and implementation of programmes for development, be expected roughly to double the present rate of economic growth of the underdeveloped countries.

But the promise of more aid at the time of disarmament must not be an excuse for not giving more aid now. Moreover, while many people have discussed the possibility of giving more aid at the time of disarmament, no nation, to the best of our knowledge, has yet committed itself to this action. In the light of recent events, when some cuts in military expenditure were not accompanied by increased aid, we fear that such action may not be forthcoming. We, therefore, call upon the leaders of the advanced nations to declare now their intention to divert to the underdeveloped countries as high a proportion as possible of the resources released by disarmament.

Disarmament in the underdeveloped countries themselves would release resources for development. The armed forces of the developing nations, like those of the advanced nations, should be reduced to the minimum level necessary to maintain law and order. Altogether, the total cut in military expenditure amongst underdeveloped nations probably might be about \$3 or 4 billion.

The Contribution of Development to World Security

Poverty and extreme inequalities in wealth are among the causes of international tension. Tension of this kind may increase, if the rising expectations of the underdeveloped countries are not satisfied and the gap between them and the advanced nations continues to widen.

There is an urgent need now for increased aid in many forms to help accelerate the economic growth of the underdeveloped countries. Increased aid could be an important element in a general movement towards improved international relations and a reduction of tension. Greater co-operation between the advanced countries of East and West in the granting of aid is one way in which relations between these nations may be improved. At present most aid is given bilaterally, often in a spirit of rivalry. We recognize the value of existing forms of aid - whose very variety is some insurance against political pressures.

We believe that economic aid to underdeveloped countries should be rendered in different forms and through different channels. The determination of the form most useful in each instance depends equally on the contributing countries and organizations and on the countries receiving the aid. In the longer run, as general disarmament is approached and achieved, we would like to see an increase in the proportion of aid given internationally.

But there are several ways in which a start might be made upon greater international co-operation now. The advanced nations may contribute jointly to capital funds, they may work jointly on major projects (e.g. dams) in the developing nations, and they may send joint teams of experts. We urge that these teams, wherever practically advisable, should have a truly international composition not only in the top administration, but also in the field.

We also propose the formation of International Youth Teams, possibly under the auspices of the United Nations, in which young specialists and technicians from East and West, North and South, could work together on specific projects under the supervision of senior experts. Possible examples are health teams and geological survey teams. It is proposed that members of the Pugwash Movement volunteer their services in their field of speciality to such International Youth Teams or similar international organizations devoted to the problems of the developing nations.

Generally, we would like to see an ever widening degree of internationalism in economic relations, including co-operative planning for the development of the world's resources. In a true world community, where the requirements of equity and welfare were acknowledged, as they are within many nations today, it would be recognized that national incomes should be redistributed between countries by measures comparable to progressive taxation; transfers of this kind would be regarded as a matter of social responsibility, not of charity.

Problems of Development

In the course of our discussions, we were impressed by a number of problems of the underdeveloped countries which will pose serious difficulties regardless of when disarmament is achieved.

The trading position of the underdeveloped countries has suffered gravely from the deterioration in their terms of trade over the past decade. Moreover as they develop they will require increasing markets in the advanced countries for semi-manufactures and finished manufactures, which they will be able to supply in addition to primary products. The advanced countries can greatly help the underdeveloped countries through trade. The Working Group, therefore, welcomes the United Nations Conference on Trade and Development, which is going to tackle these problems, and hopes that participation will be open to all nations regardless whether or not they are members of the United Nations. We believe that economic sanctions and embargoes should be applied only where they have been approved by the United Nations. We particularly welcome any measures which promote trade and economic co-operation between East and West.

The world will become a more secure place to live in if the nations really depend on each other for development and welfare. For that reason economic development should take place in such a way as to increase exchanges and trade between nations.

We also feel that the magnitude of the task of accelerating development in the underdeveloped countries has still scarcely been explored. A great increase in aid and technical assistance is certainly required. But for such resources to be effectively used it may first be necessary to undertake much more research into the problems of development in the physical and cultural conditions of the underdeveloped countries. The problems need to be tackled from many sides, by natural and social scientists and others, and the experience of one developing nation needs to be passed on to others.

Report of Working Group IV: Science and Technology in Development

(Note: This is a draft. The Conference voted for the release and wide dissemination of this report after some careful editing by the original drafting committee.)

General Introduction:

Science and technology have added a new dimension to human life. As a result, the gap between the so called "developed" and "developing" nations is widening rapidly, whilst at the same time the world is physically growing closer together. If the gap is allowed to continue growing, as it must in the absence of massive aid from the developed to developing nations, it is bound to lead to a situation of great instability and to constitute a threat to world peace and security. Now is the time to institute a massive aid programme; the longer it is delayed the larger the investment that will be needed. To be effective in preventing the widening of the economic gap, the amount of aid needs to be more than a critical value.

From the stand point of economic growth, a fundamental characteristic that distinguishes the more developed countries from the less developed ones is the extent to which society is able to control nature. An integral component of this capability is intimate knowledge of nature coupled with a built-in competence for obtaining new knowledge. This requires the creation of competence in scientific and technological research.

The problems of economic and social development are a major concern of all men every where. The hope of solving these problems rests above all on men working together. The issue we face is to find the best means to increase the effectiveness of co-operative work between human beings from different parts of the world. We believe that all existing institutions for co-operation are useful, but that many of them can be strengthened and improved. Some new mechanisms of co-operations are also needed.

It is with these problems in mind, that of international investment in development to create a better world, in education to generate an adequate number of well qualified scientists, technologists and technicians and the co-operative aspects of development that this working group has been concerned, and we make the following recommendations.

Education

Investment in man is vital to all development. It is especially important to prepare adequate numbers of well qualified scientists, technologists and technicians, for their availability essentially limits the pace of economic and social development.

The education of such men must be given an over-riding priority in any developing country. This proposition has been generally accepted, but differences of opinion exist as to the best mode of its implementation and mistakes have been made by all countries. We have discussed both what should be done in the developing countries and also what can be done by the more highly developed countries to assist them. We believe that the following points should receive special attention.

Education in Schools

The importance of science and technology and the scientific attitude must pervade the whole of the educational process in the schools. All children must be made to appreciate the importance of science and technology for the

welfare of their country, even though many of them will find their careers in other fields. Care must be taken to emphasize the importance of applied as well as pure science. A proper balance should be encouraged between numbers of students becoming technologists and technicians and those going into academic science. It must be remembered that research, development, and industrialization cannot be carried out without sufficient technical staff, and adequate provisions must, therefore, be made for technical schools.

In order to staff the schools with teachers of the right quality, the social and financial status of the school teachers must be raised to an adequate level in comparison with other professions.

The methods of teaching science (and consequently the training of science teachers) in the developing countries could be greatly improved by taking advantage of the new techniques now being investigated in the more highly developed countries. The work of UNESCO on text books for the less developed countries is very commendable and ought to be extended.

Education in Universities, Technical Colleges and Research Institutes

Although the proportion of those given education in science and technology beyond the school level in developing countries must eventually be raised to levels comparable with those in the more advanced states, attention at the post graduate level should initially be concentrated on a limited number of disciplines which are of vital importance for any particular country. Thus if universities and research institutes specializing in particular fields are vital to the progress of the country, the selection and training of the people who will staff these institutes must be part of the educational plan.

Universities ^{any} everywhere, but especially in developing countries, cannot hope to be excellent in all fields. Initially, each university should concentrate on a few areas for research and training in research. In those chosen areas (which should, of course, be related to national needs) interchange of staff (and even research students) with universities in the more advanced countries should be encouraged by every possible means.

To be truly effective such co-operation must go far beyond what has happened in the past. In many fields, opportunities for research in the underdeveloped countries are so great that individual professors accompanied by their research students could profitably spend a few years in the universities of a developing country transporting equipment and key technicians to establish working laboratories in which students and technicians can be trained. Faculty members and students from the developing country would make extended visits to universities in advanced countries not only to gain experience in special training but also to enrich the teaching and research in that university. The developing countries have great opportunities here to become leaders in fields where they can offer unique facilities for research.

The developing countries must also create first rate institutes for research in the fields of agriculture, medicine, natural resources, social sciences and special technologies appropriate to their industrial development. Care must be taken that a proper balance is maintained between the proportion of first class men in these institutes and in the universities. Close co-operation rather than competition must exist between research institutes and the corresponding departments in the universities. This can best be achieved by careful siting of the institutes near universities, joint appointments and exchange of staff and research students. The close integration of the research institutes with the universities is vital. Just as research is an essential

adjunct to good teaching in a university, so is teaching and the contact with fresh young minds essential to prevent research institutes from becoming sterile.

The corresponding research institutes in the more advanced countries can help the developing countries by taking men for periods of a few months (training in a new technique) to one or two years (completion of a research project). This is one of the easiest and the most profitable ways of stepping up the potential of the research institutes in the developing countries.

The danger of developing countries losing many of their able scientists (who go abroad for training in research) by emigration to the more highly developed countries is not inconsiderable. While it may be possible to stop this by legislation, we believe that the following actions are preferable:

- (a) Scientists should be sent abroad for training in a specific field which is important for their country; and should be guaranteed a suitable position on return.
- (b) Fashions in research in the more highly developed countries should not unduly influence countries with limited resources.
- (c) The gap in the conditions of work between the scientists in the two types of countries must be reduced, especially for the really outstanding young men.

Role of International Organizations

The role of international governmental and non-governmental organizations should be to initiate, develop and co-ordinate the educational efforts of individual countries and to serve as an intermediary, safe-guarding the disinterestedness of all aid and assistance which is channeled through them.

One of the primary tasks of UNESCO should be to maintain a systematic survey of the known and presumed educational needs of the developing countries and of the existing and potential educational resources of the more highly developed countries.

The "International University" scheme of UNESCO is to be commended and encouraged. Much greater participation in this scheme by the highly developed countries could yield a rich reward to the developed as well as the developing countries.

Status of Scientists and Technologists

We would again emphasize the importance and urgency of raising the status of scientists, technologists and technicians in the less developed countries. The rewards to these men and women through higher prestige and improved social and financial recognition of their work must be sufficient to attract an adequate proportion of the ablest people in the country. The leading scientists and technologists must be brought into the highest councils of state in planning the future development of the country.

International Co-operation

The Need for Analyses

International co-operation is essential for all stages of development but different mechanisms of co-operation are most useful for different stages. In particular, the stage of identifying and analyzing the major problems in a country or region is one in which the United Nations agencies can play a central

role. Such analyses will almost always involve a multi-disciplinary approach in which engineers, agronomists, operational analysts, natural scientists, sociologists, economists, specialists in public administration, and humanists concerned with the traditions and values of the people, must all work together.

For concreteness we may cite two examples of problems requiring such multi-disciplinary analyses.

In the Ganges-Brahmaputra basin of India and East Pakistan, some 140 million people, 5% of the world's population, are crowded together on two tenths of one percent of the earth's land area. More than 90% of the people live off the land. Yet crops are grown only during the summer monsoon, when rainfall is very heavy and the great rivers pour a flood of water. During the remainder of the year, the country is dry and the people unemployed. Poverty and malnutrition are the common lot. Recommendations have been made for an extensive irrigation system which would enable a second, and perhaps a third, crop to be grown during the dry season. Although at first sight this seems attractive, it is by no means obvious that it is the correct solution to the problems. If farming continues to be the principal means of subsistence, continuing rapid population growth will mean severe overcrowding of the rural areas. A better way may be to use most of the available development capital to promote industrial development and to improve transportation. But the correct solution requires an intensive mature and sophisticated analysis by many kinds of specialists working continuously together.

A second example comes from the Maghreb countries of North Africa - Morocco, Algeria and Tunisia. Here the greatest possible development of water supplies for agriculture may still be inadequate to allow these countries to be self-sustaining in food production. The available water might be better used for industrial development where the yield from water can be very much greater than in agriculture. Again only a multidisciplinary analysis will point the way to the best solution.

If such analyses are to be acceptable to the developing countries, their representatives must participate in organizing them. A good analysis is the least expensive step in the development process, yet it can multiply many-fold the effectiveness of even very large developmental expenditures. It is therefore one of the best ways of using the relatively small funds available for development coming through the United Nations.

Many of the United Nations agencies and institutions supported by them now perform limited analyses of one or another aspect of the problems of developing countries; but so far as we are aware, no agency now undertakes the multidisciplinary and integrated analyses which many of these problems demand.

An Institution for Resources Analysis

We recommend the establishment within the United Nations family of a semi-autonomous commission or institute for resources-analyses. Its members would be those nations which wish to co-operate in making or using multi-disciplinary analyses of development problems within particular countries or regions. The institute or commission would have a relatively small but highly paid and highly qualified staff, employed on a rotating basis, of specialists in all the necessary fields. The tasks of these specialists would be:

- (1) To identify problems for analysis under the sponsorship of the Institute;
- (2) To find competent groups within universities or research organizations of the member states, to undertake the analyses;
- (3) To ensure the completeness of the analyses and to make recommendations for necessary action by the countries concerned;
- (4) To arrange for training of teams from the developing countries in the methods of analysis and data-interpretation.

The programme of the institute or commission would be worked out and approved by conferences of the member states. But the work would be paid for by the countries in which the analytical teams were situated and by other countries interested in the problem. Thus, the budget of the institution itself could be relatively small (about \$500,000 per annum). Most of the problems selected for analysis would be those requiring the elaboration of analytical methods of such complexity and difficulty as to be beyond the scope of the regional economic commissions of the United Nations.

Such problems would inevitably involve a great many of the disciplines found in a modern university. Of all the United Nations agencies, UNESCO most approaches a university in the breadth of its concerns and the scope of its activities, and it has the closest relations with the universities. We, therefore, suggest that UNESCO should play an important part in establishing and sponsoring the institution; but other specialized agencies of the United Nations should also be intimately involved.

Strengthening UNESCO

To strengthen UNESCO for this and other tasks in the application of science and technology to the problems of development, we recommend that the National Commissions for UNESCO in each member country should contain many more natural and social scientists and engineers than is at present the case. We also suggest that national liaison agencies with UNESCO should include those concerned with science and technology as well as those responsible for education.

A World Health Research Centre

One of the results of an analytical approach to national or regional problems will be the recognition of the needs for more accurate and more pertinent data, better and more complete surveys, and research on unknown or imperfectly understood relationships. The United Nations Special Fund and the Specialized Agencies have already given valuable service in helping the developing countries to establish research centres, systematic survey methods and data collecting machinery. But much remains to be done. The programme envisaged for the World Health Research Centre forcibly emphasizes the needs for research on the problems of collection, communication and interpretation of data, on the social and economic aspects of public health, the influence of environment and nutrition on disease, and the effects on man of the manmade changes in the environment. We believe this centre could play an invaluable role in facilitating international co-operation.

Preventable diseases and malnutrition take a large toll in human misery and economic loss. Profound changes have been and can be brought about by the application of scientific knowledge on communicable diseases and malnutrition.

Large gaps, however, exist in our knowledge of conditions affecting human health and well-being. Extensive demographic and epidemiological studies must be carried out before the relative importance of specific diseases and of other health needs can be adequately assessed.

The most urgent needs for health planning are, first, fact-finding to get more accurate data on the scope and extent of the actual disease situation, and on social, environmental and other factors involved; and, secondly, the incorporation of such information into overall plans for economic development to ensure a balanced and systematic effort. Unfortunately, the scientific methodology and tools are lacking for many important aspects of demographic and epidemiological studies. In addition there is an absence of the necessary research resources in countries where the problems exist. To remedy these deficiencies is a major aim of the World Health Research Centre whose establishment is now under study by the World Health Organization. This centre would undertake research on major health problems of world-wide concern which cannot be effectively studied by local or national efforts. Its field operations would include support of and collaboration with existing research laboratories, and the establishment of regional laboratories for specific needs, such as the study of certain tropical communicable diseases.

Studies on an international scale should be undertaken on the problem of population growth and its impact on economic development. This problem has to be attacked not only through biological and social studies but also through education. Any measures taken should be based upon the fullest respect for human dignity and freedom of choice. We recommend that the World Health Research Centre should initiate and encourage research on the biology of reproduction concerning which there is much ignorance.

Transfer of Technological Information

The developing countries have experienced great difficulties in obtaining trustworthy and sufficiently complete technical information on industrial processes and the design of machinery and plants for industry. Such information has been frequently hard to obtain from industrial concerns in advanced countries. We can suggest no easy solution to this problem, but we believe that the recent action of the U.N. in establishing an Industrial Development Centre is a step in the right direction; but we urge that the U.N. and the specialized agencies do much more towards developing industrial consulting services, reference - collections of technological information, and a central exchange to publicise the needs in the developing countries for specific technical and industrial knowledge. In some developing countries, national consulting services for industrial technology have been established and more should be. These should be able to draw on the U.N. services and also on assistance from individual advanced countries.

Co-operation between East and West

Co-operation in research on scientific and technical problems of development presents an outstanding opportunity for direct collaboration between scientists and engineers of the eastern and western countries. For example, research is required on soil-salinity control in the Indus plains of India and Pakistan. A great deal of knowledge concerning similar problems has been obtained by agricultural scientists in the semi-arid regions of the USSR and the USA. Some of these scientists in both countries could gain valuable experience

and mutual understanding and confidence by working together to apply their knowledge to this critical problem. Many other examples could be cited of opportunities for co-operation in research which would be mutually beneficial.

The Role of Scientific Unions

One of the important means of fostering co-operation between individual scientist in the advanced and the developing countries is through the International Scientific Unions and their co-ordinating body the International Council of Scientific Unions (ICSU). We welcome the initiatives recently taken by ICSU to increase its activities in the developing countries, and by UNESCO to place greater reliance on advice from the Scientific Unions in planning and guiding its activities. National and international support of ICSU and the Unions ought to be strengthened if these initial steps are to lead to effective results.

Co-operative Research

A new technique of co-operation between individual scientists has recently been used successfully in France, and might well be applicable on an international scale. A fairly large size scientific problem is selected by a scientific committee from among a series of problems suggested by competent scientists. The selected problem may require three to five years and a variety of techniques for its solution. A convenor is nominated who asks selected scientists to join a working group, and no pressure is applied. In a sense this working group forms a decentralized institute, each participant doing the research in his own laboratory. The group as a whole decides on the programme and the distribution of tasks and meets regularly twice a year for progress reports and detailed planning of activities for the next six months.

Except for the small funds required the scheme depends almost entirely on the scientific community and does not require governmental agreement.

International Investment for a Better World

We regard assistance by the more prosperous countries to the developing nations as an investment in a better world. In the past, international assistance to the development of science and technology in new countries has been sporadic and intermittent. We would emphasize that if aid is to be effective, it needs to be continuous and maintained at a much higher level than before. The urgency of the problem is very great. Sufficient funds should be allocated to secure quick action. Each developed country might be expected to contribute about 1% of its gross national product per annum, and of this allocation perhaps 5% should be devoted to the advance of science and technology in the developing countries, including training.

This allocation should be independent of any measure of disarmament, but it is manifest that substantial progress in disarmament could release great resources, a considerable fraction of which should be devoted to raising the productive capacities of the newly developing countries. This would represent the modern version of beatingswords into ploughshares.

All forms of assistance are required; bilateral, (direct aid by an advanced country to a developing country) and multilateral, (through the U.N. and its specialized agencies, or through regional and other multilateral agencies).

Effective aid in the strengthening of science and technology in the developing countries requires more than financial resources. It is also dependent

on the availability of competent people. The scientific communities in the developed countries should pay attention to this need through their societies, so that a feeling of personal responsibility amongst scientists and educators will be engendered. The scientific societies should be urged to set up committees to advise and assist the various national and international agencies which are concerned particularly in the recruitment of personnel. All countries, in planning their training programmes for scientists and technologists, should also include an extra quota, where feasible, so that they can make personnel available to help other countries.

Today the assistance which the U.N. and its specialized agencies can give to developing nations is limited by the extent of financial contributions from member states. As a long term aim it is desirable to add to such contributions new resources obtained by finding independent direct sources of revenue for the U.N. Advances in science and technology are even now opening up certain new sources of wealth that are largely outside the jurisdiction of national states and have thus far not been preempted by national taxing authorities. We have in mind particularly space traffic and space communications, the resources of the oceans outside the limits of national jurisdictions (including minerals on the ocean bottom) and the potential resources of Antarctica. We suggest that now, while the situation is still in flux, the question be explored of giving the U.N., by treaty, jurisdiction over outer-space, the oceans outside recognized national jurisdiction, and Antarctica, this jurisdiction to include exclusive rights to regulate and to tax wealth-producing activities in these areas.

It is in the common interest of all nations to remove aid to developing countries from the context of the cold war. There are two principal means of doing this and we urge statesmen to explore both. One is by an agreement to put an increasing share of development aid through the multilateral agencies (though we believe both bilateral and multilateral aid will continue to be needed). The other is through common enterprises in which both East and West collaborate in carrying out large development projects - for example, a joint attack on the salinity problem in the Panjab.

A basis for co-operation between east and west in development could be built on certain agreed principles. First, it should be recognized by all that there is more than one feasible road to development, and that the choice of ways can and should be left to each developing country, acting through its own political processes without imposition, coercion (military, political or economic) or undue interference from outside. Second, assistance must be on the basis which promotes the political, economic, and cultural independence of the recipient countries.

Importance of Research in Developing Countries

All past experience shows that the return on investment in research, both pure and applied, can be very high, indeed higher than in almost every other area. For example, recent studies suggest that in Japan the return on investment in agricultural research and education has been at least 35 percent per annum for a period of several decades, and that in the United States it has been even higher.

We believe that substantial investment in the creation of indigenous research and development capabilities in the developing countries will yield similar returns. Indeed, it would appear that the expenditures on indigenous research and development, including the support of current research, the creation new institutions and facilities, and the training of expanding cadres of scientists and engineers, should be limited only by the availability of persons competent to

undertake the work. Such persons are at present few in number and their abilities should be utilized with the maximum effect. Their social standing, conditions of work, and salary should be high enough to attract and retain the most competent people of the country, and should make it possible for them to devote their full time to teaching and research. They should be adequately provided with tools of their trade, such as laboratory, office and library facilities, equipment, and funds for travel to national and international scientific meetings.

Resources allocated to research and development and to graduate education should be increased each year - again by an amount limited only by the availability of adequately trained manpower. The rate of increase of expenditure will vary from country to country, but it should be noted that the USSR has been doubling her expenditure every four years, and Japan every two. We believe that rapid rates of increase should be maintained until the expenditures on research, development and graduate education reach the order of 2 - 3 percent of the gross national product.

Developing nations, like those more advanced, are faced with the double task of engaging in research important for the progress of the economy and at the same time training expanding numbers of competent research workers. This implies that a substantial fraction of the research should be conducted within the universities. If research institutes are formed for the purpose of expediting research in specialized areas, they should be closely connected with the universities. The leading research personnel should teach in the universities and graduate students should be encouraged to conduct their research in the institutes.

The research and development programme of a developing nation requires a substantial amount of central guidance in the form of a Research Council or Academy empowered to allocate funds for research purposes. It is important that this central body be guided primarily by scientists and engineers rather than by persons who are unfamiliar with scientific research and the conditions in which it is best conducted.

Each nation should undertake those kinds of research which are most important for its development and which it can best do. Each region of the world offers particular opportunities and every nation can contribute to world science. For the most part, research in developing nations, as in others, should be applied. Local problems involving the economic development of the nation should be identified and explored. It is important, however, that basic research which is not aimed at the solution of any immediate practical problems should be given adequate emphasis. While the fraction of the total effort spent upon basic research will vary from country to country, it should in general be maintained at a level of about 20% of the total research expenditures, excluding development.

In a country's research effort, a broad spectrum of problems must be considered. In the early stages of development, a substantial fraction of the effort should be devoted to the surveying of natural resources and to the analysis of problems involving their efficient exploitation. Problems will range from those of basic geology and geophysics to plant physiology and genetics, and from the economics of development to the sociology and biology of human reproduction. All areas of knowledge must be explored. None should be excluded. However, research in areas which require a very large capital expenditure for equipment and a large number of highly qualified scientific personnel should be undertaken only if it can be pursued without greatly hampering the research effort in other fields.