Tentatively scheduled:
September 1-4, 1970
Stanford University
Stanford, California

STANFORD PUGWASH SYMPOSIUM ON SCIENCE AND DEVELOPMENT

Purpose

The twin threats of our time are:

(1) Power contest between two parts of the "developed" world, the East and the West, led by the US and the USSR, respectively.

(2) Widening split between the technologically developed world (essentially, the Northern hemisphere), and the technological underdeveloped world (the Southern hemisphere).

Both threats are products of the scientific revolution. This revolution has provided nations with weapons so destructive that their use in war would bring utter destruction on both sides; and it has made the situation of technologically underdeveloped ("developing") countries untenable by combining a "population explosion" (caused by elementary preventive medicine and sanitation applied to child birth and rearing), with "revolution of rising expectations" (caused by instantaneous and universal communication between all parts of the world.

The Pugwash program has been primarily directed to reducing the first threat--that of nuclear war within the developed world. However, many of us feel keenly the second danger to peace and viability of mankind to be no less critical than the first one.

Scientists could contribute importantly to resolution of both critical challenges. Participants from developing countries have urged, on many occasions, that Pugwash shoudl pay increased attention to development problems. The conferences at Udiapur in 1964 and Addis Ababa in 1966 have been devoted mainly to development problems. Working groups dealing with science and development have been active at most conferences. Some positive results have been achieved. A proposal for the creation of regional "centers of excellence in research" made by Carl Djerassi at the Ronneby Conference (1967), is finding its first implementation in the East African Center for Insect Physiology and Ecology at Nairobi, Kenya; the proposal of an International Science Foundation (first made by Roger Revelle at the Venice Conference in 1965), revived and discussed in greater detail at the Sochi Conference in 1969, is now under consideration by agencies such as the ECOSOC Committee on Science and Technology in Development.

The Report of Group V at the Sochi Conference suggested that the problems of developing countries should be discussed by Pugwash scientists in a more systematic way. The US Pugwash group was asked by this group to organize, prior to the 20th Pugwash Conference (to be held at Lake Geneva, Wisconsin, on September 9-14, 1970) a Symposium involving scientists from developed and developing countries, to explore the ways in which Pugwash could contribute to the solution of development problems.

In the face of numerous official and unofficial groups dealing with development, including the role of technology, a unique contribution of the international scientific community could derive from its capacity for, and experience in, bringing about international cooperation between scientists from the East and from the West in the developed world, and also between those from the developed and the developing nations. This cooperation could be useful both in analyzing the situation and defining the possibilities of positive programs in various parts of the world, and in mobilizing the scientific communities for active participation in such programs. It could help in increasing the rationality of approach to the development problems, both on the side of the developing and that of the developed countries. The objective difficulties of development would be enormous, even if given universal good will and cooperation; they are greatly enhanced by irrational or politically dominated approach to development problems in both the advanced and the developing countries, leading to competition between the former and distrust among the second ones. To some limited extent, the scientific communities, acting through the Pugwash channels, could contribute to greater regional and international cooperation, and a more rational approach.

The Stanford Symposium on "Science and Technology in Development--the Pugwash program in the seventies", tentatively is planned to be held at the Stanford University in California, on September 1-4, 1970. It is intended to bring together about 20 scientists from the developed and an equal number from the developing countries. The proposed agenda starts from the type of programs which have emerged as promising in the past, and explores the possibility for systematizing and generalizing them.

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EDITORS: The symposium will be open to your reporters, but not to the public.
FOR IMMEDIATE RELEASE

STANFORD - Approximately 40 leading scientists from nations around the world will meet here Sept. 1-4 for the Stanford Pugwash Symposium on Science and Development.

The symposium, sponsored jointly by Stanford and the Center for the Study of Science and Society at the State University of New York at Albany, will be a prelude to the 20th Pugwash Conference on Science and World Affairs Sept. 9-14 at Lake Geneva, Wis.

It will bring together about equal numbers of scientists from developed and developing countries to explore ways in which the Pugwashprogram can aid in solving development problems.

The attendees, who will meet and live in the Stern Hall dormitories, include a group from the Soviet Academy of Sciences. Other foreign nations to be represented are Israel, Egypt, Kenya, Senegal, India, Japan, Argentina, Mexico, France, and the United Kingdom.

"The twin threats of our time," says the symposium statemen of purpose, "are: 1) A power contest between two parts of the 'developed' world, the East and the West, led by the U.S. and the U.S.S.R. respectively.

"2) A widening split between the technologically developed world (essentially the Northern hemisphere) and the technologically underdeveloped world (the Southern hemisphere).

"Both threats are the products of the scientific revolution. This revolution has provided nations with weapons so destructive that their use in war would bring utter destruction on both sides; and it has made the situation of technologically underdeveloped ('developing') countries untenable by combining a 'population explosion' (caused by elementary preventive medicine and sanitation applied to child birth and rearing) with a revolution of 'rising expectations' (caused by instantaneous and universal communication between all parts of the world).

"The Pugwash program has been primarily directed to reducing the first threat—that of nuclear war within the developed world. However, many of us feel keenly the second danger to peace and viability of mankind to be no less critical than the first one."

The symposium agenda calls for discussion of cooperation among scientists of developed countries, what scientists have done to assist developing countries, and proposals for new programs of aid in technological development.

The Pugwash conferences began soon after World War II and were attended largely by atomic physicists. Financier Cyrus Eaton inadvertently contributed the name by offering his summer home at Pugwash, Nova Scotia, for the first meeting.

Focus of the early meetings was on international cooperation for atomic weapons control and disarmament. In addition, in recent years the emphasis of the meetings has turned more toward the resolution of local conflicts, the prevention of chemical-biological warfare, and stimulating cooperation between the developed and developing nations.

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MAIN PROBLEMS OF DEVELOPMENT IN AFRICAN COUNTRIES AND WHAT SCIENTISTS CAN DO ABOUT THEM

by

David CARNEY

August 1970

MAIN PROBLEMS OF DEVELOPMENT IN AFRICAN COUNTRIES AND WHAT SCIENTISTS CAN DO ABOUT THEM

by

David CARNEY *

The present paper is divided into three parts : the first deals with the main problems of developing countries of Africa, the second with what scientists from developed countries cannot do for the developing countries (what the developing countries must do for themselves), and the third with what scientists from developed countries can do for the developing countries (by facilitating the duty and the task of developing countries to do for, or help, themselves).

I

Any objective assessment of the main development problems of African countries must start from an examination of the social structure and the quality of the human population, for development is a process initiated by and for people. Consequently, any handicaps to the development process must be traced to the quality, conception of life and the resulting social structure of the population.

In a recent paper entitled "Transmission and Change in Ideas, Conception of the World and Self-Perception of Various Groups as a Factor in Human Development"[1/], the present writer shows how the process of development based on continuing change, stems from the nature and the

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1/ Mimeographed, unpublished, April 1970.

* The Author is Project Manager of the United Nations African Institute for Economic Development and Planning, Dakar, Senegal. The views expressed in this paper do not in any way reflect those of the United Nations or the Institute.

system of ideas held by a group of people. The opening paragraphs of that paper set the theme and bear quoting :

"In the business of change ideas are fundamental; the ideas of the people who desire or resist change, and the demographic cycle constitute both the means of transmission of ideas and the constraint on speed at which change can be effected.

"The crucial element in ideas promoting or inhibiting change in a given population or group is its conception of the world - its weltanschauung or world-view - and its perception of its place and role in the world - its self-perception. Given the world-view and self-perception of a group, one searches for the institutional mechanisms by which this world-view and self-perception are transmitted from one generation to another. For every group tends to devise such mechanisms as are compatible with, and necessary for, the transmission of its weltanschauung through time - the weltanschauung determines the social institutions. And in every case the next generation becomes the cohort that receives and implements or continues the weltanschauung.

"The weltanschauung, or world-view, contains implicitly, or explicitly, a message (or messages) transmitted from one generation to another and put into effect by each succeeding generation. The message determines the means of its transmission and the next generation (the cohort or agents of change) carries out the instructions contained in the message. If the message contains ideas in favour of change, the means of transmission (the social technique) will be compatible with change, otherwise not.

"The mechanism of social change and development therefore consists of the following three parts which may be identified as :

a - the Message

b - the Social Technique

c - the Cohort or Agents of Change

"Evidently, time is, implicitly, a basic dimension and essence of the mechanism. Another dimension of the mechanism is change, but this depends on the content of the message rather than on the mechanism as such. Hence, only if change is implied in, and favoured by, the social message does the transmission mechanism for the message assume a dimension of change.

"The milieu in which the mechanism operates may therefore be one of changeless time or changeful time, in other words, a static or dynamic context. In a static context, the message is given and remains always the same[1]; the social institutions are also given accordingly, and unchanging, and the next generation is like the preceding (like the old time religion, what was good for the fathers is good for their children) and its numbers, quality and composition are stable in the reproduction process. The social groups within the society, moreover, are stable - they disintegrate and realign very slowly or imperceptibly.

"In a dynamic context, the message implies change, and therefore changes; the social institutions for its transmission also change or are modified, the numbers, quality and composition of the next generation or cohort change in the reproduction process, and various social groups disintegrate and realign perceptibly[2]."

The paper proceeds to distinguish between and define the three main types of society : traditional, modern and transitional. These definitions may be repeated here for the benefit of the rest of our discussion :

Traditional Society

"In traditional society, such as exists in Africa and similar parts of the world (i.e. society bound by custom rather than law, by ascription rather than achievement of social status, by low productivity and level of living and, characteristically, peasant activity) the message does not change and the milieu tends therefore to be static. This is a direct consequence of the content of the weltanschauung in such society - a world-view that conceives the universe to be hostile to human life, capricious and unpredictable and therefore to be approached and handled with extreme caution. One must protect oneself against the hostile forces that constitute the human environment[3]. Institutionally, this means setting up a defensive social structure, military-style with pyramidal hierarchy and authority

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1/ This is so in spite of the fact that such societies are normally illiterate and depend on oral tradition for transmission of messages, and that the message may become amplified and modified in oral transmission.

2/ For a discussion of social group formation and change, see D. CARNEY, "Social defence perspectives in development planning with special reference to Africa", in United Nations International Review of Criminal Policy, N° 25, 1967, pp. 29-45.

3/ For a fuller treatment of the subject, see Everett E. HAGEN, On the Theory of Social Change (The Dorsey Press, Inc., 1962), Part II.

being transmitted from the top down in the form of orders and instructions to be carried out by foot soldiers and other ranks. All knowledge, information and authority remain at the top, all obedience and execution at the bottom of thepyramidal hierarchy : authority and obedience are connected by orders in a one-way relationship, authority activating obedience through orders. Dialogue or two-way interaction through question-and-response from bottom-to-top and top-to-bottom is absent. All communication is in the oral tradition because such societies are normally illiterate.

"The consequent reference of individual personal problems to higher authority for solution in traditional society has a threefold significance :(a) total exoneration of the individual from personal responsibility for all evil or misfortune, since all evil is conceived as coming from without, not proceeding from within : human nature is basically neutral and becomes evil or good only when "possessed" by evil or good coming from without; (b) absence of feelings of personal guilt since an external scapegoat (evil eye, demon, enraged or jealous gods, etc.) can always be found in explanation[1]; and (c) the universal presence of authoritarian personalities shunning all initiative, all inquisitiveness and all pragmatic imagination, except in the fertile field of mythology, magic, superstition and religion propagated by the priesthood and other traditional staff as a means of social control : such authoritarian personalities are attuned only to obedience to authority, lacking all innovative traits conducive to experimentation, discovery and change[2].

"The world-view, self-image and personality of man in traditional society convey explicitly as well as implicitly a certain message (or series of messages) through the generations : man's environment and his universe in general are hostile and unpredictable - do not tamper with the environment, but adapt to it and change it little, or risk offending the gods and other powerful evil forces; obey authority in the form of the priests, medicine-men, witch-doctors and elders and trust implicitly in them, for they are older and know better - do not doubt or ask questions of higher authority who know all the answers on your behalf, for it is not polite to ask questions of those in authority lest it be taken for a challenge to such authority[3]; bring up children

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1/ It bears recalling that the doctrine of fallen man through original sin and the resulting internalized personal guilt is a unique contribution of Judaeo-Christian-Islamic religion.

2/ E.E. HAGEN, op.cit.

3/ The semblance of challenge to authority is merely a cloak for ignorance. In traditional society explanations of natural phenomena are non-rational and non-scientific, being mostly mythological, with a built-in moral designed to discourage further questioning. Where mythological explanations are limited or fail, ignorance takes over and is cloaked in the guise of affronted authority.

in the way you were raised for what was good for your fathers and ancestors is also good for you and your children. Thus the message and the philosophy of traditional society - a message negating all change, all experiment, all development. Non-development is thus seen as built-in into the weltanschauung of traditional society in the way man in traditional society looks at life, his environment and his universe, and his place in it.

"Pantheon and mythology intermingled play a special role in the world-view of traditional society. Just as the individual's place in society is predetermined within the social hierarchy, so the place of society in the universe is determined and related to it through a hierarchy of increasingly powerful gods culminating in the top-god or Supreme Being that rules the roost[1]. Explanations of natural phenomena and events are given in the form of myths built up around animals, birds and fishes, popularized in the Anansi stories about Brer Fox, Brer Rabbit and their ilk. These fairy tales, unlike those of Hans Christian Andersen, have a built-in moral at the end of each one, the aim of which is to discourage further questioning and inquisitiveness on the part of the child.

All in all, traditional society is oriented against change and development - unless and until something happens internally to break the monotony. The change factor may originate externally[2] but has to become internalized in order to be effective. Or it may be of internal origin - due, for example, to structural demographic changes. Either way, such change, when it does come, breaks the vicious circle of unchanging stability."

Modern Society

"A society addicted to change, i.e., a modern, open society, is marked by : (a) a world-view favourable to change, namely a predictable world based on uniform, rational and scientific laws and explanations, and therefore subject to manipulation and control, to modification or improvement; (b) fluid social structure that is open-ended and attack-oriented rather than defence-oriented, in which the rule of law, rather than custom, is enshrined; economic and social status, though heritable, are based essentially on achievement rather than ascription; (c) authority is by consent rather than tradition and must justify itself by performance, not by age or gray hairs; (d) previous knowledge and beliefs are continually being challenged as a result of the basic

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1/ It is clear from this why religion plays such an important part in intergroup contacts and in welding different tribes or groups together. Only if the pantheons of different tribes or groups coincide can they have any cordial relationship together. Consequently, religious conversion of the weaker by the stronger group in the case where their pantheons differ is the first step towards enlarging the comity of tribes and groups and in fusing their social institutions.

2/ HAGEN, op.cit., Part III, cites external invasion by a colonial power as one such important trigger of change.

inquisitiveness and questionings by the population, and as a result of the perpetual discovery of new knowledge; (e) individual responsibility for resolution of personal problems, rather than back-reference of such problems to higher authority for solution; (f) personal responsibility and guilt feelings go together, especially in a milieu where the Judaeo-Christian-Islamic religion has been introduced and taken root; (g) because personal responsibility, inquisitiveness, experimentation and open-mindedness, status based on achievement, an open-ended social structure in which the sky theoretically is the limit - because all these are the hallmarks of this type of society, the personality formed therein is of the innovative or creative type that continually seeks change, progress and development[1]."

.....

Transitional Society

"Transitional society is society in the process of passage from traditional (tradition-bound) to modern (change-oriented) society. It is neither completely traditional nor completely modern, but contains elements of both polar types. In the general case, it remains mostly traditional and only partially modern in that the stimulus to change is not endemic (or endogenous), as in the typical case of modern society, but exogenous. Such a society ceases to be transitional when the motivation to change is no longer externally but internally located. Thus the location or source of the stimulus to change is the distinguishing criterion of the transitional from the modern society.

"Most contemporary societies are transitional - this includes most of the so-called developing countries of Africa, Asia and Latin America, areas of the world estimated to contain three-quarters or more of the world's population. A minority of contemporary societies is composed of modern societies (mostly the so-called developed countries); and yet another minority of societies of traditional type, mostly to be found also in the so-called developing areas of the world. Transitional societies are reacting societies - reacting to externally-induced change, principally from the modern segment of world society. They are still overwhelming pre-scientific in their weltanschauung, in the message transmitted and in the upbringing of their children, acquiring rational, scientific ideas only after the first stages of infancy are over."

1/ HAGEN, op.cit., Part II, Chapters 6 & 7.

The main stages of evolution may be distinguished in the history of most of Africa within the last century or so : (a) the period of European colonialism marked by the evolution from traditional to transitional societies; (b) the more recent period of political independence (mostly since the 1950's) marked by the desire to transform African societies from the transitional to the modern stage.

The main problems of development in Africa today may be classified into two groups : first the problems peculiar to the developing countries, i.e., those associated with transitional societies; second, the problems which the developing countries share with the developed countries, mostly the problems generally connected with the application of science and technology to the tasks of development, anywhere.

In considering the main problems peculiar to developing countries attention needs to be given to the manpower situation from the point of view of its quality and quantity in the context of development. Quite apart from the juxtaposition of modern and traditional ideas[1/], two aspects of the manpower pyramid in such societies may be noted. First is the population-age pyramid in which age-group differentiation naturally determines the pattern of leadership : the elders at the top of the pyramid, followed by other adults and resting on the base of the youngest age-group, the children (Fig. 1). Running through this pyramid is the generally inferior social position of women. From the employment pattern may be discerned another pyramid (Fig. 2) in which the elite class is composed of the rulers, elders, landowners, priests, medicine-men and witch-doctors, below these come the traders and craftsmen, followed by the hunters, fishermen and farmers. Lastly, as before, come the children.

1/ A recent research conducted by the U.N. African Institute for Economic Development and Planning among school children in the Dakar area and their parents, clearly reveals the juxtaposition of modern and traditional ideas so typical of developing countries at the transitional stage.

The combination of the population-age pyramid and the employment pyramid results in a fairly rigid defensive social structure with little mobility among classes and employment groups. At the transitional stage a third pyramid, the modern education-training pyramid (Fig. 3) is superimposed, the effect of which is to loosen the age-authority-traditional ideas structure resulting in the typical mix of modern-traditional ideas found in transitional society. But, furthermore, there is the effect of transforming the employment structure of traditional society towards the modern, employment pyramidal structure in which the apex is composed of professional, managerial and administrative personnel, followed by middle manpower (skilled, technical, clerical, executive, etc., personnel), the whole resting on the broad base of semi-skilled and unskilled labour. Thus, the modern manpower pyramid constitutes a fourth pyramid superimposed on the previous three.

Thus, contemporary developing societies have four population and manpower pyramids to contend with and reconcile, not without great conflict. The biggest conflict seems to arise between the pyramids of Fig. 1 and Fig. 3. The attempt to impose a modern system of education on a background of traditional ideas produces a "conflict of two worlds" resulting in : (a) the majority of the population being untouched by the educational system, (b) a large drop-out at all levels of the educational system; and (c) the production of an élite represented by the dark middle "obelisk" in the pyramid of Fig. 3. This third consequence is very striking since about a quarter of the government's budget is usually devoted to education in the typical case in Africa, and the governments usually believe in according a very high priority to education of their populations. The results do not therefore support their hopes.

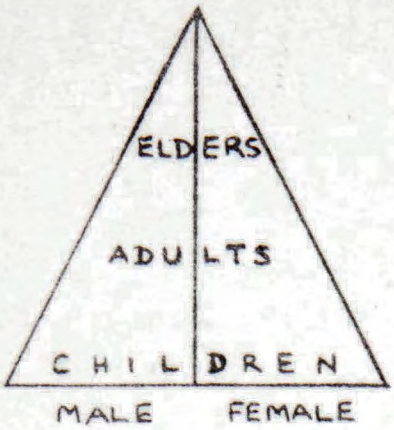

Fig. 1. Population-Age Pyramid

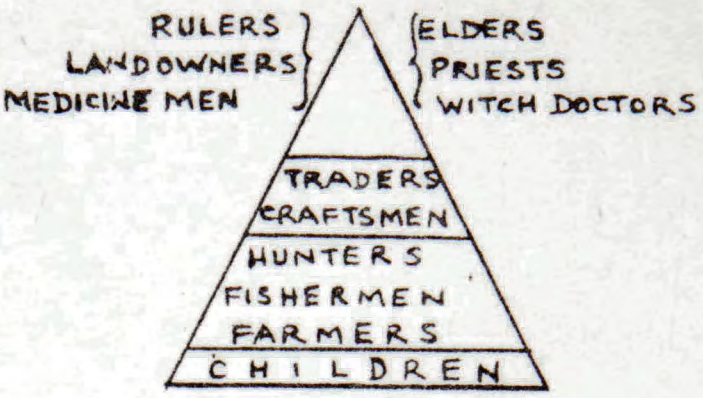

Fig. 2 Manpower Structure of Traditional Society

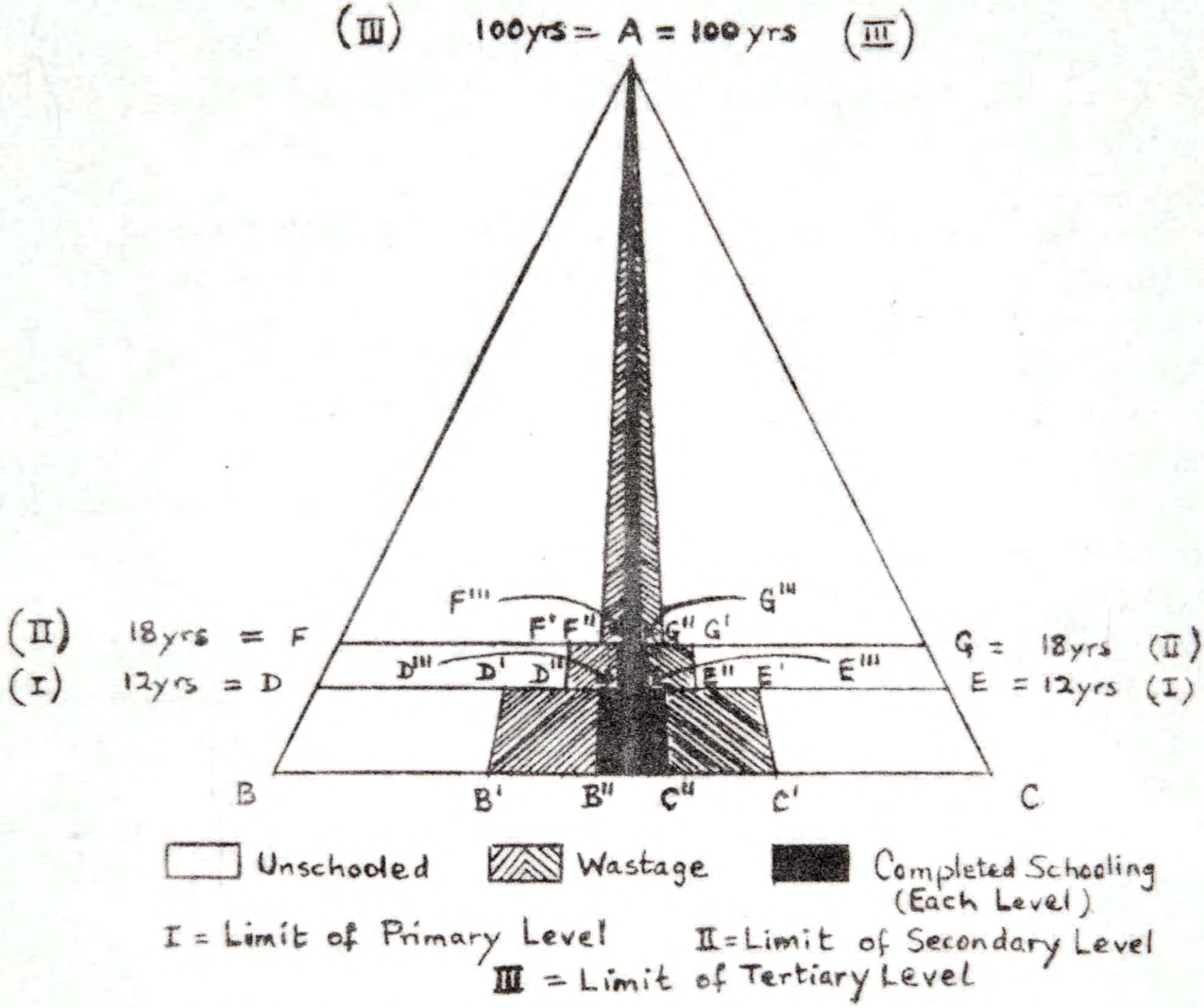

Fig 3. The Education-Training Pyramid

In order to make headway towards modernizing their societies there is little doubt of the need to restructure the entire system of education and training on the basis of new concepts. First of all, emphasis needs to be placed on a high scientific content of the curriculum at all levels. Second, education and training need to be brought more closely together, mindful of the cliché : "Education is preparation for training and training is preparation for employment".

Third, in order to reduce wastage in the system, education and training programmes at the elementary and secondary levels need to be considerably diversified and more comprehensive to permit the realization of some basic education and training for all at the primary level; secondary education for a proportion of these, and tertiary or higher education and professional training for a further proportion of those who complete secondary education. The idea is rather to step up completion rates at each level of the education and training pyramid, so that a country could come closer towards a realisation of the democratic concept in education, namely : some kind of education and training for everyone according to his ability and talent, but not to the same degree for everyone. The education-training pyramid would then look something like Fig. 4.

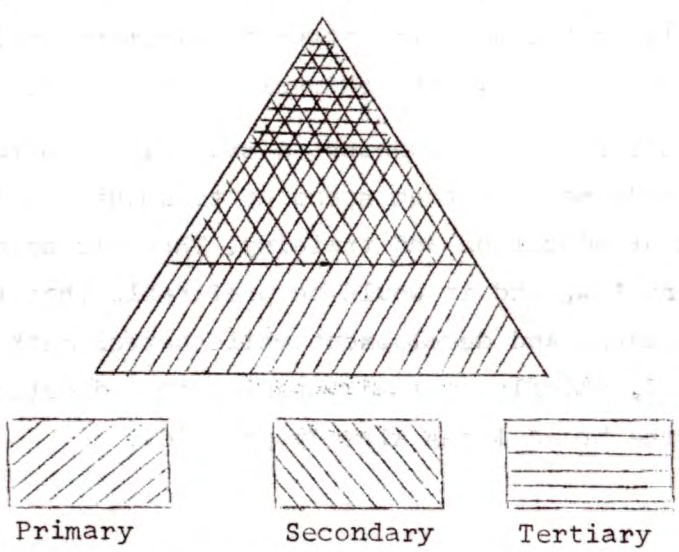

Fig. 4 - Education and Training at different levels and Maximum Completion Rates.

Parallel with an increased emphasis on science education and training would go a programme to orientate the entire community towards rational, modern, scientific ideas in all areas of life through mass media as well as to increase current expenditures on scientific and technological research and development.

Table 1 shows recently available figures for current expenditures for research and experimental development in percentage of Gross National Product, or similar aggregate, for selected countries. It will be observed that most developing countries, with very few exceptions, spend less (in many cases very much less) than 1 % of their gross product on research and experimental development, while the developed, industrialized countries spend over 1 % with Czechoslovakia, U.S.S.R. and U.S.A. heading the list. It should be noted, however, that relative to their gross product per capita, even the low percentage of expenditure represents a tremendous effort on the part of the developing countries, as compared to the much richer, developed countries.

It has become fashionable for developing countries to set targets for contribution by developed countries towards the economic and social betterment of the former. It is not so fashionable for developing countries to set serious targets for achievement by themselves. The scientific research and development field is one field where developing countries must attempt seriously to set goals to be achieved by their own efforts. A target of 1 % of their gross product to be devoted to scientific research and development could very well be the most important development goal that contemporary developing countries could set themselves for the decades ahead.

This target may represent a significant burden for many, considering that already most of them spend up to about 3 % of their gross product on all levels of education and training. There is no doubt that many could manage an extra 1 %, and it would be preferable that this go towards scientific research and development while better methods of spending the 3 % are devised, chiefly by restructuring the educational and training system along the broad lines already proposed.

Table 1

Current Expenditures for Research and Experimental Development, in Percentage of Gross National Product, Selected Countries

	Country & Year	Under 1 %	Over 1 %	GNP per capita (1967) (U.S. Dollars)
	Africa :			
	Botswana (1968 Expre on 1966 GNP)		1.36	90
	Cameroun (1967 Expre on 1965 GNP)	0.20		130
	Ghana (1966)	0.26		200
	Côte d'Ivoire (1967 Expre on 1966 GNP)	0.67		230
	Libya (1966)	0.03		
*	Madagascar (1967)	0.55		100
	Malawi (1968 Expre on 1965 GNP)	0.04		60
*	Nigeria (1966)	0.61		80
	Sudan (1966 Expre on 1964 GNP)	0.33		90
	Togo (1967 Expre on 1966 GNP)	0.04		100
	America, North :			
*	British Honduras (1965 Expre on 1964 GNP)	0.16		360
	Canada (1966)	0.89		2,380
**	Cuba (1965)		1.23	330
	Honduras (1965)	0.73		240
	Mexico (1966)	0.003		490
	United States of America (1967)		2.96	3,670
	America, South			
	Argentina (1965)	0.85		800
	Venezuela (1964)	0.12		880

* In per cent of GDP

** In per cent of Gross Material Product (GMP)

Table 1 (contd.)

Country & Year	Under 1 %	Over 1 %	GNP per capita (1967) (U.S. Dollars)
Asia :			
Cambodia (1965)	0.01		130
Ceylon (1965)	0.35		160
China (Taiwan) (1966)	0.39		250
Cyprus (1966)	0.26		780
*** India (1965)	0.41		90
Israel (1965)		1.13	1,200
Japan (1965)		1.19	1,000
Jordan (1967)	0.41		250
Korea, Republic of (1966)	0.28		160
Pakistan (1963)	0.27		90
Philippines (1964)	0.21		180
Thailand (1965)		1.05	130
Europe			
Belgium (1965	0.85		1,740
**** Czechoslovakia (1966)		3.27	1,110
Finland (1964)	0.38		1,660
France (1965)		1.44	1,950
Germany, Federal Republic of (1966)		1.83	1,750
Greece (1962)	0.23		700
**** Hungary (1965)		1.57	900
Ireland (1963)	0.40		910
Italy (1963)	0.49		1,120
Netherlands (1964)		1.56	1,520

*** In per cent of Net Domestic Product (NDP)

**** In per cent of Net Material Product (NMP)

Table 1 (contd.)

Country & Year	Under 1 %	Over 1 %	GNP per capita (1967) (U.S. Dollars)
Europe (contd.) :			
Norway (1963)	0.69		1,860
Portugal (1964)	0.02		420
Spain (1964)	0.15		680
Sweden (1964)		1.37	2,500
United Kingdom (1964)		1.74	1,700
Yugoslavia (1965)		1.002	530
Oceania :			
Australia (1966)	0.48		1,970
U.S.S.R. (1965)		2.20	970

Source : (a) Expenditure Figures - UNESCO Statistical Yearbook, 1968
(b) National Accounts Figures - U.N. Yearbook of National Accounts Statistics, 1968
(c) GNP per capita Figures - World Bank Atlas, 1969

The closer integration of education and training calls for a re-appraisal of the educational and training systems, especially in Africa. The system of higher education, borrowed from the European Middle Ages, makes an institutional distinction between education (at the university) and training (outside the university) and is detrimental to African development. Consequently, educated people (unless they come from the legal, medical, engineering and - occasionally - teaching professions) are fairly useless for any conceivable job of earning their living. No education is complete without training or apprenticeship of some sort. opposite is not necessarily true. One can acquire training without any formal education and be more valuable at earning his living than one who has acquired education without training, although employment and training could also go together.

The system under which professional and technical schools are separated from the universities (as traditionally in France, Britain and sometimes even in the United States) which has been largely borrowed in Africa, merely insures that the educated are not trained, and that the trained may have no taste for higher education. The incorporation of professional and technical schools within the university to complete the academic work of the various faculties would be an important innovation in Africa, as well as a means of cross-fertilization between educational and training institutions.

Assuming the possession of the necessary university entrance qualification, anyone so qualified could enter the university for academic work or training, or for both if one starts with academic work. One could shorten time by going in for training only, and coming out as a middle-level technician - a good thing since such people are required in large numbers in the shortest possible time, say two or three years. The professionals, required in less numbers than the technicians, could spend six or seven years : four for a first academic degree and two or three for subsequent training - lawyers, doctors, engineers, economists, high school teachers, sociologists, political scientists, etc. If they want to become higher professionals (e.g. research professionals) they could return for a higher degree for another two or three years.

In short, there would be a gap between first and higher academic degrees - no automatic continuation from bachelor's to master's or higher degree. A Ph.D who has never worked or acquired professional experience is pretty useless, so that the time spent in acquiring a master's or a Ph.D degree immediately after a first degree could have been more usefully spent acquiring a professional or technical qualification.

In Africa, there is need to incorporate in national universities not only teacher training, social research, medical, public health, engineering and legal schools; but also institutes of management, business administration or administration in general, development and planning, statistics and applied economics as well. The main difference now, as between the social and the natural sciences, is that practical experience in the former is not always required to make the training meaningful. Graduates in economics, political science, and sociology, are usually given substantive appointments in government business or the academic world without a prior period of practical experience or internship as required, for example, of medical practitioners. With the incorporation of training institutes in the universities, in fields like administration, statistics, applied economics, development and planning, such graduates should spend a year or so at the relevant institute in practical field work, training, internship, research towards a diploma before substantive appointment is offered.

With a suitable high school diploma one could choose to be a technician or a professional according as one does not, or does, take academic work before entering the training institutes. But, either way, one would have to have parallel working experience, while at the training institute, for the training to become beneficial. This means that suitable high school graduates in government or industry could enter the training institutes and become middle level technicians. Or graduate civil servants, who did not have previous training, could subsequently proceed to such training institutes for professional qualifications.

In order for this reform to be effective at the university level, especially for the education-training programme in the social science field, it would be necessary to upgrade high school education by providing for the social science subjects (economics, politics, sociology, psychology, etc., in addition to mathematics and statistics) to be adequately taught in the senior classes of high schools. This is

not impossible, and a high school certificate in these subjects should be a requirement for admission direct to a training institute in the social science field, with or without having to go through university academic work before or after such training. Without further academic training they would remain technicians; with it they would qualify as professionals.

The high schools themselves would incorporate some element of training for operatives by running under one management various types of courses - humanities, science, agricultural, commercial, vocational and mechanical, etc. - to permit students to choose the suitable combination for which their talent would qualify them, thus providing the necessary flexibility for enhancing completion rates and minimizing drop-outs.

Ranking high among the main problems of development plaguing developing countries, still in the human resource area, is the malutilization, sometimes non-utilization of qualified manpower. Often regarded as a graver problem is the exportation of such qualified manpower abroad - the so-called "brain drain". There are, of course, many reasons for the brain drain, and it would be a mistake to think that the leaders of the developing countries are helpless to take any measures to plug it if they wanted to.

For purely political reasons many governments in developing countries prefer to use foreign technical manpower in place of their own similarly qualified nationals : the latter may not belong to the ruling party, they are potential rivals for political power, they can ill disguise their dissatisfaction with the unabashed incompetence and bungling of the political leaders in technical matters for which they should properly seek the advice of their own experts. By contrast the foreign expert has no stake in the country, political or otherwise, beyond earning a good salary; hence, he may affect outward respect,

obedience and satisfaction with the political leaders no matter how much they push the country towards ruin, and in the final analysis he could be given twenty-four hours to leave the country if he stepped out of line.

Whatever the specific reasons, there is no doubt that the foreign expert is useful especially in performing those services (e.g. medical, education and training, etc.) for which the government may refuse, or be unwilling to pay or use, its own nationals; or for which the nationals feel no attraction. In so far as the patterns of rewards, inadequate facilities in developing countries, or other causes lead to an exchange of qualified manpower between developed and developing countries no disservice is done and the world's work is performed. Furthermore, the world is becoming increasingly technical and tends increasingly to use any qualified manpower that is available, regardless of race, colour or creed. This in itself is a great step forward in promoting the internationalization of talent and should be welcomed rather than deplored.

Two other considerations are in place. Firstly, the "brain drain", in so far as scientists and technologists are concerned, nourishes the flow of the common heritage of world science and technology, so that it is only natural that all countries contribute to it that can. Developing countries could not hope to be left out of making their own contribution. Secondly, as the exporting country finds it appropriate and possible, it can always attract its qualified manpower back from abroad (e.g. Mainland China) in order to work at the development tasks of the country. Thus, when conditions become ripe, the developing countries have within their means the possibility of re-importing and adequately using their qualified manpower working abroad. They are not entirely without a remedy.

Closely connected with the misuse or non-use of local scientific and technical manpower in developing countries is the naïve belief that science and technology can be transferred through third-party technical assistance rather than directly acquired - learned, copied or bought and applied by those desiring to benefit by it - chiefly by travel abroad to the various sources and subsequent domestication of the acquired knowledge.

This leads us into the category of problems shared by both developing and developed countries. First is the widespread suspicion and downgrading of scientists, science and technology. This phenomenon is practically universal but is linked to a widespread misunderstanding in developing countries where there exists a naïve confusion of the nature of science and technology with their misuse by mankind. In short, evil in human nature is regarded as, and translated into, evil of science and technology. This attitude among pre-scientific and pre-technological leaders and their peoples could well be understood, and is one of the factors in the inadequate attention and expenditure allocation to science and technology in their educational and training systems.

There is a further unfortunate consequence associated with this attitude towards science and technology : the almost magical belief that an alternative road to development could be found by developing countries, which would combine all that was best and desirable in traditional society with all that is best in modern science and technology - without the associated costs and the sacrifices. So long as such vain hopes are entertained, they continue to delay the dawn of the realization of the full implications and possibilities of science and technology in human life. Undoubtedly certain human, social and ecological costs could be minimized or eliminated, but this promise itself is only possible to those already possessing the gift and the tools of science and technology. Even so there would be, at any given time certain risks and costs which are unavoidable until better knowledge of how to avoid them becomes available in time.

The hope of a better or less difficult way to development than is currently known at the existing stage of science and technology is not confined to developing countries but is universal. However,

if such a way exists, the likelihood of its being revealed to pre-scientific and traditional societies such as exist in many developing countries, is minimal or non-existent. Rather is such a way open alone to those already familiar with, and possessing the existing science and technology and therefore familiar with its limitations as well as its possibilities and potentialities.

In the newly independent countries eager to manage their own affairs, yet limited in their fund of technical knowledge and manpower, there is a growing but unfortunate trend, already observed in some developed countries and in international organizations, under the impact of tremendous political pressures, towards the politicizing of technical posts. That is to say, posts that require technical and professional knowledge, and therefore to be filled by persons with the appropriate technical or professional qualifications, are often and increasingly being filled by nationals without the necessary knowledge and qualifications. Although this trend is not incompatible with the previously mentioned phenomenon of malutilization and non-utilization of trained local technical manpower, it complicates further and makes difficult the development efforts. For not only are the incumbents unable to perform, they also have to seek the services of the appropriately qualified people (often foreign technical assistance personnel) to get the work done in the technical posts occupied by them as politicians or political supporters. This makes the work doubly expensive in terms of manpower costs. It also perpetuates the down-grading of scientists and technologists already referred to above, thus delaying the reckoning with science and technology as the sine qua non of all development.

No attempt will be made here to be exhaustive in regard to the shared problems of developing and developed countries. Those

already discussed in the preceding paragraphs are indicative both of the similarities and, more important, the differences even in the realm of shared problems. One other problem may, however, be mentioned, in passing to other issues : the matter of venality and corruption in both public and private life. This is a problem which no society has been able to lick or is ever likely to be able to overcome. It is one reason why developed countries look on this phenomenon in developing countries with a tolerant eye. Certainly, they have no claims to moral superiority. But this is not the essential point. While there is no evidence that corruption is a barrier to the progress of development in developed countries, all the evidence shows that it does seriously aggravate and complicate the existing blockages to the development of the so-called developing countries. This because it helps reduce the resources available for development-oriented activities in countries facing natural resource limitations, and without the science and technology which could enable individual beneficiaries, if they so wished, to devote ill-gotten gains to development-oriented activities and to overcome the natural resource limitations imposed upon them.

This is one reason why developing countries cannot, at their present stage and from the development point of view, <u>afford</u> corruption, no matter what similarly goes on in developed countries already established in the path of continuous internal change. There is one important philosophical problem associated with this observation : there is fairly widespread agreement that the growth of an acquisitive instinct is necessary to the accumulation of capital and material prosperity, and corruption and venality may be seen as part of the rise of the acquisitive instinct in developing countries. The question, never before seriously posed or answered, therefore, is how much or how great is the moral cost of development - and should one therefore expect more, or less, corruption in the future ? With the acquisition of science and technology this question could lose much of its present urgency.

II

In order to better outline what assistance or cooperation scientists from developed countries can give to the developing in respect of the main problems confronting the latter, it is necessary to be clear as to what scientists from developed countries cannot do for the developing. In other words, it is necessary to know what the developing countries alone can, and must, do to help themselves.

Only the developing countries can make their rendezvous with their own destiny by facing the moment of truth in regard to the place of science and technology in their development. Specifically, they must make a real effort - if they really and truly wish for development - to change their world-view from the defence-oriented to the attack-oriented perspective. They must recognize that they have to have confidence in their ability to change both themselves and their environment, an ability which can be realized only through an unreserved embrace of the modern, rational and scientific approach to problem-solving, so basic to any development. Desire for development must be translated into demand for development through the incorporation of science and technology into their traditions.

Given this condition, change would become a way of life operating from endogenous stimuli, on a spontaneous and continuous basis. The developing countries, however, need to consider seriously and commit themselves to change. In spite of all that has been written and said by the leaders and other influential people of developing countries, it is not clear that the commitment to change has been accepted by the leaders or the people. The persistent speculation on the possibilities of a costless, golden path to development; the revival of traditional culture, folklore and mythology; the inner doubts about science and technology and the reaching out for the stability of traditional society

II

even while it is being transformed and altered - in spite of itself - by external forces : all these indicate a longing to return to the past rather than to a future full of change, risk and uncertainty.

It is difficult to make comparisons with historical antecedent because history is not always a true and certain guide to future developments. It may well be, however, that this apparent return to the past represents an attempt to re-establish contact with a past that has been interrupted by the interlude of colonialism, as well as a rebirth comparable to the rediscovery of the past during the European Renaissance and a starting point for the voyage into the unknown future. One thing is certain, nevertheless : a spiritual rebirth, a reawakening, a discovery of themselves and their potentialities, individually as well as in community is an indispensable first step to change and development if these must come. This can only be done by the societies involved, for only they can break out of the shackles of the past; not so much the physical and institutional shackles of colonialism as the mental and spiritual shackles associated, on the one hand, with the traditional pre-colonial society as well as, on the other hand, with the colonial society.

Given the readiness for this process of rebirth, there must be a willingness to pay the costs and the sacrifices involved. Only the societies concerned can and must pay these costs and sacrifices - no other society external to them can be surrogate in this matter. Part of the cost involves adequate expenditures to restructure the world-view of the society, as well as its educational and training system to increase its scientific and technological component.

III

Having indicated the end of the stick which developing countries must carry themselves, we are better able to see the perspective from which the assistance of scientists from developed countries can be of greatest advantage : increasing the capabilities of the developing countries to help themselves.

Scientific knowledge and technology, the key elements missing in the development equation of most of the developing countries, are not, unfortunately, free goods since they are produced in the same competitive environment as natural resources. For all that science and technology may do in bringing up unlimited wealth, scientific and technological manpower is scarce all over the world. And both the manpower and the technological hardware consume enormous amounts of resources in their development.

The speedy amelioration of the lot of the present developing countries would seem, therefore, to depend on two things, if they were possible : (a) a programme undertaken by both developing and developed countries to produce in adequate numbers the scientists and technologists necessary to make science and technology relatively free goods; (b) a programme, undertaken also by both parties, to produce and make available vast quantities of industrial investment capital so that this, too, could become a free good to be used in the exploitation and application of science and technology.

This, for the moment, would sound like a pipe dream. However, something very much less ambitious could bring effective results. Scientists in the developed countries could open up their educational and training institutes to increasing numbers of students from developing countries as well as give them the opportunity for work and acquiring the necessary practical experience. Assistance could also be given in

the form of finance, personnel and equipment and to establish similar institutions in the developing countries, with cooperative working links and arrangements between similar institutes in developed and developing countries.

Quite apart from educational and training institutes, governments of developing countries need to set up research institutes and laboratories (these may or may not take the form of the much discussed "centres of excellence"). These are necessary both to give support to their local scientists engaged in day-to-day practical operations, as well as provide points of attraction for some of their students abroad who may otherwise be tempted to remain permanently abroad.

The seriousness with which governments of developing countries establish such centres would be an indication that they were ready, not to stop the "brain drain" but to reap dividends from it for their own development. Scientists from developed countries could be of help in this kind of programme to mutual advantage. Such centres could be bases away from home at which additional research work could be pursued on problems more relevant to the situation of the developing countries. In serving as counterparts or correspondents of similar institutions in developing countries, such centres will assist the international exchange of scientists as well as augment the international flow of scientific knowledge and technology.

Institutional and manpower developments of the kind discussed in the immediately preceding paragraphs would inevitable come up against financial constraints on expenditures on scientific and technological research and development, which are currently world-wide among governments. It is in this connexion that foundations and private

business may have a role to play both in the developed and the developing countries. These institutions may need, therefore, to place a high priority on science education and technology in their grants and spending programmes. Business may lend the support of their facilities to scientists from developed and developing countries in relevant, mutually interesting, areas of research and development, under suitable arrangements. They may also need to supplement financial assistance to educational and training institutions that find their sources of government and state support diminishing.

It would be a mistake to underestimate the amount of worthwhile scientific research being undertaken currently in developing countries. In anglophone, as in francophone, Africa existing research institutions are carrying out research into local problems, in agriculture and animal science for example, practically without consultation or communication with one another. The need for exchange of information and sharing of research results is so great as to warrant special efforts in setting up a documentation and exchange centre, with provision for translation and abstraction in both languages, English and French. This is an area in which a few scientists from developed countries familiar with both languages could provide considerable assistance to African countries - as well as developing countries in other parts of the world - in operating such a centre and collating information. There will be greater need, of course, for translators and abstractors in the scientific and technical fields than for practising scientists. Hence only a marginal supply of scientific manpower would be actually needed at the centre. However, it will be a popular place of call for practising scientists who wish to bring themselves up to date on what may be going on in different countries.

The language problem raises generally the problem of communication of scientific ideas at the instructional level both within and between language groups. The principal matter here concerns the preparation of science instructional materials for schools and colleges, materials relevant to local background and environment. Some amount of work is already going on in this area in Africa[1/], but could do with some assistance by scientists from developed countries - especially in standardization of materials and in translation into both English and French for African schools and universities.

In view of the general shortage of science teachers in developing countries, a two-pronged attack in remedying the situation is indicated, both requiring assistance from scientists from developed countries : (a) the local training of science teachers and auxiliary scientific personnel; (b) the employment of science teachers from abroad to fill manpower needs. It may be useful to consider to what extent existing volunteer and exchange programmes by developed countries could be adapted to serve this need.

1/ There is, for example, a Science Development Centre at Njala University College in Sierra Leone which specializes in the preparation of Science teaching materials for elementary schools, in English.

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ON THE METHODOLOGY OF FOREIGN AID TO LESS DEVELOPED COUNTRIES (LDC) WITH SPECIAL REFERENCE TO SCIENCE AND TECHNOLOGY.

About the concept

Aid or assistance, sometimes nicknamed cooperation or partnership, belongs to the folklore of contemporary international relations exposed by Myrdal as "diplomacy by terminology" (1). When an American giant corporation invests ten million dollars in Europe, this is business, and European fear, a handsome one for the investor. When the same is done in Asian, African or Latin-American countries (euphemistically called them a developing country) this becomes aid to the recipient country, even though the expectation about the return must run pretty high to persuade the investor, while the capacity of the recipient country to endure a steady outflow of foreign exchange in form of expatriated profits is obvious by less than its European counterpart. The UNO and OECD compute as aid to LDC all flows of long term capitals, i.e. grants (putting in the same bag relief action to face some natural calamity, and all other kinds of donations), credits (irrespective whether they are granted on concessionary business-like or usurary conditions) and direct private investment. All these statistical and terminological tricks add into a considerably brightened picture though by all means not a rosy one, of international flow of resources to LDC (2). The more so that the real amount of profits expatriated from LDC in foreign businesses is hard to assess, a substantial investment in industrial countries of capital belonging to citizens of LDC escapes all accounting and, on the top, the losses often incurred by LDC because of adverse terms of trade constitute another ticklish and therefore gladly neglected statistical item. With respect to technical assistance the mess is still worse. Its volume is assessed by the expenditure involved and the number of experts sent to LDC. Both measures are no indicator at all of success or failure of the operation. Moreover,

we lack hopelessly statistical evidence about the real cost of transfered technology, as a substantial part of this cost is included in the price of the imported hardware and of the inputs subsequently needed for production, not speaking of the secrecy of many contracts and the impossibility of probing into transactions between subsidiaries of transnational films. In other words, "aid" is being used to denote a whole gamut of operations and relationships, prompted by various intentions, and leading often, both in the donor and the recipient countries to results, quite different from the avowed ones. The range of intentions on part of the donors goes from sort of charity-like moral compulsion to assist the poor or guilt-complex urging to redress the wrongs of the colonial past, through pondered desire of reducing the dangerous tensions between the poor South and the prosperous North, up to cold blooded business calculation and political strategy meant to influence the alignment of the LDC in the worldwide competition of the big powers. All these motivations may be present at once; a political operation may be presented to the donors public opinion as arising out of ethical and moral duty. As for the governments of LDC, some accept aid in the present forms and press for more of it, because they genuinely believe that, in spite of all shortcomings, it is still a better bargain than no aid at all. Others are so compromised in a pattern of partnership with respect to donor countries, that they cannot help but accept the game proposed to them, to the extent to which the elites in power may derive substantial personal advantages out of difference schemes of aid. Their genuine enthusiasm may be secured for proposals which are blattantly harmful to the long term interest of their countires. Very few, indeed, have pondered on the lessons arising, both from the Japanese experience in the past and that of present China. Though these two performances differ in many fundamental respects, they have two features in common: foreign capital has been, broadly speaking, kept out and an elaborate policy of transfer of knowledge through acquisition of skills rather than of ready-made technology, has been given a place of pride in the strategy of development.

Public opinion in LDC is of course free to take a much more severe view of the post-war record of aid both bilateral and multilateral and to voice its mistrust with respect to the intentions of the rich countries. In matter of facts an atmosphere of gloom and of disenchantment prevails by now, even among people who once believed in the possibility of world international cooperation for development (3).

The impact of aid; the increased evolution of distrust

a) The donors:

With respect to the donors economy there is a paradox inherent to the "aid game". In almost all cases, giving aid promotes one's sales and thus financing out of public money one's exports. This is always advantageous to business in a market economy. Whenever idle capacities exist, it stimulates the whole economic activity through the well known mechanism of the multiplier: GNP grows by a margin substantially higher than the initial expenditure involved. Thus, far from being a burden, such operations may be self financing. Together with grossly increased outlays in social policy, they could provide a substitute to expenditure on armament in reconversion schemes. This could be achieved e.g. in the American economy, so long as the political aspects of the problem could be taken care of (4).

But for the donor government it is almost impossible to sell the same operation as genuine aid to the recipient country and as an "aid yourself" to his own community. Hence, the impression created that aid is a heavy-burden to the donor economy. Angry reactions on the part of the donor's public opinion are therefore to be expected on account of "ingratitude" of the recipient country and the feeling of "waste" of public funds. The good feelings arising out of the sense of fulfilled moral values are thus often more than offset and induce campaigns against more involvement in aid operations. As a consequence the LDC reacts, and the process of mounting mutual distrust is now set out into motion.

b) The recipient country:

Inflow of foreign resources is not tantamount to increasing the LDC capacity to invest. Quite often, external savings displace the domestic ones and release them for additional conspicuous consumption of the elites. The commodity pattern of imports financed through aid is not as yet a guarantee. If essential industrial equipments are obtained through aid the foreign currency thus saved by the recipient country may be still used for luxury consumption goods and/or for acquisition of equipments to produce such goods.

In first approximation a reliable criterion for assessing the impact of foreign aid is to compare two alternative plans, one made on the assumption that no aid would be in flowing and the other on the assumption of reasonable use of a quantum of foreign aid (5). This procedure is, however, cumbersome and difficult. Even so, it leaves out the important problem of now planning decisions could be affected by the expectation of foreign aid. How many responsible people would refuse aid if it does not match the priorities which they have established and, as a consequence, change these priorities? The current practice is to modify the plans so as to fit them into the new scheme for which assistance is available. In some cases the whole pattern of development is changed, owing to import-bias and heavy reliance on transfer of ready-made technology, ill adapted to local conditions. Consciously or not, the LDC governants abdicate, in some way, of their right and duty to make their own decisions.

It is most common that responsible people in LDC have been educated in rich countries, and have reactions and concepts which are those of foreigners. For them it might be difficult, if not impossible to behave according to the optimum interest of their country.

Some characteristics of genuine aid

1) Aid to any country, should add to its developmental potential, i.e. the simultaneous existence: a) of a productive structure able to sustain its own expansion,

and/or to take case of the necessary imports through growing exports, b) of an intellectual structure able to feed the productive structure with novel techniques and managerial ideas, c) of a political and administrative machinery geared to independent decision making.

2) According to this, genuine aid is characterized by its ability to ease the bottlenecks affecting the development process, varying from one country to another, and also with the evolution of the very developmental trend.

3) One of the major bottlenecks is the methodology of aid and the choice of priorities by the recipient country. Errors, miscalculations are almost unescapable, not only on part of the donor experts but also the LDC decision making people. The situation is, however, not quite symmetrical. The donors have very seldomly the notrion that they did wrong. In nations as in individuals the reaction to this is to accuse the other party. In the case of the recipient country, error and suffering from it, may be a source of education and learning. This is why we consider that genuine aid should have a component of self-education by the recipient country, which may be only reached by giving it entirely free choice of the priorities.

4) We propose that the choice of the forms and specific items of aid should be left entirely to the recipient country. The financial limits within which this choice would be exerted, should be established according to each case, and for a limited period of time after which the aid would be negotiated for subsequent periods.

5) Aid should be granted on the understanding that the recipient country will endeavour to release through its adequate use internal reserves and capabilities, but all the same, the recipient country should be granted the right of learning by bona-fide mistakes. The ability for decision-making can be improved only through a learning-by-doing process, and the cost of such apprenticeship reflects, to some extent, the educational gap. In consequence the recipient country should be credited with a budget; it would freely set within the limits of this budget its shopping list of goods, facilities,

technical assistance and expert consultations.

6) The country's performance, assessed by the government interested and by an independent expert committee should be taken into consideration as one of the criteria for periodical renegotiation of the amount of aid at the end of each time intervals.

7) The periodicity would be of 5 to 7 years with a reevaluation of the situation after roughly at the mid period and the possibility to negotiate the renewal of the contract at that time.

Depersonalized aid

We think that, in order to free aid from all kinds of second thoughts and calculations on both parts it should become depersonalized. This goal should be reached by giving absolute preeminence to multilateral channels. It is of the greatest importance that the UN machinery for aid should be modified, and learn from the past experience to be less bureaucritized, more flexible and imaginative.

The UN should provide the funds, and keep at the disposal of the LDC necessary information and advising services, becoming thus, a true clearing house of all relevant data on development, and computation devices. Such an operation would require finances of an order of magnitude several hints bigger than what is made available at the present to United States. Hence the importance of endowing the UN with new and independent resources of income arising from the utilization of resources belonging to the whole mankind, the definition of which would deserve very elaborate studies (to start with the submarine resources as it was pointed out at the recent Pacem in Maribus conference held in Malta). To the extent to which this could be secured the very notion of donor and recipient country would disappear.

We realize that the proposals sketched above are at poles from the current practice and that, in short run they may sound quite unrealistic. However a bold departure from the routine evolved in the last quarter of century is necessary. The above approach

could be tried within a more restricted field, that of assistance to LDC in the realm of Science and Technology.

Science and Technology cooperation (ST)

There are schematically three reasons to start with ST:

1) It is necessary to have some testing grounds for the new approach in aid. A pilot project is needed before generalization.

2) Aid in ST can be isolated from a broader context because of the specificity of problems involved, and of less emotional and political components.

3) With respect to ST, the situation in LDC is alarming. ST alone cannot redeem LDC. It is not a substitute for social change or the only agent for such changes. ST, conversely cannot fully develop without a suitable political and social environment, giving to the scientists the minimum guarantees of freedom of research and of stability. But, with all these qualifications, ST constitutes a critical factor of progress, being a vital part of the developmental process.

ST colonialism

The following quotation from Calder's latest book reflects accurately the present state of things.

"No carricature is involved in describing modern science as a European invention which enabled the white nations to achieve military, economic and cultural domination over the rest of the world, and to make themselves prosperous while leaving the natives of the poor countries to progress very much more slowly. No injustice is done, to say that most research workers and technologists have unthinkingly connived in these used of science which are, at bottom, racist. Declarations about using science to feed the world's hungry have not stopped the prosperity gap growing wider; nor can they alter the fact that the intellectual interests of the great majority of research workers are

far removed from any such program, and that the preoccupation of technologists is with machines that enrich the rich" (6).

In matter of fact, according to calculations made at the Science Policy Unit of the Sussex University, roughly 98% of non-communist world expenditure on Research and Development (RD) are confined to US and Europe. Thus two-thirds of mankind accounts for only 2% of expenditure, the discrepancy in per capita ratio being of no less than 100:1 (7). As the advanced countries have the virtual monopoly of RD, the selection of priorities of research and of methods of solving the problems is made taking into consideration the needs and the factor endowments of these countries, while in most cases the interests and the situation of the LDC would be pointing to completely different directions. Moreover, "much of the present expenditures of the poorer countries represents a hopeless attempt to compete from an inferior position in solving the same kinds of problems by the same methods, rather than those that would be suggested by their own conditions. In fact, the indigenous scientific and technological capacity of the poorer countries is even insufficient to determine the nature of their own problems and to determine how far they are susceptible to solution by applied science and technology with appropriate methods" (8).

Indiscriminating transfer of ready-made and ill-adapted technology to pockets of modern industry in LDC cannot solve the basic problems of under-development. Although some LDC can proudly show to day some booming industries and modern cities, social inequalities and unemployment may have worsened. According to H. W. Singer's estimates, the present level of unemployment in LDC would be at least 25%. Moreover, it has been found that in 14 LDC unemployment increases at a rate of 8.5% per annum (10). On the assumption that the present trend continues unaltered one is led to estimate that in 1980 unemployment would grow to 43%.

Some proposals for ST aid to LDC

Two kinds of solution are being proposed:

1) Scientists and Technologists in the developed countries should pay more attention than hitherto to specific problems of LDC. Some 5% of expenditure on civil RD in developed countries should be devoted to such purposes.

2) Effort should be directed at expanding the scientific and technological infrastructure in the LDC.

If properly implemented 1 and 2 should be complementary. But, the present pattern of ST domination could easily find ways into a program of large scale research on behalf of and for LDC by Scientists and Technologists in advanced countries. The results transferred in ready-made form could even worsen the present situation. The resources potentially available should be therefore put at the disposal of LDC, with the expectation that they would use them, as a consequence of a free choice, to promote their STI (by STI we mean an integrated system of scientific and technological information services, research institutions working both in the field of fundamental and applied research projects designing and engineering offices and agency entrusted with the control of international transactions in the realm of technology).

The role of UN, in the field of ST, would be of the same spirit that was described before. An allocation of resources, for say six years subject to renegotiation, should be made and established as a percentage of the budget for RD of the LDC country. It is anticipated that this percentage would decrease over time, being eventually corrected in the light of the performance evaluated independently, say every three years by the LDC government concerned and a committee of international experts appointed by the UN.

The recipient country should be entirely free to spend the resources allocated according to its own idea of priorities of research and the best sources of expertise and hardware. Only one limitation would be imposed: research made possible through aid should be exclusively of a civilian nature and no resources could be diverted to military projects.

The UN would provide to the LDC a number of back stopping and ancillary services such as:

- Data banks stored with up to date scientific and technological information, including the "shopping opportunities" and the experts' roasters.

- Facilities for quick trips and consultations abroad, made available for Scientists and Technologists working in the LDC, who should be free to pay short and frequent visits to their counterparts in any country. IATA's regulations should be amended so as to allow for the use of unsold seats in airplanes against a nominal fare.

- International research institutions preferentially located in LDC, meant above all as meeting places, and endowed with training and educational capabilities. Such institutions, together with a certain number of their counterparts in social sciences, could eventually be federated into an International Development University. The main vocation of this University should be fostering of interdisciplinary development oriented research and training at the highest postgraduate level.

The proposals sketched in this note are very tentative; they aim at drawing the attention to the need of a radical departure from the existing philosophy and machinery for international aid. Both the Pearson Report and the Jackson Report, are in our opinion much too conservative.

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1 - Gunnar Myrdal - The Asian Drama - New York, 1968.

2 - This note is not concerned with military aid. Though understanding the need for such aid in some very specific occasions, we should like to stress that it does add very little if any developmental potential of the recipient country, except for some specific technological spillovers. In compensation it distorts the pattern of government expenditure and has far reaching political implications.

3 - See Mahbub ul Haq in CERES (FAO review) - Vol. 3, n° 2 - April 1970, as an example of the present mood of distrust with respect to ai from an LDC country.

4 - Hence the importance of the questions raised by John Galbraith in his recent pamphlet : "How to control the military" - New York 1969.

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6 - Nigel Calder, Technopolis - Social control of the uses of Science - London, 1970, p. 252.

7 - Data quoted by Hans W. Singer in Dualism Revisited, October 1969, issued by the Institute of Development Studies at the University of Sussex.

8 - Hans W. Singer - Loc. cit.

9 - Hans W. Singer - Loc. cit.

10 - Calculations of H.A. Turner quoted by H.W. Singer.

11 - A proposals for setting under the UN auspices an International University was being discussed in the United Nations at the moment of writing this note.

A.R. Abdel Meguid*

ECONOMICS AND TECHNOLOGY OF DEVELOPMENT

A Perspective

1. Over the last two decades the developing countries in Africa, Asia and Latin America achieved on average a rate of growth of output arithmetically sufficient to accommodate their growing population and to allow for a modest increase in their living standards. This statistically observed growth did not bring satisfactory progress in development; malnutrition is common, illiteracy is widespread, unemployment is endemic and growing, distribution of income and wealth is severely skewed and the gap between rich and poor countries is widening both relatively and absolutely. Even to achieve this modest rise in standards of living, a tremendous mobilization of resources was necessary. In the developing countries of Asia, Africa and Latin America annual investments, during the last decade, amounted to some 15% of these countries' national incomes. On average 80% of these investments was financed from their own resources and 20% from international assistance. 1/

2. The net flow of financial resources from developed countries (both official and private) to the less developed has been substantial; amounting to some $120 billion over the period 1956-68. 2/ In 1968, the net official and private flow of

1/ "Partners in Development", Report of the Commission on International Development, 1969, pp. 27-31.
2/ Ibid., p. 378

*) The views expressed in this paper are those of the writer and do not necessarily represent the views of the World Bank.

development assistance has been estimated at over $12 billion representing 0.7% of the donor countries' gross national product. 3/ On average a quarter of this flow was in the form of grants. 4/

3. The financial cost of these capital and technological inputs to the less developed countries, as a result of two decades of borrowing, has been rising sharply. Total recorded foreign debts of the less developed countries stood at $47.5 billion in June 1968. 5/

4. The reverse flow of debt service payments on official account amounted to $4.7 billion in 1967. 6/ These payments have been rising over the last ten years by some 17% annually, and are fast approaching a situtation where the outflow is equal to the gross flow of new lending. The Pearson Commission estimates that the developing countries of South Asia and the Middle East would reach this position by 1977 and in Africa and Latin America well before that if the flow of lending remains at the 1965-67 level. 7/ Even an optimistic increase of 8% annually in the flow of lending would mean that between 60 and 90 percent of new borrowing would be utilized for debt service payments. Export performance of developing countries in the sixties, in spite of annual growth of slighly below 6%, has led to a steady

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3/ Ibid., pp. 145, 150. For official flows the percentage varies among major donors from 0.72% (France) to 0.38% (USA). Ibid., p.148
4/ Ibid., p. 385
5/ Ibid., p. 371
6/ Ibid., p. 72
7/ Ibid., p. 74

decline from over 30% of total world exports in 1950 to less than 20% in 1968. 8/

5. The behaviour of these basic variables, which help portray the pattern of international development, leads to justifiable anxiety. Simple and sophisticated extrapolation of recent trends indicate a worsening in the relative position of developing countries, an increasing gap between rich and poor countries at an alarming rate, and a declining support for more aid at less burdensome terms.

6. Organized response by the Pearson Commission, The Jackson Report, The UN Development Committee and others to the imminent consequences of this pattern of international development has been impressive. These responses, predictably, followed the logic of the economists' approaches to the problems of growth. Simply stated, these approaches are based on a number of economic "identities" of which the following are most dominant in the literature and in the philosophy of the existing development institutions:

$$I \cdot k = \triangle Y \qquad (1)$$

$$S = I \qquad (2)$$

$$S_d + A = S \qquad (3)$$

$$Y - C = S_d \qquad (4)$$

These identities state that the growth of income (Y) depends on the quantum of investment (I) and the statistically observed output capital relationship (k); that these investments equal total savings (S) which originate domestically (S_d) as a residual after consumption (C), and is supplemented by foreign aid (A).

8/ Ibid., p. 47

The organized response has directed most of the efforts towards the discussion of the magnitude of the variables without sufficient emphasis on the institutional and catalytic agents necessary to bring about the dynamic relations of, and the logic behind, these identities. In other words, the guiding philosophy has been quantitative rather than qualitative objectives. While the former is certainly significant, the latter has proved in most developing countries to be the case of the development problem.

A Restatement of the Development Problem

7. The oversimplified financial approach dominating the international development dialogue as outlined above does not sufficiently take into account the major bottlenecks limiting the full utilization of developing countries' national and human resources. Moreover, although development performance in the last decade was disappointing, most of these countries have considerable potential for more effective economic growth. Possibilities of productive investments are numerous but remain untapped and insufficiently assessed. These refer to improvements in the utilization of present production facilities in agriculture, livestock, industry and power as well as systematic exploitation of water, land and mineral resources through quick-yielding projects of short gestation periods. Realistically, however, the economic exploitation of these facilities and resources is not realizable over the foreseeable time horizon as development

planning institutions are more "financially" and less "technologically" oriented. Let uas rewrite some of the above identities in physical science form:

Given,

(a) the scientific assessment of the country's development potential,
(b) the right choice of investment projects,
(c) the successful choice and application of technology,
(d) the economic procurement of machinery,
(e) the adequacy of infrastructural services,
(f) the availability of production and managerial skills,
(g) the assured supply of raw materials,
(h) the appropriate study of market outlets,
... etc.

$I \longrightarrow \Delta Y$

and, Given

(a) "perfect" financial institutions to mobilize domestic savings and provide investment capital,
(b) unit elasticity of supply of entrepreneurs in the public and private sector,
(c) continuous supply of implementable projects to use up available investment funds,
(d) "acceptable" social and political investment climate,
(e) adequace of foreign exchange to finance the import content of investment,
... etc.

$S \longrightarrow I$

8. The neglect of the catalytic agents required to justfy the equality sign in the economic identities represent the heart of the problems facing developing countries. There has been a noticeable tendency to implicitly assume away these problems and concentrate on the magnitude of the variables on both sides of the equations. Thus the Pearson Report's major recommendations on an international framework for development centered around the need for additional aid, for coordination between donor countries and development

agencies and for lower interest rates. 9/ The UN Development Committee is concentrating its efforts on estimating the required quantum of aid to close the resource gap of developing countries if they are to grow at 5% annually (in the First Development Decade) and at 7% (in the Second Development Decade). The conclusions of these august bodies, if implemented, would no doubt improve the development prospects. Such improvement, however, would be marginal as the level of aid and investment funds are only a partial determinant of growth.

9. The international development dialogue was, and still is, centered around increasing the total size of bilateral and multilateral aid and involves sensitive questions of monitoring the performance and the terms and allocation of aid to developing countries. There is little scope for action by the Pugwash Group in this regard, except to cast an additional vote for a larger and more coordinated aid flow. However, the use to which international resources are being put and their effectiveness in identifying and harnessing the development possibilities is still almost in a vacuum.

Development Institutions

10. In the pursuit of "quantity" goals, the quality and content of the development process have not been sufficiently met. The present development institutions are not oriented

9/ Ibid., pp. 229, 230

towards the pursuit of quality goals of development with new insights, new strategies and new emphasis. The World Bank has recently spearheaded a concerted effort to expand its role in mobilizing capital and allocating it for enhancing the productive capacity of the developing nations. The Bank's resources are not unlimited. But the real limitation on the Bank's role, and indeed on productive investment leading to rapid growth in general, is the identification of development projects and the determination of strategic areas of action. To overcome these limitations, operational planning requires a multi-disciplinary institution more similar to an applied research center than to an economics faculty. The proposed institution would be involved in three main directions, (a) identification of exploitable resources, (b) improvement of technology in existing production facilities, (c) preparation and techno-economic evaluation of investment projects.

11. Development and productive exploitation of resources must be based on reliable and comprehensive research. This maxim, though widely accepted, is easier to articulate than to apply. Most developing countries have a plethora of resource data much of which is based on rough estimates, informed guesses or partially administered surveys. This welter of often insufficient data seldom provides a realistic basis for project preparation and evaluation. The proposed institution at the heart of a country's machinery should be assigned the task of digesting and assessing the relevance, use and improvement of existing resource data and of selecting and adapting the relevant optimum technology.

12. Moreover, to a large extent, development has been thought of solely as accumulation of capital in the form of new factories, new irrigation works and public utilities. Indeed the emphasis on new ventures has competed successfully with existing production capacities in the bid for Government attention and foreign financial and technical assistance to the detriment of the efficient administration of the existing production network. Appraisal of the economic situation in many developing countries seems to indicate that perhaps the major problems of growth relate not so much to the need for more investments as to the need for applying new technologies to the existing production capacities, especially in agriculture.

13. New investments are certainly required to exploit natural resources, to raise the productivity of labor, to supply the growing need of a variety of consumers and intermediate goods and to improve land/man ratios, a key parameter in most developing countries with high population growth rates. The entrepreneurial capacity to prepare, evaluate and initiate these investments has been declining due to social and political factors in many developing countries. Project preparation machinery in most of these countries is absent or weak which partly explains the existence of large unutilized pledged aid. National development plans are mostly projections of macro economic variables which draw a future picture of the economy if

a given quantum of investments is undertaken. The proposed institution should participate in the task of preparing the complex of projects and decisions that are necessary to satisfy the plan's objectives. This complex deals not with intangible aggregates but with specific technological, social and economic datum.

14. These national or regional institutions may be coordinated and supported by existing international agencies and perhaps the proposed International Science (for development) Foundation proposed by Roger Revelle. These institutions would also be the major recipient of bilateral and multilateral technical assistance. Massive inputs of international technical assistance have been flowing from developed countries and multilateral agencies to the less developed countries. In the last seven years, technical assistance flows from USA, France, U.K. and Germany alone averaged one billion dollars annually.10/ UN technical assistance amounted during that period to some $700 million. It would not be an exaggeration to state that the yields from these funds have been minimal. Too often the transfer of knowledge becomes bogged down as a result of absence of institutions or cadres capable of absorbing, adapting and administering the new technology. A sizeable number of the 110,000 technical assistance

10/ OECD, Statistical Tables for the 1969 Annual Aid Review.

advisers are therefore ineffective. The proposed development institutions would be in a better position to absorb more effectively the services of these experts and to mobilize them in resource assessment and project preparation rather than the frustrating bureaucratic assignments most of them seem to have. Indeed a foremost task would be to draw up technical assistance programs directly related to the country's development effort.

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THE SCIENTIFIC COMMUNITY AND LATIN AMERICAN DEVELOPMENT

José Barzelatto, M.D.

Presented at the Pugwash Symposium on "The Role of Science and Technology in Development. What can Scientists do about it? " - Held at Stanford University, September 1 to 4, 1970

THE SCIENTIFIC COMMUNITY AND LATIN AMERICAN DEVELOPMENT

The central idea under which this Symposium has been convened can be summarized in Pope Paul's famous sentence: "Development is the new name for peace." 1/ Some speak simply of "development", others of "integral development", or of "human development", but gone are the days when the only preoccupation was "economic development". It is not necessary any more, especially at a meeting like this, to emphasize that economic development must be equated with social justice, nor that science and technology are an important component of true development. Let us only say that the key problem of development is not to create wealth, but rather to build a capacity to create wealth, provided the results benefit all the people of the country concerned.

I would like to start by saying that nowhere in the world is underdevelopment such a threat to world peace as in Latin America. Precisely because our nations are not the most underdeveloped countries in the world, they are experiencing the most "violent awakening of expectations." "Our people know that they live poorly in a rich continent... "We not only have illiterates but also the aspiration for knowledge and the awareness that the present civilization has created the possibility of acquiring that knowledge." I am quoting the speech of one of the Latin American Presidents at the Meeting of American Chiefs of State in Punta del Este, Uruguay, in 1967, who also said: "Something of very deep meaning is at stake in our

America: to know if within the coming years (and I emphasize the word coming, as opposed to the next century) those who love liberty and believe in the dignity and essential rights of the human being, those who think that man is an end and not an instrument, will be able to organize simultaneously both economic and social development and thus give an answer to the just expectations of so many people." Furthermore, this president, President Frei of Chile, added: "I am convinced that for most of our nations, if not for all of them, it would be difficult--I do not dare say impossible, although I think so--to achieve such an answer if they stay isolated, no matter what the extent of their wealth and size."[2/] This is the challenge to which the scientific community can contribute; but, before making some suggestions in this respect, allow me to briefly sketch what were, until recently, the principal characteristics of scientific and technological development in Latin America.

The scientific and technological infrastructure in Latin America is weak, particularly in the quantity and quality of its human resources. Hence it is obvious that remedying this situation is of the first priority. Nevertheless, other things must be done simultaneously. Traditional Latin American cultural values have not assigned the same importance to scientific and technical creation as to other aspects of human creativity, generating an atmosphere of indifference to science and technology in which only a very small

percentage of the graduates of the institutions of higher learning have decided to dedicate their lives to research. Real scientists have been few, usually poorly paid and socially underesteemed, and practically always dedicated to basic research. They have in general been isolated from,and even indifferent to,the concrete needs of the society in which they live. Technological research, the natural link between basic science and the needs of a society, has been almost entirely missing.

The amount of research has been limited and almost exclusively carried out in public institutions, mainly in the universities. These have almost no relation with government and its plans, or with the private sector of the economy and its needs. Scientists looked for their reward in the pursuit of knowledge and in the recognition of their international peers, while the University saw in them only a matter of prestige. Industry -mainly public in many countries, but whether public or private, usually monopolistic and developed under a policy based on substitution of imports and a strong protectionism - lacked the competitive climate that helps to create the demand for innovation. Such an origin also explains the small volume of most industries, in most cases created to satisfy a very small market and imposing financial limitations on the possibility of doing research. The practical long range consequences of this situation are reflected, among other short - run causes, in the present crisis of Latin American exports. These,

are experiencing a steady decline in their percentage of the volume of world trade. Furthermore, governments have not created enough incentives to stimulate native innovation.

Under such circumstances it is easy to understand why the importation of technologies is such an important process, even though it is usually carried out through enterprise agreements which are, in the case of small enterprises, frequently poorly selected, generally bought at too dear a price, and seldom adapted to the local characteristics. In addition, these agreements rarely have an impact outside the particular enterprise involved, due to the low capacity for the diffusion of innovation, the so-called "technical dualism."

This has been in general, the picture of the development of science and technology in Latin America until recent years, with the probable exception of only two sectors: medicine and, in some countries, agriculture. Only in these fields, and especially in the area of public health, have there been national policies integrated to national development programs, reasonable scientific and technological infrastructure and adequate, rapid transfer of technology, with proper adaptation and diffusion. It is interesting to note that in medicine --with the exception of the pharmaceutical industry, which is not directly involved in the organization of health care-- there is no application of the patent system.

During this last decade, and with progressive intensification, this situation has clearly been changing. All university forums, both at the student and faculty level, are now speaking about the responsibility and role of the Latin American university in society. The number of university fulltime personnel is steadily increasing. The main growth is oriented toward science and technology. Technological institutes and government research institutions are being created, some of them oriented towards crucial aspects of development.

At the political level there has also been a spectacular change. I have already mentioned the Meeting of American Chiefs of State in Punta del Este, Uruguay, in 1967, which marked the beginning of a regional concern for the development of science and technology. The Presidents proclaimed their decision to "harness science and technology for the service of the people of the Hemisphere"[3/]. The Action Program they approved included a special chapter where Inter-American cooperation was called for to complement national efforts in this area. Specifically, the idea of a Regional Scientific and Technological Development Program was approved. It is encouraging to see that only 3 years later such a Program is already in existence and has spent $6.15 millions in its first 15 months of operation, having already sent 213 visiting professors and researchers to Latin America and 319 Latin American fellows and research assistants to the institutions chosen as regional training centers. Its budget for the current fiscal year is expected to reach almost nine

million dollars.

This attitude at the political level was not a passing one. In May 1969 Latin America spoke to the new administration in the United States Government through the "Consensus of Viña del Mar".[4/] This document includes 9 pages of proposals, 3 of which refer to scientific and technological development. The specific requests stated there are being discussed, and some of them already are being implemented within the Inter-American System. Furthermore, only a few weeks ago, at the First Meeting of the OAS General Assembly, the need for and the importance of scientific and technological development in Latin America, was clearly emphasized by the Minister of Foreign Relations of Argentina.

This new attitude in Latin American politics is also apparent at the national level. Eleven of the countries south of the Rio Grande, with the strong participation of the scientific community, have created governmental bodies to deal with policy-making for and promotion of science and technology. Most of them have been recently organized, but in a few countries they have been active for some years and already have significant budgets and functions.

Despite all these signs of change, many of the negative aspects previously analyzed are still present in varying degrees in most countries in Latin America, and, I suppose, in other underdeveloped

countries; and we should keep them in mind when discussing the possible contributions of the international scientific community, and the Pugwash Conference in particular, to development.

Such a contribution, as in any other type of international cooperation, will only be successful if it is a complement to the efforts being carried out by the underdeveloped countries themselves. In other words, the developing countries must make a political decision, each according to its own model, to orient their effort towards development, and the developed nations should generously complement this effort as they are requested to do so. Mistakes and wrong attitudes on the part of the small countries can best be corrected through a free exchange of ideas; but when aid is tied to conditions which reflect the preconceived notions of the developed countries, two results may occur. One is that the objective may be reached only in part or not at all. More certain is that the countries will resent the procedure.

It is at this creative level of exchange of ideas and of finding solutions where I believe the greatest contribution of the international scientific community can be made. There are no accepted prescriptions to accelerate development, and I am quite sure that magical universal solutions will never be found, simply because each developing country has its own changing problems and characteristics, quite different from the rest. There is a great need for good research

and analysis and, especially, for new ideas. Scientists are trained to fight bias and preconceived notions and to promote change of what up to then has been considered to be "the truth". The world in general and development in particular require such an attitude and scientists should seek to influence political opinion by providing fresh aproaches. No other forum could be less biased and less politically suspect in providing an arena for the identification and analysis of the problems that slow down development, and in suggesting solutions, than one made up of members of the scientific community.

Development of a country or a group of countries, requires a harmonic development of all its components and science and technology are important and, in the long run, indispensable components. Just as economic development per se, without progress in social justice, makes the rich richer and the poor relatively poorer, increasing social tensions that finally result in violence, scientific development per se will only make the wise wiser and the ignorant relatively more ignorant, increasing the alienation of the scientists from the society in which they live. In my view this alienation is an important cause of the phenomenan we call "brain drain".

The scientific community of underdeveloped countries has to be a part of the national effort for the revolutionary changes necessary for development. Scientists have to realize that they have an important role in making development possible. Public opinion, on the other hand, has to understand their importance in order to support them.

The international scientific community could help in promoting and bringing together these two attitudes in the developing countries. Scientists like artists are usually lonely people and unless they feel they are participating in a process that is more important than their own personal interest they will choose to leave the problems of development behind rather that contribute to their solution.

Furthermore, such an effort would also increase the number and involvement of scientists from the developed countries who would thus be motivated to help to train scientists from the underdeveloped countries and to study their problems. What is even more important they should also influence government and public opinion in the developed countries to accept the idea that development can require political and socio-economic structures quite different from their own and even sometimes contrary to their own countries particular interests, but that these structures should be accepted in view of a more important overall common good.

The Pugwash Conference could organize a forum which could help to mobilize the scientific community of the underdeveloped countries and aid them in making their voices heard by their own governments. At the same time it would provide an opportunity to impress upon the governments of the developed countries a message containing such ideas as those I recently heard expressed by Albert Sabin, and I quote: "I would like to submit that what is on trial today is not science, but the leaders of the great powers who are still pursuing outmoded concepts of international relations that prevent the proper utilization of the fruits of science and technology for the benefit of <u>all</u> mankind." "It seems to me that an

entirely new philosophy of international relations and aid to impoverished nations must be developed by both the capitalist and communist 'have' nations of the world. The capitalist and communist 'have' nations alike must come to realize that they have a common enemy in the poverty, hunger and despair of more than two-thirds of the worlds's population. " 5/ Just as developed countries are awakening to the need to pay the cost of maintaining an environment in which they can live healthily, in their relations with the developing countries they should realize that there are costs involved in living with their underdeveloped neighbors in a world of peace and understanding. And, finally, that it would be well to pay these costs before they become costs in human lives, as in Vietnam.

The need for a forum for relating science and technology to development is the result of a communication gap which must be overcome. First, among scientists themselves, to establish the meaning of their work and a kind of self-orientation and control for constructive purposes. Second, between scientists and the rest of the world, especially the developing world, to the end that science can make sense and be adequately controlled through and contribute to political processes. I believe the warning made by Hannah Arendt is still a valid challenge to the scientific community. She wrote: "The reason why it may be wise to distrust the political judgment of scientists qua scientist is... precisely the fact that they move in a world where speech has lost its power...";

that there is "a crisis within the natural sciences themselves. The trouble concerns the fact that the 'truths'of the modern scientific world view, though they can be demonstrated in mathematical formulas and proved technologically will no longer lend themselves to normal expression and thought...."; and that "men in so far as they live and move and act in this world, can experience meaningfulness only because they can talk with and make sense to each other and to themselves." 6/ What more elegant justification than this is needed for conferences such as Pugwash, or for the extension or elaboration of the Pugwash concept in relation to science and development.

I hope these points of view and suggestions will contribute to start a lively and productive discussion. If so the discussion will justify having taken advantage of your patience and attention.

Thank you.

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SOME PROBLEMS OF DEVELOPMENT

IN

AFRICAN COUNTRIES

BY

F.G. TORTO

SOME PROBLEMS OF DEVELOPMENT IN AFRICAN COUNTRIES

The theme of this symposium is "What can scientists do for development?". Agenda Item I is concerned with what scientists from developing countries see as the main problems of development in their own countries, particularly from the point of view of possible assistance from, and co-operation with, scientists from developed countries.

This paper will discuss only a few area of difficulty; it will not attempt a comprehensive analysis of the problems in any one country. The major theme that the author wishes to underline is that a stage has been reached in African development, when the objective of all assistance should be the building up of African institutions and African competence in all areas. How to assist in the building of confidence, of Africans in themselves, of governments in their own scientists, economists and others; the development of African organizations concerned with research and development, and with the application of science and technology; the development of African based and African run industries, etc.; these should be objectives of the Africans themselves and of those who wish to assist them. One requirement that will help to achieve the objectives stated is that assistance should be given to enable existing institutions to develop their full potential, before consideration is given to the establishment of new centres.

Problems of Scientific Research

Mainly as a result of the recommendations made at many conferences held during the last decade, and the endorsement of these by the O.A.U.,

several African countries have recently set up national science policy councils. In some cases the councils are not purely advisory, but have some measure of control over certain agencies, in particular research institutes, that carry out research required for national development.

Certain difficulties appear to militate against the realisation of the objectives that are laid down for the councils and research institutes, as well as for research in universities. Some of these difficulties are discussed below.

Direction of institutes and of research

Serious difficulties still arise from the lack of research personnel of all categories. At the highest levels there are not enough persons of high calibre, training and experience who can identify areas and topics of national and applied research requiring priority attention, and who can effectively direct such research. This is a possible area for co-operation with advanced countries. The solution is not as straightforward as it might seem. It would not be sufficient, nor is it desirable, merely to send experienced persons from advanced countries to direct research institutes, nor even to help local directors to formulate programmes. What is needed in the less developed countries, especially the ones which have made some headway in the setting up of research and other scientific institutions, and in the training of personnel, is to upgrade their own ~~promising~~ nationals, who show sufficient promise, to occupy the senior positions, and to do so effectively. How to do this is a problem which requires some study. Possible approaches

include intensive training visits for senior personnel from developing countries to developed countries to gain experience. Another possibility is the institution of special "courses for research directors" in which they can be given an insight into the running of research institutes. Such a course could involve a two-way flow of ideas. Thus at the same time as the experience of research directors from developed countries is placed at the disposal of personnel from developing countries, the problems of research in the latter can be conveyed to scientists in developed countries, especially those who are likely themselves to make visits or take up short term appointments in the developing countries. Instead of, or additional to, "courses", there could be "workshops" of fairly long duration, say six weeks, on the same subject, which would preferably be held in one of the developing countries. Thus a group from various African countries could meet in one of the countries, together with experienced persons from developed countries at a workshop, where there could be a study "on the spot" of the problems, and a search made for possible solutions.

Small numbers of persons in various specializations

At a lower level there are not enough research workers in any one speciality, whether in research institutes or universities, to enable the formation of teams of sufficient size. This leads to isolation of workers and consequent lack of stimulation. This is an area in which assistance would be welcome in many countries. In many instances the institutions do not have the resources to recruit the desirable numbers of persons in the various specialities. What is required therefore is not help with recruitment, but schemes whereby research workers in selected

disciplines are "loaned" by institutions in the developed countries for periods of say three years, in order to help to "catalyse" the work in an important field in a research institution in a developing country. It may be pertinent to observe that this is tantamount to sowing "seeds of excellence" in existing institutions, and is in the opinion of the writer, a better device than the "centre of excellence". The latter may become a centre which is a shining example in a region, but what is an example worth if it cannot be emulated in the many institutions which are required for tackling the numerous problems that abound in the countries.

Lack of technical staff

Another important shortage is that of technical staff. A number of factors contribute to the existing situation. These include the training of technicians in institutions which are manifestly "sub-university", and the lack of prestige that goes with such training and employment, as compared particularly to employment open to university graduates. In any case facilities for training at the highest technical levels are not easy to organise. Many reasons are responsible for this, including the expense of setting up facilities for training the small numbers required in certain fields, such as glassblowing.

Two types of action are called for. One is to improve facilities for technical education, by the provision of equipment and teachers; the other is the provision of facilities, under various forms of assistance, for promising technicians to train and acquire experience, at the highest levels, in the developed countries. A good example of assistance with technician training is a joint Ghana Government-Canadian

Technical Assistance Trade Training Centre in Accra. This is manned by Canadian and Ghanaian staff. The centre caters for the training of technical employees of government and private organisations, including firms, in fields such as automechanics, maintenance of refrigeration units, etc. The level of training is not high, but the personnel that is produced is very important for keeping technical services running in many areas that contribute to development.

Maintenance of Equipment - The spare parts problem.

Apart from the relative lack of technicians to service instruments, there is a serious spare parts problem. The general level of development of technical organizations is such that there are often only a very small number of most types of equipment in the whole country. This is particularly true of the more sophisticated scientific instruments like spectrophotometers, gas chromatographs, radio counters and so on. Spare parts for such instruments have usually to be obtained from abroad, and difficulties with foreign exchange and involved ordering procedures can lead to an instrument being out of action for comparatively long periods. A useful form of assistance could involve an arrangement whereby small spare parts are sent quickly from an institution in a developed country upon request by a laboratory in, say, an African country. This is bound to be an unspectacular form of activity, but by keeping essential research and other activity going, it can produce results out of all proportion to the cost involved.

Application of research results

There is evidence that an important deficiency in some African countries is in the machinery for transmitting research results to industrial concerns, to farmers and others who need to apply them towards productive ends. This leads to waste of the resources and effort expended on research. This is an area needing study and attention. Significant benefits would be achieved through some machinery which would enable the authorities and research workers in African countries to benefit from the experience of developing countries in this type of activity.

International experimental development centres

An important gap which exists in the research and development effort in African countries is the type of organization which can develop an invention, whether it be a process or device or material, from the laboratory scale to prototype or pilot plant stages. Not many African countries can readily assemble the funds and skilled manpower to set up industrial research and development organisations which can cater for all the various types of needs that are likely to arise. Further the demand for such development work in any one country, under present circumstances, may not justify the setting up of a large multipurpose centre. The solution that suggests itself is for an international centre serving the needs of many countries. In view of the difficulties which have attended the setting up of international organizations sponsored by a number of African countries, and the discontinuance, at least on international basis, of some that were

actually started, it would seem that the best hope for the type of multipurpose centre envisaged would be setting up under the auspices of one of the United Nations agencies. Suitable arrangements could be worked out for countries to refer appropriate projects to the centre, and for the safeguarding of the rights of countries or of individual inventors.

Such an arrangement as the one suggested here would help to ensure that African inventions are not stillborn, as they often are at present, nor that their development is left in the hands of organizations in developed countries.

Negative features of certain forms of assistance

Finally, it is necessary to underline the fact that certain forms of, and certain approaches to, assistance and co-operation can have harmful effects on the real development of the "recipient" countries. Real development is intended to mean rapid progress towards a state of preparedness on the part of the "recipient" country to carry on satisfactorily in the absence of further assistance. To avoid the undesirable consequences of assistance certain conditions must be observed. Some of these are the following:

(i) Visiting "experts", and those who serve on advisory and consultative missions, must be persons of really high calibre and experience.

(ii) Visiting "experts" must spend a long enough period in the country to become really familiar with local problems and to give, after the period of "aclimatisation", a long ~~enough~~ period of useful service.

(iii) Projects for advisory missions, and eventual implementation under schemes of assistance, should not be ones that are conceived

only by "donor" countries. They should be projects that are seen by the local authorities as fitting into their development plans. Much harm can be done by foreign countries proposing aid schemes involving projects which are not really vital to the development of the country. Such projects often draw upon the country's small manpower and material resources.

(iv) Projects should not duplicate some which have been already carried out or which are proceeding in the country. There is an example in one African country, where surveys for a large irrigation project were undertaken, within a space of five years or so, by no less than four missions from different countries. Each mission made recommendations for the scheme, often repeating what has been said by a previous mission.

(v) Visiting experts, advisory and consultative missions should not hesitate to advise governments, where appropriate, to heed the advice they have already received from their local scientists and technologists, where such advice is obviously sound. They should refrain from passing up the ideas of local persons as their own. It must be remembered that the building of confidence is one of the essential elements of development in African and similar countries at the present time.

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AN APPROACH TO KNOWLEDGE, DEVELOPMENT AND PEACE

Antonio Bacigalupo

It is most encouraging to learn that programs such as the Pugwash has been organized by scientists with the purpose of finding ways of reducing the threats of our time that menace peace in the world; among them the widening split between the technologyically developed and underdeveloped sectors of the world.

This is indeed a very serious problem since it encompasses the interests of all, and because it gives rise to much speculation mistrust and resentment on both sides.

The problems created by this widening gap are enormous not only because it produces large differences in the material standard of living, (nutrition, health, dress, housing, comfort) but also because it raises enormous ethical questions. For instance, should pigs in developed countries eat better foods including milk, than malnourished children in developing societies whose families cannot afford milk? However, we should take consolation in the fact that science is trying to produce food for children from the raw materials that now produce animal feeds. Is it right that pet foods in one society be more nutritious, expensive and better-tasting than the regular meal of millions of people? That the land considered too steep for forming in developed countries is the agricultural land of others? Is it fair that tractors in one society should make unprofitable the hand work of millions of hungry people of other societies? If we were hungry, could it make sense to know that some countries put the land to idle only because they have surplus food? Would you believe that some farmers can make more money by not growing crops than by having a good harvest?

What are the reasons that have produced these large differences especially since some underdeveloped countries have the potential of producing everything?

A common answer, not long ago, was that these people were lazy and did not have technical training. Today we rather think they are tired because they are undernourished and that their knowledge is much greater than their means.

But, the present state of affiars has not come about by chance. The causes are clearly written in the pages of the history of people. We can see that many of those that today are underdeveloped were conquerers and the cradles of human civilization, and those who are not developed were then primitive.

True, there always has been the dominant and the dominated, spread across continents, as far as their communications could reach. But today by virtue of "our" modern science and technology men can more easily dominate other men with powerful yet subtle machines and instruments. The same science and technology that liberates men in one part of the world could oppress men on the other side, or even on the same side.

At present, developing nations produce many of the raw materials for the developed and sell at prices which are ever decreasing in comparison with the processed or manufactured products they buy. This price gap obviously results in growing gaps of standards of living and economic development. Under those limitations, cheap labor (read under-developed) because a must for the survival of raw material production and incipient processing industries.

Notwithstanding, in spite of the present situation we ought to agree that the world has been slowly, may be too slowly, learning about the need of recognizing some of the basic right of every human from the minute he is born. Mankind has accepted on paper a wonderful declaration of human rights though it is a long way from truly putting in practice these principles, as well as principles of human responsibilities.

Unfortunately, for all of us, the exquisite mental power of knowledge and reasoning, of science and technology, has been put on occasions to the service of the illogical, the dangerous, the immoral and the destructive. Much good and damage has been done to the world by the use of science. If science continues to develop the way it is, the time will come when it will be possible for one misfit or a group of a few terrorists to threaten or eliminate all mankind. The lives of all wise men and true scientists have not been dedicated to destroy or to enslave men, but rather to make them free and to create a better world; therefore it is right that we should make every effort to eliminate

the use of science and technology, directly aimed at destroying humanity; we can not possibly accomplish peace by living on top of monstrous bombs, gases and microbes.

What kind of development?

Economic growth of a group without social development is just as bad as the reverse. This is why when we talk about development we should be talking about the two aspects. In a way one is the counterbalance of the other; they reach an equilibrium which can be spread to larger sectors when we grow beyond a selfish attitude and the need of conquering. Many are finding by themselves, that unrest and violence in all societies cannot be the only motivating force or purpose of mankind. It is already apparent at the national level, in many countries, that social development and national integration are extremely important; in some cases even more so than economic gains. Maybe the future turn of humanity will surpass our present goals, overcome our weaknesses and enlighten us on the virtues of the predominance of unselfish actions.

And why not? Though we have been trained to believe that dominance is a virtue at all levels; personal, national and others, fortunately nobody in particular owns such things as the air, the oceans, or all resources; it belongs to all of us. Science and technology are the patrimony of humanity. Therefore it is just fair that all of these should be at the service of the people, and the sons of the people.

Life is evolution; societies keep "improving". This is why the developing societies are not going to develop in the same way as those now developed. For one thing they cannot take advantage of the same opportunities and they don't have to repeat the same mistakes. All of us have to learn from each other. It is easier for an underdeveloped society to change, be more daring, free and open to constructive suggestions since there is not as much to lose materially. Change in developed and established socieites is certainly more difficult and complex.

If we could only find a system in Society, similar to that used by science, where nothing,

except God, is sacred; where everything is questioned and has to be proven; where we are constantly looking for the truth even if it contradicts our previous findings. A good system for society should anticipate and satisfy the needs and wishes of the people provided that they don't jeopardize the heritage of wisdom that has been purified through the ages: truth, human rights and corresponding human duties.

What are the requirements for economic growth?

Experience has shown time after time that there is no growth of any industrial, commercial or agricultural development unless we satisfy the following pre-requisites: knowledge, experience, sufficient capital, capable working force, adequate markets, satisfactory economic profits and friendly government. To be sure there are some key factors like political decisions and markets which are most important, but all of them are indispensable. Science and Technology though important, however, are not able to produce by themselves the economic growth of any society. For this reason if any serious efforts are given to the economic development of up-coming nations it is indispensable to seek integration with economists, philosophers, sociologists and politicians.

However, as it is usual, that local markets for new processing industries are too small for efficient operation often it is necessary to find foreign markets, especially in the developed societies.

Here is where many troubles appear due to political decisions in developed and developing societies; they impose tariffs on imported products and give hidden or open subsidies to national products when the local industry is affected. Little it matters that it was another sector of the same government that had patronized such competition.

There we are today in spite of many previous efforts made in the past, in the field of training research and tranference of know how by people of good-will standing on both sides of the fence.

The best thoughts and accomplishments can be erased over-night by pressure coming from

the interests of few groups. Too often assistance from developed nations has only helped the rich. This type of situation leaves little room for hope in international trade of developing with developed nations; there seems to be a limit the first ones are always going to lose. Under these conditions the only move that makes economic sense is commerce among developing nations avoiding the selfish limitations of nationalities or groups.

But how can this happen in an era where there is nothing impossible; when man has been able to surpass many old fantasies and utopian ideas, like reaching the moon, developing the forces that can assure his own annihilation, and producing genes? But if many fantasies have been made reality in the material side of the world, why are we so afraid of tackling or studying the feasability of having a harmonious world society? As scientists we cannot deny that the world has today the complete capacity and potential of producing all the machines, equipment and computers required to liberate man from the burdens of back-breaking physical work and menial jobs; to provide all the minimum vital needs of all children and the disabled (food, housing, clothes and education); to guarantee all men and women the right to have a fairly good job and the opportunity to advance; to give them enough time for enjoyment and fraternization among and within societies. Thus men can be free to gain higher levels of motivation, to reach above average, and enjoy a more rewarding and productive life without having to worry for basic necessities and feeling the urgency to dominate anybody. Then we could challenge the creativity of men and his ideals to give all of us new tools and procedures to solve the difficult and complex problems of justice and social and economic progress in all societies. We won't be bored - we have plenty to do here on earth; there are far too many jungles and arid lands that have to be put to work; too many backward systems of using the world resources; still there are large numbers of unused resources and diseases to control. We are in time to avoid the evils of population explosion, nuclear explosions, pollutions of all kinds and other threats to humanity. Once these goals have been accomplished then we could all work and enjoy another of the great adventures of mankind; to travel beyond our

planet carrying the peaceful message of our species.

Does it sound like a dream?---Not any longer. We can do it and do it well.

What about social development?

It has been said many times in the past that the real problems of developing societies stems from the injustices created by the domination of an oligarchy who owns most of the land, the capital, without giving adequate pay to the people they employ. However, often, when the land and the wealth are redistributed, the process does not satisfy some when this is done in a way that is not in agreement with personal ideas or when it affects their own material interests (but especially the last).

Some developing societies are fortunate in having the opportunity to test new types of systems based on values which are supposedly uncontaminated with anti-human seeds. Today there is a need in those societies, going through deep changes, to use all the good previous experiences to innovate and test new models. Some are trying to establish an unselfish philosophy, others a balance of social and economic motivations. We could all profit from their experience if we let them carry out their plans, as long as they are harmless. We should not be too hasty in condemning new systems because they cannot show their true potential when they are surrounded by negative prejudice and an aggressive environment.

After all, this type of human search is vital to the survival of all societies and even of our species. We had better find the true nature of our problems and the answers to our present society by trial and error, rather than suffer the consequences of violence against hard-headed systems. We need to be more tolerant; therefore we need more adaptable systems to growing and changing needs of people in our own community and the world.

All these ideas are pointing to the need of establishing, without bias, studies and research on the relations and consequences of integrated, interdisciplinary and multi-national actions aimed at finding ways which will bring harmony to the world (Science of World Harmony?). It is doubtful whether empirical or biased analysis of existing systems

will produce peaceful solutions to all societies.

There cannot be any bigger or more meaningful contribution to the world, if this conference could trigger the research and reactions to use the forces of science, technology and philosophy in conjunction with those of economics, social and political sciences. We could easily defeat hunger, overpopulation (a necessary evil of under-development?), pollution, but most important of all for putting any human being above economic profit and materialism.

SCIENCE CAN ALSO GIVE US THE FREEDOM TO CHOOSE PEACE

Every man, even the illiterate and those not actively taking part in the decision process of society cannot help but feel the presence and actions of government in his life. Whether he wants it or not he arrives at conclusions about his government and society. This type of participation has in recent times been highly accentuated not only by more trade, and wars, but also by the words, sounds and sights brought by the radio, TV and periodical publications.

In fact we could literally say that now everybody can sit around the huge world arena and watch from different angles the global drama staged by society. One does not have to watch too long to realize that this complex and confusing play really demonstrates the pitiful inadequacies of our present systems which have been designed to solve the problems and needs of isolated groups but not those of the world society as a whole.

The show which at the beginning seemed remote and unrelated to our lives has grown materially, through science and technology, to enormous proportions which engulfs everything including most of the spectators. Unfortunately through these efficient channels we have received good and harmful knowledge; peace and violence; hate and love, trust and mistrust; power of creation and of destruction; moreover material growth has accelerated the discovery of the convenient and inconvenient side of everything.

For this reason today all of us and all societies are constantly faced in almost every action with multiple and sometimes conflicting alternatives like economic profit or social development; individual interest, or communal interest; domination or cooperation; ethical or non-ethical behavior.

But decisions are taken on the guiding scale of values which have been adopted by the individual and society. And again because of science and technology, problems reach extremely dangerous levels for the world and our society when other groups use a different set of values, it is not surprising that many scientists, technologists and intellectuals are very much disheartened at the consequences of their efforts.

Power, declaration of human rights, gadgetry and luxury, economic growth, culture of beauty and comfort have not produced or have not been paralleled or supported by development of wisdom.

At present the relation between matter and mind is so extremely unbalanced that indeed it is difficult to conceive that it is the result of the free play of our conscience and reasoning.

It rather seems as though somewhere, a long time ago, all of us have fallen into deep traps which are stopping us from knowing understanding and respecting each other. Accordingly, unless we recognize and diagnose correctly where we are, and when and why we fell, we have no hope of harmonizing our local, national and world society.

But are we completely free to analyze ourselves and our beliefs without bias? Can we do it? Sometimes our world looks so good, powerful and promising! Maybe study and research of our own cibernetics and brain physiology can help us in understanding the true nature of our brain, the process of developing values, beliefs, feelings and attitudes. We should be able to differentiate true principles of world understanding from the sacred crows of societies in order to avoid present and future traps.

We should determine the varying degree of correlations between values-taboos-knowledge and education-environment. If these relationships can be established, then we should revise the wisdom of teaching that each one of our societies should be selfish and superior, that is if we really are looking for grounds of mutual agreement and respect among local and national societies.

Of course, if laws and systems should represent the will of all the people then successful or unsuccessful protest marches, revolutions, silent rebellions should give us sufficient reason to believe that in those cases there is a need for more fiducial and sensible systems. Society cannot afford any longer, to have a clumsy, slow, impervious, back-firing and often unreliable system of interpretation of the true will of the people.

We cannot think of a better guide than to trust the evolutive wisdom of all the people everywhere; i.e. humanity to serve the human race; we are fully entitled to decide our destiny since we are the goal and the means of Society.

People, regardless of their economic and social evel are always willing to help. Well informed people can better conquer their first selfish impulses and exchange them for concern and actions in favor of other people. Its magnitude depends on the right information, values, encouragement and the rules of our governments.

It can no longer be said in this age of instant communication that it is necessary to delegate responsibilities and even give up, automatically on occasions, our most cherished right and corresponding duties; the right to live, and let live; to know and to be heard; to enjoy and participate directly in the process of making a better world for ourselves and our fellow men.

Unfortunately for too long people have been mostly listening, but now because of science and technology we could produce the means of listening and talking to anybody or any group anywhere. We can now break the barriers of our traps created by misinformation and designed to protect ourselves from our human enemies. We don't have to have enemies! Satelites, transistors and computers have already made it possible to learn from unbiased opinion, i.e. from the people themselves. Therefore we must reduce the power of the representatives that rule us and strengthen the direct power of mankind itself.

Everybody could now express his personal opinion, directly or via telephone to a Permanent Computer Center of Popular Opinion, on local, national and world affairs. Today for the first time in the History of the world we are really capable of constantly receiving and giving opinions; this could be done by allowing equal time, to uncensored and unselected information, programmed everywhere through the week by a Cooperative world Net-work to show the original opinions of people in each locality, region, state, nation or continent regarding the situation, the news and the polled opinions of each community of any issue. A system like that could gradually educate all of us about how everybody is like everybody else and not just more stereotypes, monsters or caricatures. Maybe it could also teach us better definitions and implementations of the right and corresponding duties of men instead of only having thetorical and continuously prostituted declarations of human rights.

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THE ROLE OF SCIENCE AND TECHNOLOGY IN THE DEVELOPMENT OF INDONESIA *)

INTRODUCTION

Indonesia is an archipelago which consists of 18 large islands and some 3000 small ones, covering an area of about 1,9 million square kilometers.

The current population amounts to 120 million which is unevenly distributed over the islands. About 75% of the whole Indonesian population live in Java and Madura. Transportation and communication between the islands and within each thinly populated area, are major problems.

In Indonesia every day of the year is sufficient warm for the growth of plants and nearly everywhere the rainfall is sufficient for producing at least one crop without irrigation; and in most places more than one.

About 1,2 million square kilometers or 2/3 of the total land area is covered with forests containing thousands of species of which many might have economic potentials. Large parts of Kalimantan (Borneo), Sumatra and West-Irian (New Guinea) are currently being explored.

Sixteen million hectares is used for agriculture. About 80-85% of the agricultural area is used for subsistance farming (rice and food crops); the remaining 15-20% is cultivated to

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commercial crops.

The main estate crops are : hevea rubber, oil palm, tea, coffee, tobacco, cocoa, cinchona and sugar cane. Important small holder industrial crops are : hevea rubber, coffee, tobacco, coconut and pepper.

Developed mineral resources afford a major contribution to the national economy, and there is ample ground for optimism with regard to further increase expansion and new discoveries. Mining activities up to now include petroleum, tin, coal, silver, gold, bauxite and nickel. Already known mineral to be developed are copper, nickel, manganese, tin, sulphur, petroleum and diamonds. In addition, mercury, chromite, molybdenium, asbestos, kaolin, cement materials are known and some of these minerals are currently receiving particular attention.

Before Indonesia gained independence in 1945, it was for more than three centuries under Dutch rule. Peaceful construction of the country was hampered by several factors a.o. the struggle for independence which lasted for about 5 years and political struggles within the country culminating in the abortive communist coup of October 1, 1965.

During the colonial period very limited opportunity existed for local people to enter schools and universities.

Just before World War II started, there existed in Indonesia only 3 schools of higher learning namely the schools of engineering, law and medicine. At that time not a single Indonesian (native) geologist or mining engineer was available although the country was the biggest producer of oil in the Far East.

After 25 years of independence many basic problems related to development still remain to be solved. It is the purpose of this paper to expose some of these problems more in detail, with the hope that Indonesia, through the Pugwash movement and other organizations can receive more international reinforcements in confronting these basic problems.

A REVIEW OF THE DEVELOPMENT OF SCIENCE AND SCIENTIFIC ORGANIZATIONS IN INDONESIA

Science has a relatively long tradition in Indonesia. The Indonesian flora was studied for the first time by Jacob Bontius (1592-1631) while Rumphius (1628-1702) published an important work called "Herbarium Amboinense". The first scientific organization called the "Batavia Society of Arts and Sciences" was established in 1778, with the purpose to promote research for the benefit of the East Indian trade, agriculture and welfare.

More systematic botanical research was started with the founding of the famous Botanical Garden in Bogor, in 1817.

In the field of agriculture, emphasis in research was put on problems related to the cultivation of food crops and of products for the export as tea, rubber, sugar, copra, tobacco, coffee, etc. Soil studies were also undertaken resulting in some famous publications on tropical soil.

A generation of fine Dutch scientists did pioneering work in the field of marine geophysics and valuable contributions were made in the fields of geology, volcanology, seismology etc.

Medical problems too have attracted much attention and investi-

gations on beri-beri, amoebiasis, malaria, plague, smallpox, filariasis etc. resulted in valuable contributions which have found worldwide recognition.

Other important developments were the establishment of the Council for Natural Sciences of The Netherlands Indies in 1928 and the founding of the Organization of Scientific Research in 1948.

After the country gained its independence, a reorganization took place with the establishment of the Council for Sciences of Indonesia in 1956.

The main tasks of the new council were :

a) to advance and promote efforts and activities in the field of science, serving the interest of the nation in particular and that of peace and mankind in general.

b) to advise the government on its own initiative or upon request, on problems, projects and activities related to science.

This Council which lasted for 6 years has been quite succesful in its effort to convince government authorities, political parties and the Indonesian society in general that economic and social reconstruction can only be achieved through the application of science and technology.

In 1962 a Ministry of National Research was established and the Council for Sciences was subordinated to the new ministry.
The Council was given the task to coordinate and to undertake research, while the new Ministry took care of matters relating to science policy.

A reorganization took place in 1967, based upon the idea to

simplify and reduce existing government agencies, which resulted in the liquidation of the ministry and the establishment of the ~~new~~ Indonesian Institute of Sciences (Indon. abbrev.: LIPI).

The Indonesian Institute of Sciences is a non ministerial, cabinet level agency and its main tasks are defined as follows:

a) to promote the development of science and technology in Indonesia for the benefit of mankind in general and of the Indonesian people in particular.
b) to search for scientific truth, as academic freedom are recognized and guaranteed within LIPI as far as it is not in contradiction with the 1945 Constitution.
c) to make preparation for the establishment of the "Indonesian Academy of Sciences"

In order to accomplish the task mentioned above the Institute is assigned the following functions :

a) to advise the government on the formulation of a national science policy as part of an overall national policy.
b) to promote and provide guide lines in the development of science and technology.
c) to foster and maintain relations and cooperation with national as well as international scientific bodies.
d) to conduct research through its own institutions.

Other scientific organizations, closely associated with the Indonesian Institute of Sciences are the Institute of Atomic Energy, the Institute of Space Research, the Organization for the Coordination of Survey and Mapping, the National Archive, and the Central Bureau of Statistics.

SOME PROBLEMS IN THE APPLICATION OF SCIENCE AND TECHNOLOGY TO NATIONAL DEVELOPMENT IN INDONESIA

National development plans

Since 1949, three overall development plans have been launched in Indonesia. The first five year plan (1956-1960) focussing upon economic development and rehabilitation of the industry, could not be executed satisfactorily because of bad planning and increasing inflation.

The second plan, called the First 8 year National Reconstruction Plan (1961-1969) did not achieve its main goals because too much emphasis was put on "prestige projects" such as large monuments, big buildings etc. This plan comprises 335 projects respectively in the fields of nation building, culture, education, research, welfare, administration, distribution and finance.

Based upon past experience, the present government adopted a more phragmatic approach in launching the third plan (1969-1975). Great emphasis is put on economic objectives and less emphasis upon education, social and cultural objectives with due recognition that the economic objectives will influence the other objectives. The main objectives of the current 5 year plan are (1) to step up production of food (2) to improve production and supply of clothing (3) in conformity with present ability to improve housing and (4) to improve the efficiency of the community.

In the current 5 year plan the highest priority is being given to agriculture including forestry and fisheries. It is realised that increase of agricultural products will partly meet the need of food for the increasing population.

Industry supporting agriculture will be given priority such as fertilizers, pesticidd etc. and great emphasis will be put on rehabilitation of infrastructure connected herewith (irrigation, roads).

It is expected that at the end of this 5 year plan, a strong agricultural basis will be established so that the following plan will be focussed upon the development of industry.

It is fully realized that in the face of population explosion a static agriculture could provide neither sufficient food nor employment thus driving increasing numbers of people to the city. The government therefore acknowledged that the industrial sector ultimately has to be regarded as the key to economic growth.

Our discussion on problems relating to the application of science and technology to development with special reference to Indonesia will covered a.o. natural resources, food and agriculture, population, social and cultural problems and research.

Natural resources

Indonesia possess rich natural resources but our knowledge regarding these resources is very scanty. Lack of reliable data on our mineral reserves had lead to failures in the construction of steel and phosphate plants in the past. Advices of geologists who are very sceptical concerning the potentials of the iron ore and phosphate deposits have totally been ignored.

At present about 25 petroleum companies and many others mining enterprises are exploring our offshore and on-shore areas. Millioms of dollars are being spent for exploration work and little effort has been made to compile the existing data. Many scientists are concerned that these basic data in geology and geophysics will be lost

for the coming generation if drastic steps are not taken to store and compile the data systematically.

With the exploration now in progress, problems of pollution and conservation should be considered seriously.

Much more needs to be known regarding our marine resources and waters in relation to protein source, navigation etc. Programmes of surveys, applied and fundamental research concerning our natural resources are of greatest importance. A national policy on natural resources and mapping should be established very soon, with specific emphasis on priorities, preference and requirements of the type and scale of maps and on transfer of technology in the field of space cartography and remote sensing.

Food and agriculture

Indonesia's economic structure is largely agriculture, which includes production of food and industrial crops, livestock, fish and timber for both domestic use and export. The agricultural sector generates approximately 55% of the current national income, provides the livelyhood of 75% of the population and through its export products, contributes more than 60% towards the total foreign exchange earnings. Despite this, the country has faced a serious economic crisis in recent years, partly because of food deficits.

The most efficient approach to meet short term food production goals with minimum investments seems to be intensification of present farming, rehabilitation of irrigation systems, and improvement of infra structure. For the longer period ahead, attention should be given to developing virgin lands in areas of current low population density mostly located outside Java.

Problems confronting agricultural research have been summed up as follows :

a) The research institutes in Indonesia are not equipped and organised to meet the agricultural problems of the present and the future.

b) Inadequate guidance and coordination at the national level.

c) Extreme fragmentation of the natural agricultural institutes with a complete lack of coordination among them and a wasteful duplication in research programmes and in development of the meager research personell facilities and equipments.

d) Inadequate and ineffective links and lack of coordination between research and extension on the one hand and between research and education on the other.

A joint Indonesian-U.S. agriculture research survey team has submitted recommendations on organizations, systems and requirements for research in agriculture and related industries.

Population

With an annual growth of 2,6% in population and with decreasing death rate, Indonesia is facing a big population problem. Another problem which is considered to be more menacing is the uneven population distribution in this country.

Java, comprising only 7% of the total area of Indonesia has about 65% of the population and problems of unemployment, facilities for education, health services and housing are increasing.

The government realizes the importance of family planning and steps have been taken to encourage birth control among the population. Studies on family planning, internal migration, unemployment and reliable statistics on increase of population, are of paramount importance.

Social and Cultural problems

One of the main obstacles concerning application of science and technology to development in a country like Indonesia is of a social and cultural nature, among others acceptibility of new ideas. Social and cultural traditions are often positive bariers to change.
A seminar recently conducted on non economic factors in Indonesia's development resulted in the conclusion that the majority of the Indonesian people are not yet oriented towards development.

In addition to the problems mentioned above which prevail in most developing countries, there is another factor characterizing a country like Indonesia. It is a nation of islands. Most Indonesians belong to the same racial stock, nevertheless isolation due to transportation and communication problems during many centuries, have created different social and cultural patterns among the people. In the process of change towards modernization and towards a greater national unity, these differences must be taken into account to avoid creating problems which could result in disastrous effects.

Research and studies regarding these social and cultural patterns should be stimulated and intensified.

Research

There are two approaches to a change in production of goods or services. The first is to improve an existing industry and the second is to introduce a new industry, a new process or a new product.

It has been suggested that in the present stage of development, Indonesia should take improvement of existing industries as the first priority and innovation (by invention or application of foreign knowledge) as the second priority.

Fundamental research should be carried out in order to augment existing knowledge in fields of potential relevance, with particular

emphasis on those areas which are not or can not be properly studied elsewhere as in relation to specific natural resources, climatic and soil conditions or social problems. In some field of natural sciences, where specific problems exist and where Indonesia can be considered as a "type area" such as geology, geophysics, soil science and biology, notable contributions have been made by Indonesian scientists.
No or little contributions can be rendered nowadays in branches of sciences which require modern and sophisticated instruments like marine geophysics, molecular biology, clay mineralogy, etc.

In Indonesia research is being carried out in (1) laboratories of ministeries; (2) universities;and (3) non ministerial government agencies. Private research practically does not exist.

According to available figures, from 1962 up to 1965, some 350 research and survey projects in different fields have been sponsored by the Ministry of National Research and the Council for Sciences of Indonesia. Thorough evaluation of the results show, that only 10% of the research projects could be considered as satisfactorily performed. Causes of the failures are among others; political and financial instability, leave or absence of research workers to study abroad, the large numbers of research projects, uncareful selection of research topics and last but not least, the low morale of research workers because of insufficient salary, inadequate funds and irregular supply of literature.

It is well known that research in universities, plays a specific role in a developing country. There exists already a strong link between research organizations in universities with industry and agriculture. Several advanced universities in Indonesia have provided useful services such as standards, testing and contract research.

However, it becomes apparent that in developing countries there is a strong pressure for universities to drop basic research and to

engage in routine activities relevant to the social problems of the country ~~like~~ such as housing, transportation, food, population, civic order etc. It is a common feature that universities are actively participating in operational problems of the government.

The result is, that the creative educational function ~~is~~ will be damaged and that in the long run such universities are not able anymore to produce people who are trained to think creatively and imaginatively, who can solve problems whose solution can not be found in any text-books.

FINAL REMARKS

From the foregoing discussions it is obvious that much can be done by scientists from the advanced countries and the Pugwash movement in particular, to support developing countries in solving many of the current problems which have been outlined above.

With regard to Indonesia, it is logical to emphasize once more that this country has specific features such as tropical climate, dense vegetation, tropical weathering of rock formations, tropical agriculture, difficult transport problems in a 5000 kilometers long archipelago, etc. The tropical climate requires specific equipments which can only operate under conditions different from those of the temperate zones. Economic plant species and their use in Indonesia require research and adaptive work before they are fully useful. The science of tropical agriculture, particularly for pastures should be developed. Geology and mineral exploration, require a deep knowledge of the processes and the products of weathering under humid tropical conditions. These particular points are stressed here, because if scientists from the advanced countries really want to contribute, this may be achieved by working

within the unusual and peculiar features of Indonesia, in cooperation with local scientists.

Experience of many years of foreign aid has taught, that in the industrial sector, too much emphasis has been put on crash programmes and quick yielding projects. There is now a growing realization that technological transfer is a cultural, social and political process not just the imitation of manifacture. Imported technology and local research and development must complement each other. It is hoped therefore that more share should be given by aid suppliers to the development of science and technology, within the broader contex of foreign assistance. These contributions could only be absorbed properly if the development of indigenous capabilities in science and technology can be accelerated.

The recommendation made by the Pearson Commission, that aid suppliers devote a significant share of their R and D resources and facilities to projects specifically related to the problems of less developed areas, should strongly be supported.

Most developing countries are seriously concerned about the fact that in the advanced countries about one billion dollar is being spent annually on research related to developing synthetic products and substitutes. Synthetic rubber is currently threathening the economy of less developed areas like Malaysia and Indonesia.

Developing countries need to establish its own national science policy-making body and advice is needed, including assistance in determining priority problems in research and in survey of the scientific and technological potentials in those areas. Improving of supporting services like documentation centers, natural resource surveys, standard institutes, testing and quality control laboratories, which are all necessary foundation to sound industrial growth, are badly needed.

A strong link should be developed between scientists from the advanced and developing countries. Workshops and symposia jointly organised by these two groups in Indonesia have proved to be very useful. A good example is the workshop on food, jointly organised by the Indonesian Institute of Sciences and the U.S. Academy of Sciences. The prime objective of the meeting was to formulate recommendations on Indonesia's most crucial current problem: how to overcome caloric deficiencies and achieve a more nutritious diet for the country's 120 million people. These recommendations have been used as a base by the government in preparing the current five year plan, in the agricultural sector. Another workshop on industrial research is now being prepared jointly by the Indonesian Institute of Sciences and the U.S. Academy of Engineering and will be convened in 1971.

It is sincerely hoped that the problems presented here can provide guidance for scientists and the Pugwash organization in their noble effort to narrow the ever widening gap that exists between the advanced and developing countries.

FLOATING FLIER — Kirby Winn, winning skipper, is crowned and presented a trophy as victor in a strange sailboat race yesterday from Shelter Island to Harbor Island. Winn had to fly a kite as he sailed. The race was a benefit event for the Head Start program. From left to right are Mrs. Karolyn Dorsee, Lee Bodin, a crewman, Winn and Jack Dorsee, race sponsor.

CRACKS HALT ROME SHOW

ROME (AP) — The sound and light show at the Roman Forum, which traces the city's history through the fall of the Roman Empire, is being suspended because of cracks in 2,000-year-old archways.

Inspectors ordered the suspension after they looked at cracks in the Palace of Tiberius, built two years before Jesus Christ was born.

Private Rites Held for J. G. Auld

Private services for J. Gordon Auld, founder of the Puss n' Boots pet food company, were held today in Pacific Beach Mortuary.

Mr. Auld, 79, died Saturday in a hospital. He lived with his wife, Dorothy, at Wesley Palms Retirement Home at 2404 Loring St. He moved to Pacific Beach from Laguna Beach in 1964.

A 1914 graduate of Kansas State University, Mr. Auld was a real estate broker in South Pasadena when, in 1930, he experimented in his home kitchen and developed his pet food formula.

He later established a laboratory near the South Coast Fishing Co. in Wilmington, Calif. where he utilized fish parts that had been discarded by commercial and sports fishing vessels.

Eventually, he had three plants in operation. He sold his company to Quaker Oats Co. in 1950 and retired.

Surviving in addition to his wife are a daughter and two grandsons.

The family suggests contributions to the Wesley Palms Memorial Fund or the Heart Fund.

Mrs. Josephine Tillinghast

Private services were held for Mrs. Josephine Alice Tillinghast, 78, a resident of Palomar Mountain. She lived in the county since 1913.

Mrs. Tillinghast, of 1937 Guizot St., died Saturday. Inurnment will be in Connecticut where Mrs. Tillinghast was born.

She was a member of Sunnyside Senior Citizens Club of Pacific Beach. Surviving is a son, Roy of San Diego, and two grandsons.

Pio Nunal

Rosary for Pio Nunal, 67, of 910 S. 37th St., will be recited at 7 tonight in Greenwood Mortuary. Mass will be said at 9 a.m. tomorrow in St. Jude's Church. Burial will be in Holy Cross Cemetery.

Mr. Nunal, a city resident for 22 years, had worked for the 32nd Stree Nav[illegible] a member

State College Car Ends 'Clean' Race

By DICK FINN

Four tired San Diego State College engineering students pulled into a Mission Valley service station yesterday for a 20-minute pit stop just three hours before they finished the grueling 3,600-mile transcontinental Clean Air Race.

The first cars across the finish line at the California Institute of Technology in Pasadena yesterday afternoon were a 1970 Plymouth Valiant burning liquefied propane, and another Valiant using unleaded gasoline. Both were driven by students from the University of California at Berkeley.

Crossing the finish line first does not insure winning the race. All cars that finish will be tested for performance and exhaust emissions, with the car producing the least pollution and the most information on antipollution technology being declared the winner.

$5,000 Prizes Offered

Racers are competing for $5,000 in prizes from the National Pollution Control Administration.

The first 32 of 41 cars remaining from an original field of 70 finished the race from Cambridge, Mass., in the space of seven hours late yesterday.

During the stop here Alfred B. Innis, 22, team captain of the State College entry, emerged slowly from a support truck which followed close behind his car, a white Ford Cortina powered by liquid natural gas. He slumped heavily against a station wagon.

"I feel like I'm going to die. I've had the flu for three days," he said.

Drivers Exhausted

His exhaustion was shared by David Halseth, 19.

"We've been averaging about four and a half hours of sleep a night for the last three weeks," Halseth said.

The team, also including Elwyn G. Ericson, 23, and Scott Couchman, 21, has been rotating drivers every 300 miles along a route which included stops in Toronto; Ann Arbor, Mich.; Champaign, Ill.; Oklahoma City; Odessa, Tex.; and Tucson.

The week-long race to promote clean air began Monday at the Massachusetts Institute of Technology.

Proving a Point

The young State College drivers said they believe the point they are making is worth the grinding fatigue of driving 12 to 13 hours a day.

"We're going to show the public, if their eyes are open to see it, that in six months, 20 to 30 students developed a car below 1975 emission standards," Innis said.

Problem Overcome

The SDSC entry, sponsored by San Diego Gas & Electric Co., has performed well. There was one minor problem — a hole in the insulation around the vehicle's gas tank.

This was not serious enough to reduce the car's performance, however, said Dr. Robert J. Murphy, SDSC engineering professor and the team's faculty adviser.

Sole Local Survivor

The SDSC entry is the sole survivor from San Diego. The University of California at San Diego had two entries. The first was damaged in a traffic accident and the second, a steam powered vehicle, was unable to maintain minimum speeds on the highways.

Sept 1

(1) AM

THE ORGANIZATION OF RESEARCH IN DEVELOPING COUNTRIES

Dr. C.M. Varsavsky
Argentina

From inspection of the first Agenda proposed for this conference (Centers of Excellence, International Science Foundation, etc.) it seemed to me that it was aimed more at the problem of the development of scientists in developing countries rather than at that of the development of the countries themselves and how can scientists best contribute to it. Obviously, able scientists must exist before they can contribute to the development of their countries, but their existence, although a necessary condition is not a sufficient one. Worse yet, certain scientists can be actually an obstacle to development because they themselves do not contribute to it and, further, they misguide young scientists who potentially could.

Therefore, I do not feel it is out of place to insist in a clear definition of the purpose of this Conference. To me it should not be to devise ways and means to help individual, or small groups, of scientists to do research on the basis that they are "good" investigators or that their results are publishable (in foreing journals). Such a job is already being carried out by many money granting institutions.

Being an interdisciplinary group with no money to give an no axes to grind, we are in a unique position to discuss the other aspect of the problem, namely, how can scientists and technologists best contribute to the development of their countries. If we accept that this is our basic goal, the training of scientists from developing countries falls into its proper perspective: it is a mean to reach an end and not an end in itself. The logical train of our reasoning should, then, be:

What does a country wish to achive through development.

What actions are required to reach the above goal and what is the part that corresponds to science and technology within those actions.

How many of what kind of scientists and technologists will the country need.

How can they best be trained and in which way can international cooperation contribute to their training.

In other words, before we judge the success of efforts such as the Centers of Excellence or the potential success of an International Science Foundation we have to agree on a set of values to base our judgement. In what follows I intend to propose one such set.

In principle, scientists can do research on anything that is technically possible (by "technically possible" I mean conceptually and /or experimentally within our reach). Up to now the scientific community at large has done that. It is quite obvious, however, that not all research that is technically possible has the same social value; however, although each individual can probably make his own classification of research projects in a scale of social desirability, the scales of different individuals will in general be different.

Apart from differences which are likely to occur among individuals taken at random, differences will also occur among averages taken over large numbers of individuals belonging to different societies (I will leave the definition of society very loose: it could mean Africa as opposed to Western Europe or central Argentinians as opposed to patagonian Argentinians). It is on the basis of these differences among societies or, rather, of the coincidences within a society, that we may work out a set of values applicable to that society. In this way we could establish what differences may exist in judging the desirability of different branches of research between the society of developing countries versus that of developed countries.

Obviously, I have not carried out such a survey of world opinion. All I can do is, therefore, to express, as a citizen of a developing country, what I would answer to whoever were conducting the survey in question.

I would first point out some factors that lead to undesirability of reserch projects, whether carried out in developed or developing countries. In general terms I find undesirable research whose (successful) end result brings unhappiness to man, either by attempting against his physical well-being, his mental well-being or his freedom. Governments justify expenditures on this type of research on the basis of national security. The justification is questionable, to say the least, but we can not go into that problem here. In any case, Pugwash is certainly not going to get involved in the promotion of decidedly undesirable research.

If we turn to research that is not morally undesirable, the choice of the kind that ought to be supported is not so clear. We cannot proceed by naming subjects at random and classifying them as desirable or un - desirable. Also, a given country has limited amounts of money and of human resources that it can use for research activities, and in planning these activities it has to be kept in mind that money or people put in one project means that another project is left without them. In such a case reserch that is not morally undesirably does not necessarily qualify for support.

In my opinion, for a line of research to be desirable in a developing country it has to fulfill the basic condition of satisfying a specific and very concrete need of the country.

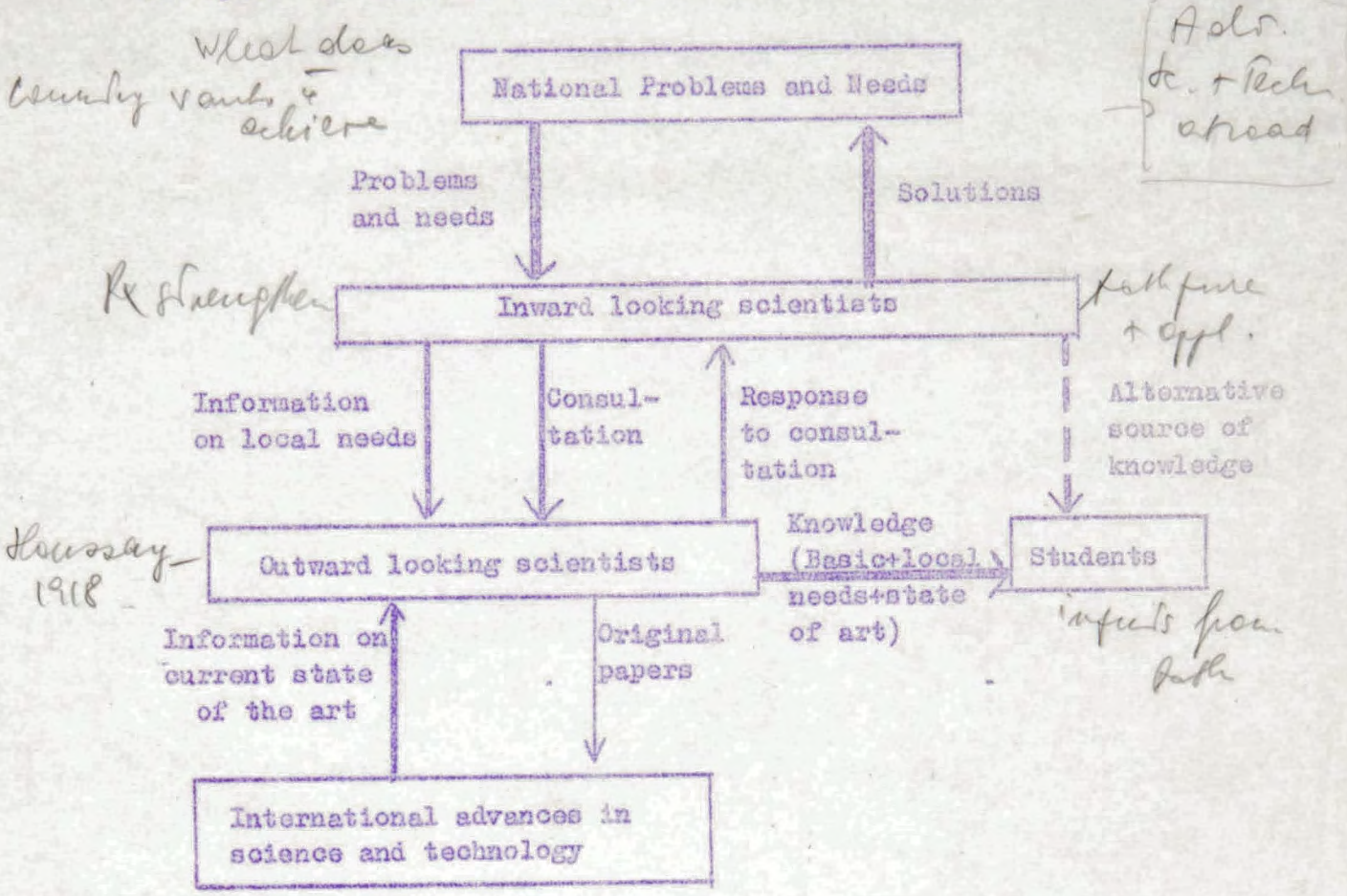
This condition that does not apply to the highly developed countries and, in particular, to the U.S.A. constitutes the biggest difference in the judgement of desirability of research between developed and developing countries, and it may be difficult for the scientists of the former (and sometimes even for those of the latter) to comprehend and accept it.

I should, perhaps, clarify what I meant by "specific and very concrete" need of the country. The clarification brings me back to the line of reasoning mentioned at the beginning of this paper, where the first point was: What does a country wish to achieve through development, and the second one was: What actions are required to achieve the above goals. The specific needs of each country will arise from the answers to these questions, and since the answers are going to differ very strongly from country to country (in particular with regard to the second point) it is practically impossible to give general rules that will be valid to all developing countries (except the general rule that the needs will indeed arise from those answers). Therefore, all I can do to make my point more clear is to give some examples. In the area of population, for instance, India may need medical research in the field of fertility control, while Argentina may need socio-economic research to promote immigration. In the area of efforts to increase exports, Bolivia may need research in mining techniques while Perú may need research on the detection of fish colonies. The list of examples, could, of course, be continued forever but this is probably quite unnecessary. It will be more profitable to refer to the next two points of my line of reasoning.

How many of what kind of scientists andtechnologists will a country need cannot, again, be answered in detail except in reference to individual countries, but at least a general pattern can be sketched.

I visualize the scientific and technological community of a developing country as consisting of two components, of which one will seek its inspiration outside the country and the other within it (both components may coexist in one individual scientist). By this I mean that part of the community, or some individuals (during part of their time) will keep up with the latest advances of science and technology in the rest of the world and will carry out its research mostly inspired by such advances, and keeping in close touch with those colleagues who work abroad in the same field. The other part of the community (or some individuals during the other part of their time) will look at the national problems and needs for their inspiration and, collaborating from time to time with the outward looking sector, will solve those problems and needs.

The system is shown in the figure, where I include the students,



The diagram is reasobable; one could even say that is a truthful diagram of the way a scientific community can operate. I shall attempt to show later, however, that thruthfulness alone is not sufficient, in the sense that a scientific community could operate according to the diagram but still not fulfill its functions. Before I go into that, however, let me say that in the developing countries that I am familiar with the diagram is not followed at all, the inward looking scientists being totally absent. The lack of linkage between scientists (and, hence, students) and the national needs alienates the scientists and makes them prone to emigrate. The result is the well-known phenomenon of "brain-drain". It is quite obvious that the brain-drain will not be solved by giving the outward looking scientists better working (or worse yet, as some people totally devoid of imagination propose, living) conditions . The only action that will prevent the brain-drain is to establish strong ties between the scientist and his country. And by strong ties I do not mean sentimental ties: I mean deep involvement of the scientist in the process of development.

Such words as "strong" and "deep" used in the previous paragraph were not inserted there for literary purposes; rather they take me to my next point, namely that fulfillment of the diagram does not imply fulfillment of the function.

I said that the diagram is truthful; by that I meant that it is true that the relationships represented by the arrows, and only those, should exist. But to the concept of truth we have to add that of importance. The effort spent in creating each arrow should be proportional to its importance. For example, scientists can contribute to the development of their countries even if they severe their ties with the international scientific community (as happened in China); they cannot if they severe their ties with their own countries. Students can be taught by the inward looking scientists; they cannot be taught without danger of alienation if the outward looking scientists fail to interact with their countries. Therefore, when resources are limited, priority should be given to the more critical arrows, and even if resources were very ample, a well balanced scientific community will dedicate more of them to those same arrows. When discussing the training of scientists in developing countries, and how the international community can assist in their training, we have to recognize that the prime mover, the fundamental box in our diagram is "National Problems and Needs", and that the bulk of the scientific manpower and money should go into the "Inward Looking Scientists". (Mind you, nowhere in this paper I differentiate between pure and applied science -such a division may be truthful, but is decidedly unimportant-; I only distinguish between science certain to be useful to the country and foreign science -which may or may not be useful).

It is my impression that the international effort has not proceeded according to the scheme suggested herewith. The proposed International Science Foundation, some Centers of Excellence (such as the Trieste Center) and the work of most Foundations seems oriented to strengthen the outward looking group, without due regard of the fact that such action may be detrimental to the development of the country. To improve such a situation, a revision of the policies of the money-granting institutions of the developed countries is required. In addition, however, greater interaction among the developed countries themselves is urgently needed. In this respect it may be opportune to transcribe some paragraphs of the Report of Working Group 4 of the Eighteenth Conference (Nice, 1968). The Group recommended the organization of Regional Symposia "in different regions of the developing world" and in reference to them it said: "These Symposia would also examine the important question: what are the objectives the people of a region have for the development of the region? For example,it may be inappropriate for a particular developing region to adopt in detail or to imitate the methods, values and patterns for life as seen in many of the present advanced countries, and it may be far

better for them to work out structures for themselves, consonant with their local heritage and resources. The strategy of development can be defined only after the objectives of development have been defined. ..."Participation in these Symposia should, as far as possible, be confined to scientists of the regions concerned; there could additionally be some recognized specialists in the areas under discussion and some persons long active in the Pugwash Movement to convey the Spirit of Pugwash to these Symposia. Later, under the heading "Co-operation between Developing Countries", the Group stated: "The Working Group felt that too often consideration was given only to relationships between developed nations and developing nations and to aspects of aid, technical assitance, etc. that could be provided by the former to the latter. It would like to emphasize, however, that every country in the world can in some respects be in the position of a donor country. It is clear that much closer ties should be established among the developing nations themselves, who are faced with similar situations and problems and are attempting to reach similar goals. International co-operation for peaceful purposes among the developing nations can be an important factor for development".

This paper has more than its fair share of obvious truths. I will incur, however, in one more. All I have said is valid for countries whose governments are committed to develop them in freedom from power blocks and with freedom for their citizens. It just happens that the main obstacle to development is that very few countries have such governments. How to overcome such obstacle is totally beyond the scope of this paper.

———————o———————

Sept 1

AM

1) Rabinowitch : East – West, present and obsol. – What not to do

North – South What to do.

LATIN AMERICA

1) Varsavsky : development not like developed countries

2) Barzelatto

3) Bacigalupo
Slides!

AFRICA

4) Meguid Egypt
10 Bill/yr, 110.000 Techn. Ass. Exp.

Problem of yield of investments – quality vs. quantity.

$$I_k = \Delta Y$$

→ strateg. catalysts

5) Coleman
S. Sc. important – Appl. Sc. & Res. –
R. incremental change – diversity

York Pol. problems of over populated countries.

Resumé

1. Volzaorsky – 2. Barzelatto: Planning – med. ad.
   dt. ft. spk. 3.) Baigadolnge –
4. Segreid – collab. bio. ca + sc. 5. Coleman
6. Toro   Kohli   Pol
   Defense budget

Volzaorsky: Liv. standards –

	3	2	1	0
	2^3	2^2	2^1	2^0
	8	4	2	1
(1)			0	1
(2)			1	0
(3)			1	1
(4)		1	0	0
(5)		1	0	1
(6)		1	1	0
(7)		1	1	1
(8)	1	0	0	0
(9)	1	0	0	1
(10)	1	0	1	0
(11)	1	0	1	1
(12)	1	1	0	0
(13)	1	1	0	1
(14)	1	1	1	0
(15)	1	1	1	1

4096 2048 1024 512 256 128 64 32

	4	3	2	1	0
	16	8	4	2	1
0	0	0	0	0	0
1	0	0	0	0	1
2	0	0	0	1	0
3	0	0	0	1	1
4	0	0	1	0	0
5	0	0	1	0	1
6	0	0	1	1	0
7	0	0	1	1	1
8	0	1	0	0	0
9	0	1	0	0	1
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28	1	1	1	0	0
29	1	1	1	0	1
30	1	1	1	1	0
31	1	1	1	1	1
32	1 0	0	0	0	0

No of digits = (2^x) x+1

Find highest power of 2

Subtract

13

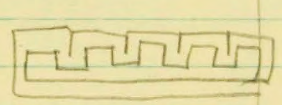
Find highest

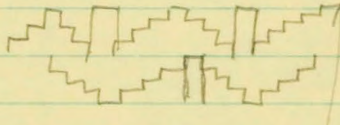
5
4
1

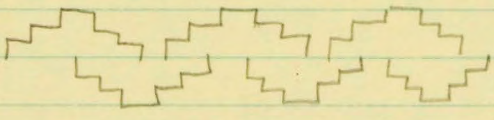
13
8
5

22
16
6
4
2

31
$16 = 2^4$
15
8
7
4
3
2
1







Sept 2, 1970

Sussex - Oldham

98%

50% — Def., Sp., et. cn.

25% — econ. obj.

10% — fund. res.

14% — Welf., Ned. Res.

< 1% — probl. of devel. countries

Valsarsky

"Happiness Res. Institute" —> Aims of Developm

Buzzati

Scientists — Prof. in development

Prof. Salam (Trieste) — Alex Kaplan (Jerusalem)

① "Scientists for Development" — ② Int. A. F.
(Stockholm July 23) — Manifesto

Aid: Multilateral > Bilateral

UN system — total chaos: 30 agencies,
15 committees A. + Techn. — ③ Think Tank
small staff

70% —

86% —

Ratings.

Holsti — Arms race
+ control
Disarmament

Passing vary for off. agreem. + negot.
~~unoff~~
Unoff. channel of com., dipl. gab.
Public Appeal
mobilizing sc. com.

Weiss
Change in attitudes – grad. schools
High power research – what is it good for?

Rotblat To whom should we address ourselves?

Come as individuals don't represent anybody. → new things express freely, private meetings, pay fare, press doesn't like it.

Ideas contrib. to relax. of tensions.

Can say things which cannot be said elsewhere

Hauser R+D political decis. making

Victor Rab.

Forum; ideas exchanged + new ideas generated
convince sc., not publ.

Djerassi
Am. Chem. Soc. – Colorado
Repr. San Mateo –

Post grad. Res. in Chemistry. – Djerassi
synth. polymer chemistry – pl. effect of post doc person.
Fin. commitment – 2 yrs
Post doc. – Sr. Men

Sept 3

Diag. Studies – 14 man yrs (Odhiambo)

[What prop. of pop. benefits by develop?
How many better off
" " worse "

Learning includes right to be wrong

East + West to help South

Odhiambo

Int. Center for Insect Physiology and Ecology
ICIPE, Nairobi

Djerassi: Model system
Odh: Sc. ideas for development

Review situation in Africa: Adm. Manpower
Sc. capability
Quality of work
How does one use science for development?

Impediment on insects – maj. probl. of develop.
1) Could we do effective research to remove this imped.
2) Sharpen effectiveness
Build up Sc. capital – in-built mechan.
3) Thinking "inwardly" – self interest: Quality of environment

Sept 2

Op. for aid
mult.
No constituency
Spent poorly

P.M.

Chairman: Oldham Sussex

Kretzman: UNDP - U.N. Developm. Program
m Hoffman

Jackson Report (distr. in June 1970)

Jan 1966 - comb. Techn. Assist + Spec. Fund
Channel for money - Project requested by country matched funds 250 Mill/yr →
½ Bill. $ budget → FAO, WHO, WMO hire experts
+ do work in connection c̄ country.

Expanded to include 1) projects not govt. requ.
Regional - Global.
Global: Res. to fortify prot. of corn

2) Institutes outside UN Agencies to carry out spec. projects.

Changes next spring:
a) Regionalization
b) Decentralization

a) Polit. Basin - Lat. Am - Asia - Africa

Asst. Admin.

b) Decentraliz. of program → country
Proj. origin in country - country direct (Resid. Repr.) - Representat. will work in project
Local UN building - all spec. agencies
Interdisciplinary project. - Region. desig. in Reg. Off. in N.Y.

Sept. 2

Hopper (Canada)

Center of 21 persons created by Act.

Canad. Int. Devel. Aid Agency – CIDA
Appl. of Sc. + Techn. to develop. regions
10 [illegible] non-Canad. – 11 Canad.

30 mill $ first 5 yrs. – 2½ mill first year
Canada 400 mill $ for. aid budg. (will be 5%)
R + D = 20 mill annual

OECD – [illegible]

Agricult. Res: 1960 – Int. Rice Res. Inst., Philipp.
Ford 10 mill. – Rockefeller
450,000 – 750,000 of budget
+ " Aid → 2¼ mill.

→ 3 other Inst.: Cent. for Maize + Wheat, Mex.
Columbia Progr., Int. Cent. for Trop. Agri.
2¼ mill each.
Nigeria – Int. Inst. Trop. Agri.

Bellagio – World Bank
Coord. agencies to sup. Int. Agri. Res.
5 other progr.: Water manag. Upland crops, legumes,
Livestock Afr. S. of Sahara, econ. policy for Agri. Develop.

Dwarf wheat – dwarf rice (Japanese in 30's)

Victor R. Ntl. Ac. Sc. – pool of scientists.

Sc. Techn. + Develop.: first 5 yrs – bring together Sc. of [illegible] + sec. econ. ministries of econ. pl., educ.

Brazil – 1965 – Brazil. Res. Council
identified areas: Ind. Res. etc.
Study groups to look at probl. areas – multi-disciplinary – [illegible] + progr. of Res. Council

CROFE
OE CRF
CFR

RFC
RCF

FCR
FRC

pollution problems are there – pesticides

Commits Int. Sc. Community

Ensure
1) High quality personnel

Select leading people in insect science to be part time directors of project

high quality – meaning to them

2) Post-doctoral who have proved ability
2 - 3 yrs

Associate –

3) Training program of African worker
fellowship

4) Syst. of regular seminars about dev. problems

Mechan. for insuring resch. results → operat.

a) Patent Policy

b) Reg. adv. Committee – Complementary with c reg. res. inst.

Finance: eman. from scientists (not from donor)

third: Acad. of Sciences

Djerassi Example – Nairobi – Tom's article in Science

proposal in Jennings – Fish Mtg: Academies

AAS + Sc, NAS, Czech, UK, Sweden, Eng. Sc. Holland

Dresselhaus
Oldham
Djerassi

ERCRO
ERDCE

ERDCF CRDE
COERF

COREF
ERDCE
ORCEF

Switzerland, Japan, Germany
Royal Soc. London, France
Australia,

Why Acad. not helpful? Nat. pet groups.

Royal Society, Japanese
1 Bill$/yr for first 5 yrs

Buzzati – Trieste Coop & Unesco

Revelle : Interam. Science Foundation – ISF
1961 – Stone
1969 Focki – > Stockholm Academies of 16 countries
no Eastern countries.

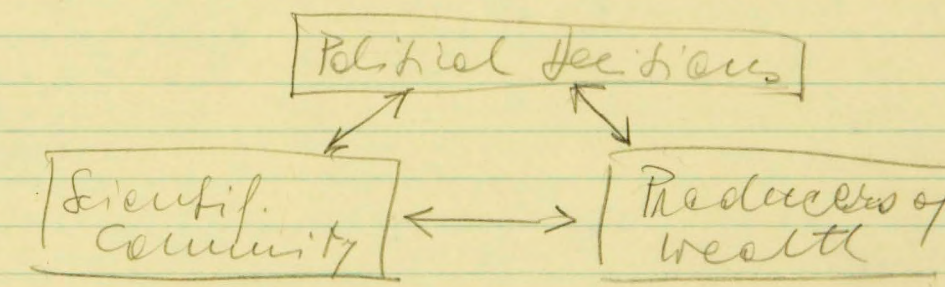
Relevance to needs of countries concerned
Cont. Comm., Anger, Chm.

Prof. + Students attacking a problem
to which neither knows the answer.
90% will be Wrong

Joint learning process = joint research

Dangers:

Valsavsky



Sept 4

Pathfinder

30 national groups – not all called P. International: P. any sc. who has concern in social implications of science: Total attendance: 800 Pugwashites (600 + 200)

Privilege: Receive publications invited ? 5 yrs main confer 1962 - London, 1967 - Kennedy Cont. Comm. elected at main conf. Raised ? 4 (3 co) → 18 (12 co)

Secy Journal – $10,000/yr up to 2 yrs ago

Since 2 yrs: office, staff of 5, $30,000

Runs on shoestring, purposely prefer loose amorphous body,

Unique: 1. all scientists (natural + social)

2. Individuals – must be active sc. come as individuals, bring in exp. in sc.

3. Main act. — Annual Conf.

ABC 100 part. — pre exchange

Begin — only body East – West

Prod. Prof. Organiz.

& increase activities

Before ch 1) Study groups: Biol + Chem Warfare

↓ SIPRI not

celebrate 150 yr. no war in Sweden for 200 yrs.

2) Security

↓ Symposia on spec. subj.

Some monogr.

This is 11th Sympos. in 3 yrs.

Topics: Nuclear disarmament (great menace to mankind) + Arms control still major topic.

Developing nations already with ABC (3rd conf.), also Nuclear

7th Conf. part.c. Asp. in Sc. — develop. nat.

Emphasis has been shifting

Topics + part.c panels

Orig. Phys. + Chem. then inc. Soc. Sc.
Disarmament -> Collab. of Sc. for develop. of ...
Should be 2 parts: No, discussions. Cannot separate
Peace - Environ. - Pollution - indivisible
E-W coop, even when conc. c̄ South
First meeting c̄ Comm. Block - does not indicate disinterest, timing communic. Need more time.
[Pull out by its own bootstraps]
In Region Prog. "communist" - not too respectable. Have to be careful

---

Hansen!

Revelle - analog. econ.
ign. scient.
bloody-minded adm.

Rx India - Pol. Sc.
15/1000 45-50/1000 = 3% growth rate
Rx Social + economic development

(Japanese) Int. Trade Policy ~

? Develop. countries c̄ labor surplus

[each person be years to define himself]

Revelle

Individual

International

Interdisciplinary

Interfering

Rx Define problems for sc. to work on

Make sc. understand develop. problems
not only technical but social change

10 – 15 Bill by middle next century
50 Bill end of " "

SCIENCE 'FASHION' CALLED HARMFUL

Latin Physicist Gives View at Pugwash Conference

FONTANA, Wis., Sept. 10 (AP)—A Latin-American scientist attacked "scientific fashion today and said it often resulted in the wrong kinds of research in underdeveloped countries.

"One sometimes falls into the trap of developing with foreign aid a scientific establishment which is not concerned with the problems of that country," said Dr. Carlos Varsavsky of Buenos Aires.

Dr. Varsavsky is the only Latin American among the mo than 100 scientists from 35 nations attending the 20th annual Pugwash Conference on Science and World Affairs at this resort on Lake Geneva. The conferences take their name from the site of the first meeting—Pugwash, Nova Scotia.

Dr. Varsavsky, an astrophysicist, is a member of the continuing committee for these conferences, founded by the late Lord Bertrand Russell, the British philosopher.

"There are kinds of scientific development that are not good for a country," he said in an interview, adding that "sometimes you simply develop science."

He said that only 2 per cent of research and development effort in non-Communist countrie was carried out in underdeveloped countries.

Notes Stress on Defense

In highly developed countries, more than half of the research effort is devoted to defense, space exploration and nuclear energy, he said, and noted that this kind of research was of little use in developing countries.

Since most of the money for research is available in these fields, most scientists pursue these interests and they "set the fashion in science," he said.

Such interests are self-perpetuating he said, since students work with professors who have these interests and then enter the same research field.

Dr. Varsavsky formerly was director of the National Radio Astronomy Institute in Argentina and a college professor. He was educated at the University of Colorado and Harvard.

He said there is an "internal brain drain" as well as an "external brain drain." The former, he said, refers to scholarly research that is not relevant to the problems of the scientist's country. The latter refers to emmigration from the country.

More Argentinian sci[illegible]tists, as well as those fro[illegible]de-veloping n[illegible]tions, [illegible] for indu[illegible] d[illegible] cal res[illegible] coun[illegible]

20th PUGWASH CONFERENCE ON SCIENCE AND WORLD AFFAIRS
Fontana, 9th to 15th September 1970

"PEACE AND INTERNATIONAL CO-OPERATION: A PROGRAMME FOR THE SEVENTIES"

STATEMENT BY THE PUGWASH CONTINUING COMMITTEE

The Twentieth Pugwash Conference on Science and World Affairs, held from the 9th to 15th September 1970 in Fontana, Wisconsin, was attended by 109 scientists and scholars from 31 countries, and from 5 international organizations. Under the theme "Peace and International Co-operation: A Programme for the Seventies", and following the pattern of informal and lively exchange of views that has characterized these unofficial conferences since their inception in 1957, the participants discussed a variety of international problems in five Working Groups on the following topics:

International Security Problems (General Aspects); European Security Arrangements; Disarmament and Arms Limitation; International Co-operation in Science and Technology; and Science Technology and Development. In addition, plenary sessions were held on International Aspects of Environmental Pollution and the Depletion of Natural Resources, and on Problems of Population and Economic Growth.

The reports of the Working Groups, submitted to the Continuing Committee, are felt by us to be of broad general interest, and are attached herewith. It should be emphasized that the contents of these reports represent broad consensus of the respective Working Groups and not necessarily of the conference as a whole.

It will be noted that these reports contain a number of recommendations on future activities; these proposals will be considered by the Continuing Committee.

The 20th Pugwash Conference was organized under the auspices of the Committee on Pugwash Conferences of the American Academy of Arts and Sciences with the co-operation of the National Academy of Sciences of the USA. Our host was the Adlai Stevenson Institute of International Affairs.

One new arrangement tried at this conference was the invitation of a group of student aide-participants. This group included 22 students of science, international relations, and science policy from 10 countries. A special session was arranged at which students and other participants

exchanged views about Pugwash. It is expected that this experiment will be repeated at future conferences.

At the final session of the conference, the Continuing Committee announced the election of Professor Hannes Alfvén of Sweden, distinguished physicist, as President of Pugwash.

The 21st Pugwash Conference will be held in Sinaia, Romania, from the 26th to 31st August, 1971. The Continuing Committee has elected Professor Corneliu Penescu to be President of this conference.

Working Group IA

INTERNATIONAL SECURITY PROBLEMS

1. General Aspects of Security

The Group considers the world situation to remain very serious despite some favourable trends in international politics. The threat of a nuclear conflagration still exists, the intensity of the arms race is growing, and armed conflicts are going on in different places of the world. In the light of these developments Pugwash cannot and should not weaken its efforts to secure universal peace.

Therefore, the Group considered it important to move away from traditional strategic thinking where states are seen as pieces on a chessboard. A conceptual framework should be adopted in which the aim was not only to achieve and maintain peace, in the sense of absence of violence - which may or may not be protected through a balance of terror - but where security and peace include also disarmament, co-operation, material progress and national self-determination. Measures to be taken to promote these aims could include the following:

- promoting universal application of the principles of peaceful co-existence between states irrespective of their political, social and economic systems;

- avoiding interference by all states in the domestic affairs of other states, so that any state may change its social and political system without the fear of interference from outside states;

- facilitating support, by non-violent means, to national liberation movements which are seeking to unseat regimes condemned by the United Nations for violations of human rights;

- increasing economic, technical and scientific co-operation between all nations, emphasizing in particular the need for such co-operation with different economic and political systems;

- promoting comprehensive disarmament and demilitarization in the developed world;

- implementing fully the U.N. resolutions on decolonization;

- attempting to dissuade the developing countries from the build-up of military forces;

- increasing substantially economic, technological and scientific assistance to help these countries develop themselves;

- encouraging personal contacts in various fields between nationals, including in particular those countries between which there exist conflicts. Such action would be consonant with the aims and within the potential Pugwash;

- specifically taking serious steps to bring China back into international organizations, particularly to take her seat in the Security Council, and to intensify the efforts to re-establish Chinese participation in the Pugwash Movement;

- improving regional and universal security arrangements. In this connection, it was considered important to discuss in more depth, at the next Pugwash Conference, measures to increase the capability of the U.N. to handle local conflicts.

2. Current Conflicts

A. The Middle East

The Group welcomed the acceptance by the parties of the Rogers plan and the establishment of a cease-fire, but deplored the fact that the peace negotiations had not yet commenced. The Group re-endorsed the statement on the Middle East originally adopted in the 18th Pugwash Conference in Nice (see appendix I) and then noted in the 19th Conference in Sochi. While considering it probable that the present cease-fire has brought the U.N. resolution closer to its implementation, the Group urges that all parties should avoid any action which could further increase the mistrust now prevailing between them. The Group calls for a speedy resumption of negotiations through the Jarring mission, in an atmosphere of scrupulous observance of the cease-fire conditions and credibility of intentions.

The Group examined various proposals for steps that could be taken to bring peace to the Middle East, and to provide for a humane settlement for all living in the area. The Group holds that all people in the area should enjoy their human rights and live in peace, and that all states in the region should have the right to exist. In this context, the Palestinian refugee problem has to be solved according to the principles of the U.N. Charter - (see 4 below).

B. Indo-China

The Group considered it a matter of grave concern that since the last Pugwash Conference, the armed conflict, far from being stopped, has spread to Cambodia. The Group, proceeding from the statement adopted at the 19th Conference in Sochi (appendix II), stresses that for Laos and Cambodia as well as South Vietnam, the aim must be to achieve peace not to equip or support the local parties to continue the conflict.

3. Arms Trade Involving Developing Countries

This question was seen as virtually important, and various proposals were put forward. The Group agreed that arms trade must be seen in connection with issues of disarmament and security concerns in both the developing and developed countries. Differences of opinion were expressed, and the Group agreed that the question needs further study (see 4 below).

4. Proposals for Further Study

The Group felt that the Pugwash Movement, because of its unique network of contact and interaction between scientists devoted to peace and development, can play an increasingly important role in matters of political importance. In some cases Pugwash-sponsored studies, particularly in areas where governmental organizations may be disinclined to do so, would help disseminate facts, clarify problems and elucidate the positions of the parties involved.

Middle East: The Group recommends that the Continuing Committee establish a working group to help to find ways to implement the United Nations Security Council Resolution 242.

Indo-China: The Group suggests that the Continuing Committee constitute a study group on Indo-China and request a suitable institution to provide facilities for the collection and distribution of information to the participants in the study group. The group should report at the next Pugwash Conference, but should be free at any time to present its proposals to the parties.

Arms Trade Involving Developing Countries: At the 19th Conference in Sochi, it had been recommended that the United Nations convene a committee of experts to examine certain aspects of arms trade. Since the United Nations has not adopted this proposal, and because of the complexity of the problem, the Group recommends the following steps:

a. That the Continuing Committee propose to one of the institutes presently engaged in research in this field that it convene a group of experts to examine the collection and verification of information on this issue.

b. That the Continuing Committee organize a symposium with participants from both developed and developing nations, to discuss the economic, technical, political, social and military problems related to arms trade to and production of arms in the developing countries.

c. That this symposium report to the next Pugwash Conference, so that the Conference can consider the possibility of drawing up a draft convention on the limitations of such arms trade.

APPENDIX I

Middle East*

The Working Group has considered the Middle East question and taking into account the need to eliminate acts of war and to secure a just and lasting peace:

1) urges speedy implementation of Security Council Resolution No. 242 of 22 November 1967;

2) urges the parties to co-operate fully with the Jarring Mission to obtain this implementation;

3) suggests, as a guarantee of a peaceful settlement under the auspices of the United Nations, the temporary demilitarization of certain sensitive zones along the borders following the withdrawal of Israel troops in implementation of the Security Council resolution;

4) suggests that restrictions on the supply of arms to contending parties, following the implementation of the resolution should be considered.

* Proceedings of the 18th Pugwash Conference in Nice, 1968, p.20.

APPENDIX II

The following Statement was made at the 19th Pugwash Conference:*

> "The Group considered that complete withdrawal, as quickly as possible, of American troops from South Vietnam is a necessary condition for the establishment of peace in that country. It also felt that a very substantial and very rapid reduction in the strength of American forces would facilitate achieving a cease-fire, and aid in the negotiations for a political agreement among the parties in South Vietnam. To facilitate settlement of the Vietnam conflict, it is necessary to promote the setting up of a coalition government in the South.
>
> "It is stressed that the goal must be an end to the war, and not the so-called 'Vietnamization' of the war. Only when this senseless and tragic conflict comes to an end will it be possible to devote attention to the necessary and pressing tasks of political, social and material reconstruction."

* Proceedings of the 19th Pugwash Conference in Sochi, 1969, p.19.

Working Group I.B.

EUROPEAN SECURITY ARRANGEMENTS

1. Assessment of the situation in Europe as a result of recent developments.

Since the 19th Conference in Sochi there has been a marked change in the atmosphere of international relations in Europe, characterized and largely brought about by the conclusion of the treaty between the Soviet Union and the Federal German Republic. This new situation opens up possibilities of further development of cooperation and improvement in the relations between the signatories, improved relations of the F.G.R. with other East European states, and greater security for Europe.

The conclusion of the treaty representsdetermined efforts by both sides to reach agreement, but it was also facilitated by the general lessening of cold-war tensions, which still recently were rather intense.

While this treaty represents a major advance, it is only one step in the right direction, which, one hopes, will soon be followed by others.

The reports of the Ronneby and Sochi conferences drew attention to the desirability of admitting both German states to the United Nations, of recognition of all existing European borders, and of recognition of the G.D.R. by all states without prejudice to possible future unification of the two German states. These aims have not yet been fully achieved.

Up to the present the treaty has been signed but has yet to be ratified. Public opinion in the F.G.R. is not unanimous, and there are sections opposing ratification. Early ratification of the treaty is of great importance, and its prospects can be greatly assisted by cooperative attitudes by all concerned over practical matters such as the handling of border procedures and of other day to-day transactions. Such signs of good will, which in some measure are taking place, can help to create confidence that the treaty is bringing tangible and immediate benefits.

Apart from this treaty, other recent moves are the direct negotiations between the governments of the G.D.R. and the F.G.R., although these have not yet led to agreement, and direct negotiations between the F.G.R. and Poland. Similarly, there are negotiations in progress between the four occupying powers concerning West Berlin.

2. Recommendations for further action.

In this situation the prospects of an early implementation of the proposal for a European Security Conference appear good, particularly since neither the question of the participation of the G.D.R. and the F.G.R. with full and equal status, nor that of the participation of the U.S.A. and Canada seem to be any longer matters of controversy. Pugwash should urge all governments concerned to initiate steps towards convening such a conference. The conference should consider a treaty to be signed by the states of Europe that would obligate them:

(a) to solve their disputes exclusively by peaceful means and to assume the obligation to refrain, pursuant to Article 2 of the Charter of the United Nations, from the threat of force or the use of force in questions which affect security in Europe and international security;

(b) to respect unreservedly the territorial integrity of all states in Europe in their present frontiers; and

(c) to conduct their mutual relations according to the principles of sovereign equality and to assume the obligation to refrain from intervention in each other's internal affairs.

The conference should also consider the problem of the high level of armaments and armed forces in Europe and means of their reduction. It cannot be expected that this complex problem can be disposed of at a conference, but it may be possible to set up a continuing body for the purpose of studying the problem of arms reduction. It may also prove possible and desirable to have this or some other organization concern itself on a continuing basis with European security.

The conference should not, however, be restricted to security, but should concern itself with the improvement and expansion of all forms of cooperation within Europe which may have become possible or easier as a result of improved relations, and which can in turn contribute to a consolidation and further improvement of these relations. This includes economic relations as well as scientific, technical and cultural ties. It is important to eliminate, to the maximum possible extent, restrictions on trade, travel and the free movement of persons.

In the field of economic cooperation, there already exist many examples of joint economic and industrial projects, including countries of East and West Europe jointly, usually on a bilateral basis. Their total scale is, however, still small, and much more can be done. The Group noticed that in this field, as in scientific and technical exchanges, there was much emphasis on the fields of highest prestige, probably because these most easily attracted the attention of the few national organizations that now function as the channels for such cooperation. To widen the scope of collaboration it would be useful to decentralize the initative, so that suggestions for binational or multinational ventures could arise from many channels.

Regional multilateral arrangements function now, for example, in the management of the Danube, and similar arrangements might now be workable in the Baltic. There are other subjects suitable for multilateral arrangements for the preservation of the environment. In the fields of scientific and cultural cooperation there also exist already many working arrangements, some bilateral, some multinational but relating to special fields, and all of these are worth extending. Here again any possible decentralization of initiative would be beneficial.

The Group considered, but did not favour, the idea of some institution responsible for cultural exchanges throughout Europe, but a body which would look at possible additional forms of cultural collaboration and would encourage these where appropriate might be profitable.

Mutual understanding would be greatly assisted by measures to ensure that school textbooks, particularly of history and geography, used in each European country were based on well-informed and objective understanding of the situation in other countries to which they refer.

3. The place of Europe in the world.

The Group felt that it was premature to express any definite view or suggestions concerning the means and ways of integrating the current efforts in Europe into a wider endeavour to create a world-wide system of security and cooperation as envisaged in the Charter of the United Nations. It was, however agreed that the security of Europe and the prosperity of the nations of Europe are not possible without the further development of the ties which link the nations of Europe with nations on other continents.

In this respect the Group emphasized the possible role of Europe as a factor influencing international relations in general, and particulary those between the superpowers, and the role of Europe in the developing areas of the world.

The view was expressed that these problems could be further studied and elucidated at some future Pugwash meeting.

Working Group II

DISARMAMENT AND ARMS LIMITATION

With grave concern the Group has to record that the year which has elapsed since our Conference at Sochi, despite some positive events (the beginning of the Soviet-American strategic arms limitation talks and the coming into force of the non-proliferation treaty), has brought no significant decrease in the threats inherent in the arms race. In the view of some, hopes of controlling the arms race to any truly significant extent, by means of partial measures, are receding rather than becoming brighter. In this situation the Group is convinced that it would be the missing of an historic opportunity if the Resolution of the UN General Assembly adopted on 16 December 1969 A/RES/2602E (xxiv), declaring the Decade of the 1970's as a Disarmament Decade, were allowed to remain yet another cry in the desert. The Group can see no lack of realism in the General Assembly's request to the Conference of the Committee on Disarmament (CCD) that, while continuing intensive negotiations with a view to reaching the widest possible agreement on collateral measures, it should work out, at the same time, "a comprehensive programme dealing with all aspects of the problem of the arms race and general and complete disarmament." The easing of tensions in Europe, the achievement of near-parity in the "strategic" capabilities of the principal nuclear powers, the vast potentials of satellite reconnaissance as an instrument of verification, these are some, but by no means the only factors, which would tend to make the resumption of negotiations on complete and general disarmament a meaningful endeavour. In the unanimous view of this Group the starting point of this great enterprise should be a critical review by the US and Soviet Governments, in the perspective of those changes and developments which have supervened during the past eight years, of the plans they had respectively put forward in 1962 in the shape of the Revised Soviet Draft Treaty on General and Complete Disarmament (September 24, 1962) and the United States Outline of Basic Provisions of a Treaty on General and Complete Disarmament in a Peaceful World (April 18, 1962, as amended on August 6, 1962 and August 8, 1962).

Practically all that is stated and argued in the next following sections of this Report tends to show that any attempt to buy national security by further military build-up is self-defeating. The Group is anxious that it should be fully realized by governments and public opinion all over the world that the superficial quiescence of major

conflicts is deceptive and that complacency at the present time is pregnant with massive dangers. It is the duty of Pugwash to bring these dangers to the urgent attention of all those who are actively concerned with problems of arms control, disarmament and international security.

Problems of Strategic Arms Limitation

The strategic arms limitation talks and the approaches of the major nuclear powers to strategic policy appear to be based largely on the idea of maintaining a capability to inflict unacceptable damage on each other in the event of nuclear war, i.e. on "deterrence".

The concept of deterrence was extensively discussed and the following criticisms were voiced. First, there is the fact that requirements for deterrence have been used as a rationale for a continuing growth in nuclear weapons stockpiles. Second, the idea of one of the major powers deterring a deliberate calculated nuclear attack by the other seems of limited utility because the most real threat of nuclear war is not in such an attack but rather in accidents, miscalculation or in an uncontrolled escalation of an international crisis. For these and other reasons the final objective of arms control and disarmament negotiations must be general and complete disarmament. Prevention of further growth in "strategic" armaments and even substantial reductions must be regarded as at best interim measures.

Despite these reservations, realistically, efforts at arms control and disarmament will, in the present situation, probably continue to be related to the concept of nuclear deterrence. In that context, present stockpiles of nuclear weapons and delivery systems seem grossly excessive. This seems particularly so when it is recognized that many nuclear weapons and delivery systems which are often characterized as "tactical" could in fact be used to destroy not just military objectives but the population, industry and fabric of society in many countries; and when it is recognized that the damage-inflicting capabilities of nuclear weapons are generally and notoriously under-estimated primarily because only immediate fatalities and direct effects are considered. Actually, each of the major components of "strategic" force, such as the ICBM's or the missile launching submarine forces alone would have a more-than-adequate capability for deterrence.

Despite the enormous "overkill" inherent in present "strategic" forces, we are now threatened with a further multiplication in numbers of "strategic" nuclear warheads, principally because of the development of MIRV's (multiple independently targeted re-entry vehicles). When coupled with improvements in missile accuracy, which seem entirely feasible and very probable, there is basis for serious concern.

First, there is the possibility of an attempt by one or both of the superpowers to develop a "first-strike" capability against its adversary's fixed land-based missiles. Were such a capability developed, a "first-strike" would seem extremely improbable considering that, even if successful, it would not prevent a devastating retaliatory blow by other forces - submarine based missiles and bombers. Nevertheless, efforts to develop a "first-strike" capability would be very undesirable for several reasons:

in a time of severe crisis the incentives to strike first would be increased;

ICBM's might be launched in an almost automatic way, based on a warning of attack, in order to prevent their destruction: and reliance on such automatic response might result in erroneous launching of missiles with catastrophic results;

there would be an adverse effect on the arms race. With the perception that ICBM's might be vulnerable to pre-emptive attack, there would be incentives to build new delivery systems to replace them, or to increase the number that might survive attack by defending them or by increasing their number.

The development of highly accurate MIRV's is also dangerous because it may play into the hands of those who would argue in favour of using nuclear weapons not only for deterrence, but for actual war-fighting. There will be those who will claim that with large numbers of highly accurate, relatively low-yield nuclear weapons, it will be possible to execute "surgical" type attacks against adversary military targets with there being a minimum of collateral damage to civilian population and other targets. The concept is wrong because of the aforementioned under-estimation of the effects of nuclear weapons, and it is dangerous in the extreme because of the probability of uncontrolled escalation. It is, therefore, important to warn the public and political leadership about such dangers and if possible to prevent the further development and

deployment of highly accurate MIRV's.

Last year at Sochi we warned of the adverse consequences of further development of MIRV capability. Regrettably the testing of MIRV's has proceeded much further, and recently deployment has begun. That being the case, limitations of MIRV's would now be much more difficult than one year ago. However, the Group expressed the hope that it might not be too late to negotiate limitations and urges that it be an urgent objective of SALT.

In any case, considering how far the programmes have gone, serious consideration should be given, in both the SALT negotiations and in unilateral national decisions, to minimizing the adverse implications of MIRV development. This might be accomplished by reducing the main rationalizations for their deployment, namely by limiting ABM defences; and by reducing reliance on fixed land based ICBM's for deterrence. Because of their vulnerability to attack by highly accurate MIRV's, fixed land based ICBM's seem likely to be obsolete (unless a launch-on-warning doctrine is adopted for them) within the next decade. Phasing them out of inventories very rapidly seems preferable to attempting to extend their operational life by a few years through proliferation or active defence (and also much to be preferred to the adoption of a launch-on-warning doctrine).

We would generalize and urge that in both the SALT negotiations and unilaterally, the superpowers make a special effort to eliminate those strategic systems which are particularly likely to lead to increased risks of nuclear war or to an acceleration of the arms race.

In this connection limitations on anti-submarine warfare would seem highly desirable. As long as the superpowers insist on maintaining deterrent forces, there is great advantage in their being as invulnerable as possible, since any suggestion of vulnerability seems almost certain to lead to an effort to compensate for that real or imagined vulnerability with the result being an expanded arms race. The Group was of the opinion that at present missile launching submarines are highly invulnerable. To allay concern about future vulnerability, inhibiting or preventing development and deployment of improved anti-submarine warfare capabilities would be desirable. This would increase the acceptability of greater reliance on missile launching submarines and a more drastic and rapid phase-out of some other "strategic"

delivery systems. An agreement to prohibit deployment of large active sonar systems seems particularly desirable. There are no compelling arguments for deploying such systems for purposes other than to attempt to locate missile launching submarines. Furthermore, there would be no problems in verifying compliance with such an agreement. Other measures for limiting anti-submarine warfare were discussed (limiting numbers of hunter-killer submarines and geographical limitations on deployment of certain naval forces). Consideration of such measures merits serious attention in SALT.

Severe limitations on ABM deployment are likely to be essential to any significant limitations on strategic armaments. Any ABM deployment is likely to stimulate a race in ABM technology, and to make limitations of strategic offensive forces more difficult. In particular, even a very limited ABM deployment would make more likely the deployment of large numbers of MIRV's, and would make more difficult drastic reductions in strategic missiles. From this, the desirability of a total prohibition on ABM is apparent, and the Group would hope that an agreement on such a prohibition could be negotiated very quickly. However, negotiation of an agreement limiting ABM to very low levels and limited geographic areas would also be of the greatestimportance, especially if it opened the way to early agreement on a total prohibition.

Negotiation of limitations on bomber defences is likely to be much more difficult. That being the case, the best hope of preventing a bomber-anti-bomber arms race would be in the exercise of restraint with respect to construction and reliance on bombers. The Group would urge that in the event of a lessening of reliance on ICBM's for deterrence there not be an effort to compensate for this by increased reliance on bombers, either short or long range.

The preferred reliance on certain components of the"strategic" forces - that appears to be suggested by the above arguments - will appear objectionable to military and other groups that have a vested interest in the preservation, and expansion, of other sectors of the strategic forces. Firm control over all decisions relevant to the strategic postures of the major nuclear powers by the civilian political authorities within them is, therefore, essential if there is to be optimum progress towards arms limitations and disarmament.

The Group recognized that there are a number of military systems with multipurpose capabilities: "tactical" nuclear weapons, aircraft carriers, "tactical" aircraft

and shorter range missiles. Some of these can be dealt with in the SALT negotiations, the others in the context of general and complete disarmament and in negotiations on European and other regional security measures.

Despite some complications arising because of the present political and military situation in Europe and in the increase in the number of nuclear powers there are very substantial areas of potential SALT agreements.

While there was a consensus within the Group that the SALT efforts should be encouraged, there were expressions of serious concern.

First, the fact that the SALT negotiations have been in prospect for three years and in progress for almost one has resulted in a diminution of serious arms control efforts in other fora where more nations are represented. In particular, measures that might normally have been considered in the CCD have been put aside in the hope that they would be dealt with in SALT or on the grounds that consideration of them should be deferred pending a SALT agreement.

Second, there is a very real danger in an unproductive prolongation of SALT negotiations, of the major nuclear powers going ahead with weapons programmes, that would otherwise not be undertaken, in the hope of strengthening their bargaining positions. Indeed, this may already have happened.

If no significant agreement is reached in SALT, we could well be worse off than if the negotiations had never been undertaken. Aside from the possible adverse consequences mentioned above, a failure of SALT is likely to result in a worsening of Soviet-American relations, an increase in military influence, a disillusionment on the part of the rest of the world in the sincerity and capability of the superpowers to act responsibly, an adverse impact on the containment of nuclear proliferation, and a long interval before there would again be a prospect for making major progress on arms control and disarmament.

With these considerations in mind, it is of the greatest importance that (1) the SALT negotiations proceed expeditiously; (2) that the United States and the Soviet Union exercise great restraint in acquiring additional strategic systems during the negotiations; and (3) that concurrently with the SALT negotiations, there be vigorous efforts in the CCD and elsewhere to move forward with general and complete disarmament and with other partial measures.

Nuclear Test Ban Treaty

The Partial Test Ban Treaty has greatly reduced atmospheric contamination from nuclear tests, but it has not put an end to the development of nuclear weapons. The rate of nuclear testing has been higher since the Partial Test Ban came into force in 1963 than it was before (an average of 48 reported tests a year compared with 40 previously). Moreover, there has been a continuing trend towards increasing the maximum yield of the weapons being tested underground.

There was consensus within the Group on the fundamental point that the problems of extending the Moscow Treaty to underground testing are essentially political and that the technical problems of verification are not the real stumbling block.

Such difficulties as existed previously in the detection and identification of underground tests have been reduced to such an extent that, in the Group's unanimous opinion, Pugwash is now fully justified in pressing for the immediate negotiation of a ban on tests above a certain threshold as a strict minimum requirement. This would raise no problems of verification, even without on-the-spot observation. The Group was also unanimous in strongly recommending the adoption, ultimately, of a complete ban on tests whether or not a foolproof verification system by on-the-spot inspection can be devised and accepted. Such a ban, in the view of the Group, would not present any risk to the national security of either of the superpowers.

Excessive claims have been made regarding the importance of nuclear explosions for peaceful purposes. Whatever short-term economic advantage there may be in the use of such explosions is likely to be more than offset by the risks of nuclear proliferation implicit in such explosions. If they continue to be permitted, it is quite possible that they will be conducted by non-nuclear weapons states despite the inclusion in the non-proliferation treaty of provisions for such explosions to be carried out by the nuclear weapons powers. Moreover, there is the risk that the weapons technology of the nuclear weapons powers would be advanced as a result of explosions for peaceful purposes. Accordingly, inclusion in a comprehensive test ban treaty of provisions permitting explosions for peaceful purposes would seem to be undesirable.

Nuclear Proliferation

The Non-Proliferation Treaty entered into force

on March 5, 1970. A number of technologically advanced non-nuclear weapons countries have not so far signed, let alone ratified, the treaty. Ratification by the majority of these 42 non-nuclear-weapons countries which have signed the treaty but not ratified it yet, depends upon the negotiation of safeguards. The first phase of the safeguard negotiations at Vienna yielded agreed general principles to be incorporated into safeguard agreements; and there is reason to hope that the second phase, concerned with the formulation of general regulations, and the third phase concerned with the adaption of these to individual projects, will yield equally positive results.

While the prospects of the Non-Proliferation Treaty being universally adopted depend on resolution of the aforementioned safeguards problems and on progress being made in SALT, other factors of importance are the development of nuclear armament by China, and the continuing existence of the British and French deterrent nuclear forces. Whatever the military relevance of these so-called independent deterrents may be, they provide an incentive and also a measure of political justification for the aspiration of a certain number of other countries to the acquisition of a nuclear weapon capability.

Nuclear and Other Weapons of Mass Destruction on the Seabed and the Ocean Floor and the Subsoil thereof.

The Group considered the latest joint draft dated September 1, 1970, tabled by the USA and the USSR. Some of the ambiguities and inadequacies of the previous drafts have been removed; but even with these improvements the draft treaty would be limited in its effect to a ban on the emplanting or emplacing on the ocean bottom of weapons of mass destruction, as well as of launching installations or other facilities for storing, testing or using such weapons. The draft also includes a new article imposing upon the contracting parties the obligation to continue negotiations for further measures calculated to prevent an arms race on the seabed, the ocean floor and their subsoil.

Although the majority of the Group was prepared to concede that a treaty on the lines of the present draft might do some good in forestalling the future development and deployment of the prohibited weapons, some members deplored the amount of time and energy which had gone into the preparation of its successive drafts to the detriment of projects deserving of a higher priority. It was, however, agreed that this treaty, as well as another treaty calculated to demilitarize the ocean floor, may contribute not only to

disarmament but also to the project of creating an international regime for the exploitation of that part of the wealth of the seabed, the ocean floor and their subsoil, which is in process of being recognized as a common heritage of mankind.

Chemical and Biological Weapons

The Group noted with satisfaction that during the past year the Geneva Protocol of 1925 had been ratified by Japan and Morocco: that ratification by Brazil was a foregone conclusion: and that in August 1970 President Nixon had re-submitted the Protocol to the US Senate for ratification. These four ratifications would bring the total number of parties to the protocol to almost 90 and these parties would include all the major powers in the world. In the view of the Group it can be forcefully argued that the fundamental prohibitions embodied in the Protocol, even in its present state, qualify as rules of customary international law, binding on all states regardless of ratification; nonetheless, it is desirable that the reservations or interpretations which purport to exclude certain agents from the ambit of the prohibition should be avoided. In this context some members of the Group suggested that the validity or otherwise of certain controversial interpretations (e.g. the US interpretation of the applicability of the Protocol to herbicides and the UK position on CS gas) should be submitted through the UN General Assembly to the International Court of Justice at the Hague for an advisory opinion.

In the unanimous view of the Group even the universal acceptance of the Geneva Protocol would not reduce the urgent need for an international convention prohibiting not only the use in war but also the development, production and possession of all chemical and bacteriological (biological) weapons. The Group gave careful consideration to the British argument that priority should be given to a convention prohibiting the development, production and possession of bacteriological (biological) weapons under any circumstances, but it took the view that the considerations in support of a single convention prohibiting both bacteriological (biological) and chemical weapons were much weightier.

The Group examined in some detail the various proposals for verification of production and possession made partly in the relevant Soviet and United Kingdom drafts and partly in a number of other documents submitted to CCD. It has taken the view that whereas some system of international verification was inevitably necessary in order to

overcome categorical opposition from military authorities, an excessively intrusive system, such as might endanger agreement on a treaty, was not called for. It was suggested by some members that a relatively thin system operating with e.g. "challenge inspections" might be sufficient , by others, that national means alone would suffice.

There was consensus on the point that pending the entry into force of a convention prohibiting the development, production and possession of C & B weapons there should be no procurement in any country of weapons of this kind.

The Group agreed that every encouragement should be given to unilateral disarmament in this field.

Secrecy should be eliminated even from defensive bacteriological (biological) research, and the Pugwash Symposium on rapid detection and identification of biological agents, to be held in Switzerland early in 1971, should contribute significantly to this end.

The Group attached great importance to SIPRI's programme of feasibility studies and experiments in the field of verifying the observance of agreed prohibitions relating to C & B weapons, and noted with satisfaction that US and Soviet scientists will participate in the planning and evaluation of these studies and experiments.

The Group recommended that when chemical agents or weapons are disposed of, the most careful measures should be taken to avoid contamination of the environment; and that the fullest international consultation and co-operation should take place if the effects of disposal might affect foreign countries.

Working Group III

INTERNATIONAL CO-OPERATION IN SCIENCE AND TECHNOLOGY

1. Co-operation to Preserve and Maintain the Integrity of the Environment

Recent years have seen wide public recognition of the dangers of severe & irreparable damage to the ecological balance of man's habitat on earth, not merely on a local but potentially on a planetary scale arising from:

a) the explosive growth of human population:
b) the reckless and wasteful use of scarce material resources:
c) the polluting effects of modern industrial processes on a vast scale.

We recognize that, while some expressions of such concern may be exaggerated, real and urgent dangers exist.

The Working Group began by agreeing that efforts should be directed not to stabilizing the environment, since it would be neither possible nor desirable to arrest the process of technological development on earth, but to preventing widespread irreversible changes from occurring in the plasticity of the biosphere. The aim should be to preserve the variety and resilience of the various ecological regimes and the ability of the habitat to recover from the ecological insults inevitably offered to it by the manifold technological and industrial activities of man in which the use of fertilizers and pesticides should be included.

It must be recognized that any effort. to maintain the integrity of man's environment will necessarily involve considerable expenditures of resources, not only of technical skills but also of energy. The value of such efforts compared to their costs may, therefore, present very different aspects to developed and to developing societies, and it is recognized that whilst development is in itself an improvement in the human enivornment, in some areas where the motives are largely aesthetic, environmental conservation may be a luxury that some non-industrialized countries cannot at present afford. Nevertheless, the need to safeguard our habitat for future generations is shared by all mankind, and since the problem is essentially indivisible its solution calls for universal collaboration in which no doubt the richer communities will have to be prepared to shoulder a substantial proportion of the cost. Some statements of interest at the UN and other international fora have paid lip service to this necessity without always resulting in positive action.

Our present situation may be regarded as a transition phase between two limiting cases. On the one hand, the activities of stone-age men offered relatively slight perturbation of his habitat from which it was capable of recovering fully. On the other hand, another type of stable and balanced habitat might in future be created in a controlled technological environment in which all resources are so far as possible conserved and recycled for future use. The concept of Space-ship Earth in which all resources would eventually be conserved and controlled might be regarded a limiting state towards which mankind may aspire. The present situation represents a difficult phase of transition in which the rates of wastage and pollution exceed the capacity of the biosphere to repair. Grave risks of irreversible damage to man's environment will persist until these deleterious processes are brought under control.

Unfortunately, ecology is still an infant science and the extremely complex processes involved are at present scarcely understood. All too frequently science policy encourages research toward immediate economic benefits, and neglects the long-term gains to be derived from basic research into the fundamental processes of nature. The solution of the problems of environmental control will undoubtedly involve an enormous research effort, not only in the field of ecology but also in the economic sciences in relation to the question of so-called 'external costs' and disutilities, which might be felt to fall outside the present competence of Pugwash. It may be envisaged that in the long term research will have to be directed to: (a) regulating the incidence of external monetary costs and external non-monetary disutilities arising out of industrial and agricultural practices; and also (b) sharing by all peoples in the regulation of the use of limited fishery and forest resources on a global basis. Additions may be needed to international law comparable to the Test Ban Treaty or to existing international fisheries agreements.

The problem is many-sided, therefore, having social, economic and legal aspects outside the competence of the Working Group. On the purely technical side, however, we wish to emphasize that the following measures should be implemented as a matter of urgency:

(a) Basic ecological research should be strengthened on the basis of international collaboration not only of the institutional kind foreshadowed, for example, in the International Centre of Insect Physiology and Ecology at Nairobi, but also on the level of individual and institutional exchanges.

(b) There is an urgent need for continuous international collaboration in the task of forming independent estimates of scarce resources on a global scale -- including sources of energy, of materials, of fresh water, and fertility levels, both terrestrial and marine.

Appropriate specialized agencies of the UN should also be charged with the duty of estimating and projecting levels of demands for these resources in relation to developing patterns of economic growth in various parts of the world. In addition, they should keep under review and make

recommendations concerning levels of efficiency in utilization of these resources with a view to discouraging wasteful practices, on the one hand, and encouraging economy in recycling waste and fully utilizing by-products, on the other hand. Prevention is better than cure.

In this connection, information and data retrieval systems (technical and scientific economic and social) should, as was recommended in the UN report on 'The Capacity of the UN Development System', be so organized that its component parts would be mutually compatible and that it can be integrated into a future world wide system.

c) The creation of an international commission -- or its equivalent -- to link the ongoing work of the ICSU Special Committee on the problems of the environment with that of the UN agencies in reviewing, not only hazards to human health and genotype, but also hazards to the viability of the habitat, and to recommend minimal standards in relation to biological, chemical and radioactive contamination of the environment. Attention should also be paid to noise pollution, particularly in relation to the proposed development of supersonic transport aircraft.

d) The development of an international network of environmental monitoring stations to report continuously on a global basis on the state of the atmospheric, terrestrial and marine environments, including:

(i) the gaseous and particulate compositions of the air, together with observations of secular changes in the albedo, cloudiness, turbidity and circulation patterns of the earth's atmosphere;

(ii) the chemical and particulate composition of the oceans and inland seas and on ecological changes in these waters, whether these changes be due to surface oil, or chemical or thermal pollution, or to biological waste;

(iii) the pollution of soil and underground waters throughout the world by pesticides, toxic wastes and other products of human activity, and also soil erosion, in particular relating to the fertility of both cultivated and uncultivated land and the potability of freshwater supplies;

and (iv) to provide an early warning system on adverse health and ecological effects.

e) The creation after appropriate research and discussion, of a mechanism through which, once a serious level of environmental damage is established or (better) foreseen actions can be proposed to remove the causes and ameliorate the damage.

In this connection attention is drawn to the possibility of using satellite monitoring devices on the one hand, and on the other hand to use new techniques of assaying micro-organisms as indicators of changes in biological niches.

With reference to levels of man-made radioactivity, it was suggested that Pugwash could set up an internataional and independent group of specialists in relevant disciplines to assess and interpret the physical and biological data on this problem being collated by UNSCEAR and ICRP. This group could also be instrumental in studying the possibility of a reduction to 10% of the planned radioactivity release limits in the nuclear power industry, and should consider the question of power reactor siting and the rate of development of the nuclear power programme in the light of its interpretation of available data.

2. International Scientific Co-operation

The Working Group then turned its attention to the promotion of international co-operation in science and technology.

The number, variety, importance and scope of international cooperative ventures expands continuously. If Pugwash is to make a unique contribution in this field (as it has in the development of the concepts underlying the International Science Foundation and the International Centre of Insect Physiology and Ecology) it seems essential that:

(a) Pugwash should have a small standing group of regular participants interested in international co operation to provide a memory and continuity for Pugwash efforts in this field, and that

(b) the international co-operation group should be linked systematically with the other elements of Pugwash (arms control, international security, and most importantly, development) because international co-operation is an abstract concept that becomes operative only in specific concrete situations.

Future Pugwash Conferences may well wish to avoid consideration of international co-operation in the abstract, in favour of a closer analysis of how Pugwash can facilitate the development of new strategies and mechanisms for co-operation using concrete cases and stimulate fresh initiatives.

As a concrete proposal we suggest that the following step be taken:

An ad hoc international co operation committee of correspondence be formed. Besides the standing members, the group should have at its disposal a number of associated members to provide by correspondence materials concerning individual disciplines. The committee of correspondence should serve as a collecting and collating body, to prepare a comprehensive report for each Pugwash Conference, with a view of recommending positive international collaborative projects on a disciplinary or interdisciplinary basis.

3. The Role of Pugwash in Promoting International Co-operation

For years Pugwash scientists have viewed international cooperation in research and teaching, not only as valuable in itself, but also as a means of improving the relationships

between nations and promoting development . This view has led to a series of proposals to create specific centres or organizatons, some regional and others global. Among these are ICIPE in Nairobi, SIPRI in Stockholm, and the proposed International Science Foundation, whose origins may be traced back to earlier Pugwash proposals.

Reviewing this situation, the Group tried to define the conditions under which new programmes for international scientific co-operation would have the best chances of success in terms of such different criteria as: a) the advancement of the disciplines they serve; b) the educational functions they perform, c) their roles as integrating or divisive factors among the countries or regions they serve; d) any responsibility they might bear toward developing countries. It was agreed that effective co-operation can often best be based on existing universities and research instituters which individually or in groups can promote joint research and training programmes. Success obviously requires a high professional standard in the area chosen, but also the political will to share costs and facilities. Among factors influencing the willingness of governments to invest research resources whether of men or money, in an international organization, will be the benefits accruing to the participating countries, both in terms of scientific or technological results and, in some cases (such as CEPN or ESRO) in terms of industrial contracts.

The Group felt that the creation of new international scientific centres or organizations is not advisable unless a feasible objective can be clearly seen which is sufficiently challenging to attract good scientists, and which would be difficult or impossible to achieve within or between existing universities or research institutions. It was also realized, however that international programmes largely involving routine monitoring of the environment (such as we advocated above) would not be likely to succeed unless it were given such a research content as would attract gifted research workers

4. Population Growth and Human Reproduction

The very rapid increase in population throughout the world involves profound effects on human society, and these will become increasingly serious during the next several decades. It is clear that unless intensive analyses and efforts are greatly augmented in the near future, critical situations will arise in many areas of the world that will affect the health and well-being of thousands of millions of people, not to speak of the social instability and threat to world peace that will result.

There are many facets to the problem which must be attacked simultaneously because of their inter-locking nature. Previous Pugwash meetings have stressed the necessity of giving first priority to the need for increasing food production -- both natural and synthetic. Great differences exist between cultural and national needs and values, and population regulation must at present remain the choice of individuals in a particular cultural setting. Motivations vary widely, and unless there is a clear understanding among peoples and their leaders of choices and consequences with respect to population growth in particular contexts, as well as in relation to the world as a whole, motivation -- the necessary basis of influencing individual and social practices -- will probably not be modified to any great degree. Motivation itself, and the means of changing it, is a poorly understood factor and much more research is required in this field.

Experience to date has shown that economic improvement has an appreciable impact on lowering the rate of population growth, and in many instances provides the single most rapid and effective condition for slowing population increase.

These are complex considerations and the Working Group could only touch briefly upon them. Two technical aspects of the problems, however, were given particular attention. These concerned the need to expand considerably research and development of more adequate contraceptive devices, and research on the biology of human reproduction.

These two sets of problems and their potential solutions vary for different regions and cultures. It is suggested that Pugwash, in consultation with WHO, could usefully promote specific studies to determine firstly which population regulation devices and procedures would be acceptable to particular regions and groups, and secondly to help mount the necessary scientific research and development aimed to meet these needs. Since there is usually a lapse of 10 to 15 years with present practices from the start of research and development to the application of new birth-regulation procedures, and the procedures at present available are markedly inadequate, it is urgent that greatly augmented research efforts, funds and international co-operative effort be undertaken as soon as possible in these and other areas so that the problem of population growth might be dealt with more effectively, hopefully in the near future, but especially towards the latter part of this century, when the problem will inevitably have assumed even more serious proportion.

5. Education for a Changing World

One of the most outstanding characteristics of our times is the rate of change now imposed upon all human socie by the exponentially rising increase of science and technology. EEducation must change with equal rapidity, or it cannot aid our youth to live in such a world and to adjust to such incredible changes.

Science education must include the study of science as a social process, resulting in our altered human circumstances, and must be extended to everyone. For such education neither the natural scientist nor the social scientist can properly function alone. For example, the problems of pollution or other challenges to a healthful environment require both scientific and social analysis and remedy.

The effective collaboration of teams of one natural and one social scientist in the development of teaching materials and courses suggests that the Pugwash Conferences could well initiate teams of natural and social scientists representing different political and social systems or different degrees of economic and industrial development.

The Group noted, however that international programmes which include studies of the sociological or economic aspects of the impact of science and technology on society may be biased by ideological considerations. It was realized that an unbiased and analytical approach to such problems is often difficult and that it is particularly important that studies in these and similar areas remain objective.

In addition, we should at long last, as a tribute to C. F. Powell, hold the four Pugwash science education conferences recommended by him and others at the London Pugwash Conference in 1962, on the following subjects: (1) education and human ecology, (2) the evolution of education, (3) education for society, and (4) education and world development.

Working Group IV

SCIENCE, TECHNOLOGY, AND DEVELOPMENT

1. Preamble

The Group is convinced that the economic and social development of the poor countries is one of the most important problems of our time.

We deplore the decrease in the development* effort of most developed nations, right through the U.N. "Development Decade", and welcome the steps taken by Canada to raise substantially its contribution to development and, in particular, to stimulate and support scientific research and development in areas relevant to the development of the poorer countries. We hope that this example will be followed by other nations. We heard with dismay that, according to available U.N. statistical data, only 2 percent of the total research and development effort in the world is at present devoted to development problems.

While social, cultural, political, and economic considerations are of key importance for development, we believe that natural scientists and technologists can and must make a substantial contribution towards the solution of the problems standing in the way of economic and human progress. We welcome the plan, discussed in section 5 below, to stimulate the thinking and action of scientists all over the world in the area of development by creating an association of "scientists for development" and believe that this effort deserves the full support of the Pugwash Movement. The success of this effort requires that scientists display as much objectivity, dedication and unity of purpose in tackling development problems, as they have done in the furtherance of their own professional interests, both within and across national frontiers. It also requires them to seek collaboration with social scientists, humanists and others in a unified, multidisciplining effort of wide proportions.

2. The Goals and Strategy of Development

The question was raised in the Working Group as to the general definition, aims and strategy of development. The Group recognized

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* Except where it is used in the obvious context of R and D, the word "development" in the Report refers to the development of the poorer countries of the world.

the virtual impossibility of arriving at any generally acceptable definition. It also recognized that in such a task scientists had no special competence by virtue of their training. The Group felt nevertheless, that in thinking about science and technology as a means to further the developmental process, there was need to have a general philosophical framework within which to work. A question raised in this connection, was whether this was not the appropriate time for the developing countries to examine the qualitative and quantitative aspects of their development strategy. Such timeliness, it was felt, arose from two considerations: firstly, the fact that we are now more aware of the fundamentally different social, economic and political predicament from which the poor countries of today are trying to advance, and secondly, the environmental and spiritual crisis apparent in the highly industrialized countries. It was suggested that it would be proper for Pugwash to initiate, in collaboration with concerned social and political scientists, a panel or symposium dealing with the quantitative aims and desirable levels and directions of advance, for both the more and the less developed countries.

While there was partial agreement that development is far more complex than "mere" economic growth, little agreement could be reached in the Group on its precise nature and aims. Three views, it was felt, merited further consideration. A first suggestion was that development was primarily an augmentation of all those resources -- natural, human, mechanical -- which are scarce in a given society and which, therefore, constrain its advance. Attention was focussed on the fact that maximal exploitation of the total resources of a society included satisfaction of "rational", material, and of "value-derived"preferences. A second point of view focussed on "real" political, economic and cultural independence of a society, implying its ability of working with more affluent nations on the basis of mutual respect and understanding. A third suggestion was couched in more ethical terms, and stressed as the primary development goal the acquisition of freedom and justice by all the individuals in the society. The Group was, however, reminded by several participants that in many developing countries the immediate provision of minimum physical needs must have absolute priority. The concern of scientists must be not only with the ultimate goals of development, but, most urgently, with its immediate needs.

3. Contributions Which Science and Technology Can Make to Development

The Group considered at considerable length how scientists could contribute most effectively to development. The Group agreed on the necessity of promoting the scientific and technological capacities of a developing society by improving and spreading education and research. Some members suggested that the resulting development of an infrastructure would by itself serve not only to generate a "microclimate"

conducive to the promotion of science as such, but also to support its application to economic and social needs. Others stressed the danger of creating "outward-looking" scientific communities oriented from the socio-economic goals of the developing country and looking to the scientific communities of the world for topics of their research and recognition of their work.

The creation of scientific and technological infrastructures should be used to link scientific communities of different nations with one another. It should enable decision-makers to call on a body of specialists able to make meaningful technical judgments on task-oriented ventures, such as industrial, agricultural and medical projects.

It was suggested that structures should be developed which would give stimulation and provide recognition for research in development areas, both for indigenous scientists and for scientists from developed countries, devoting several years of their careers to problems of development, at home or in developing countries.

4. The Contribution of Pugwash

In considering how Pugwash could contribute to development, the Group felt that one question to ask is: what is unique about Pugwash? A welter of organizations exists, both national and international, governmental, intergovernmental and private, concerned either with development, with science or technology, or their application to development. The uniqueness of Pugwash consists in a combination of characteristics. It is widely inter-disciplinary (though primarily scientific), broadly international, fiercely individualistic, and, we may say, indelicate. Few private organizations include members from such a broad range of disciplines, and from so many countries, both East and West and North and South. Few official national or international organizations have such tenuous ties to governments, or such a tendency to talk freely even on delicate and sensitive subjects. The Working Group discussed at length a summary of the discussion at the Pugwash Symposium on "Science and Development --What can scientists do about it?", held on September 1-4, 1970 at Stanford, California, outlining the character and purposes of Pugwash involvement in the development area. This was accepted by the Working Group as the basis of plans for future activities.

In the light of the above propositions concerning the unique characteristics of Pugwash the Group felt that Pugwash could attempt:

1. To propose and develop new ideas for international and regional scientific and technical institutions, as exemplified by the International Science Foundation and the International Centre of Insect Physiology and Ecology in Nairobi, both initiated at Pugwash and now

in development or active discussion in broader scientific circles. Among such proposals may be the creation of an international Technical and Scientific Volunteer Corps; establishment of an international Institute of Development Sciences; introduction of development curricula in universities; the creation of clearing organizations for directing the study and research of students from developing countries, in educational institutions in developed countries or in developing countries other than their own, towards preparation for development-oriented education and research work at home.

2. To increase the understanding among scientists and the general public of the problems of development, and enhance the exchange of ideas and experiences among representatives of different cultures and of different economic systems. It was agreed in this connection that much more significant contributions could be made if representatives of China and Cuba could be involved.

3. To stimulate the study from different viewpoints of questions, such as the long-range impact of the present unprecedented increase in life expectancy in most less-developed countries. Other subjects for such study are adverse consequences on development of military expenditures in both the more and the less developed countries; comparative experiences of different countries in urbanization; and problems of labour-intensive technology. The inter-relationships among rapid population growth, employment and under-employment, agricultural evolution, electric power development, trade, transportation, and access to resources, exemplified by the situation in the Ganga-Brahmaputra Basin, and the effects of synthetic primary products on development of countries whose economy depends on the export of corresponding natural products, are possible examples.

4. To foster co-operative research on development problems by scientists and technologists from the more and the less developed countries, particularly the younger ones, as well as co-operation among scientists from different less developed countries to exchange information on their experiences in promoting science and technology and applying them to development.

5. To help develop a climate of opinion among scientists and the general public, both national and international, in support of a higher level of government commitment to:
   a) a large increase in the magnitude of capital and technical assistance from the developed countries to the develping ones; and
   b) the allocation of a part of the R and D resources of the developed countries to work in their own institutions on the problems of development.

6. To help in moulding opinion in both the scientific community and the general population of developing countries against the diversion of scarce material resources to unproductive purposes, in particular, to armaments.

7. To help in the application of new methods of assessment in appraising the social and economic benefits and costs of the use of different

technologies in the developing countries, and of the wide consequences of construction of large projects - for example, dams for electric power generation and water storage.

8. To help develop standards for international scientific behaviour, in which equal co-operation and self-disciplined restraint would replace what has been described as "scientific colonialism". In this spirit, Pugwash could also study and make suggestions concerning fields of science and technology which should be fostered in the developing countries. Environmental sciences - meteorology, oceanography, geolggy, geophysics, geochemistry, hydrology, ecology, forestry and their associated technologies of weather forecasting, fisheries, natural resource development, forest industries, and environmental protection - are examples of such development-related scientific areas.

9. To organize "travelling symposia" on scientific and technical problems related to development which could give stimulus and support to scientific and technical communities in several countries.

10. To promote the revision, among educational institutions, scientific societies and individual senior scientists, in both developed and developing countries, of currently accepted incentives and rewards in favour of research and teaching in developing countries and on topics of importance for development.

11. To evaluate the efforts of the United Nations and its family of specialized agencies and other multilateral institutions, related to the advancement of science, technology and economy in developing nations, and perhaps also in the wider area of assistance to science and technology.

12. To help to develop better understanding between younger and older generations, in recognition that the concern of young people over existing conditions, and their search for better solutions to the problems of poverty and inequality on the national and international scales, is also a concern of the scientific communities, aware of the need to direct the powers given to man by science and technology towards benevolent objectives, particularly the satisfaction of human needs.

13. To help study the possibility of suggesting that governments of developed countries allow university graduates to carry out duties in developing countries in substitution for military service, as is practised by France. In conjunction with this, the panel should study how young men with little experience but much interest in working in developing countries might form a useful "International Science Corps".

5. Future Organization and Activities

At the Ronneby, Nice, and Sochi Conferences, working groups on science and development expressed concern about the lack of continuity, of adequate preparation for discussions, and of follow-up action, in respect of Pugwash's important and useful recommendations.

The Group felt that the problems raised could best be tackled by the setting up of a Study Group on Science and Development within the Pugwash Movement. The task of the Study Group will include preparation of material for discussions at the Annual Conferences, organization of Symposia, and setting up of panels to consider specific problems in greater depth than is feasible in short conferences.

The Group has compiled a list of topics to which the Study Group could turn its early attention. Among ones considered particularly urgent were :

(a) A panel on ways of increasing the viability of natural product industries likely to be threatened by the development of synthetics.

(b) A travelling symposium on the search for new and more suitable contraceptive procedures for specific developing countries.

(c) Collaboration with the group engaged in preparing an appeal to scientists to organize an Association of "Scientists for Development". The Group endorsed in principle the views expressed in the Draft of a Manifesto prepared by this group (attached). It felt, however, that references to a specific institution (ISF) and appeals for contributions to it should be omitted.

The Group was informed of the plans of Working Group III (on International Co-operation) to establish an ad hoc Committee of Correspondence. In view of the common interest of this Group with that of the Study Group on Science and Development, it was recommended that close co-operation be established, possibly in the form of some overlapping membership.

The report of the Symposium on Protein Deficiency, organized by the FGR Pugwash Group*, was received with great interest. The Working Group urges the Continuing Committee to support rapid implementation of the recommendations of this Symposium.

The Working Group avoided in its report duplication of recommendations made by Working Group III, whose scope overlapped in part with its own. However, Group IV wishes to emphasize the special appropriateness of one recommendation made by Working Group III, namely that substantial co-ordination with the UN Stockholm Conference on the Human Environment is desirable since the subject is so closely interwoven with development.

* Pugwash Newsletter, vol. 8 pp 3-17 (July 1970)

WORKING GROUP IV APPENDIX

MANIFESTO - Drafted by Buzzati Traverso
and
Abdus Salam

We live in an age in which the development of countries - human, social and economic - is closely correlated with their strength in science and technology. Indeed, the influence of science and technology on a country's development has become so great that the gap between the rich and the poor countries is actually increasing.

This widening disparity between the wealthy and the impoverished nations has become a matter of the utmost concern, since in the long run, political stability, economic equilibrium and the fulfilment of human aspirations on a global scale cannot be achieved until this gap is substantially reduced. And it should be self-evident that science and its applications must become the chief instrument for achieving a balanced human and economic development of countries of the third world, through the realization of their human potentialities and increased productivity from their available resources.

The dimensions of the problems at hand - 70% of the world's population live in the developing countries, while 86% of the world's intelligentsia and production are to be found in the industrialized countries - represent one of the major challenges of today.

The concern and the contributions of the world scientific community to meet such a challenge have so far been sporadic and limited. At a time when the thinkers of the world are faced with the problems of the misuse of science and its products - which is bringing about a panic-stricken flight from reason - the world scientific community should stand united in reasserting its confidence in the scientific approach to solve the major problems confronting mankind and to concentrate our efforts to help the growth of the countries that have recently become independent.

We summon you, individual scientists and scientific academies and societies, to join us in the establishment of the world-wide movement "Scientists for development" (or "Scientists for human development"), the purpose of which is the mobilization of the world's intellectual-scientific potential for meeting the challenge created by the present world situation.

We think that, united, we could effectively lighten the task ahead of us in several ways:

- by devoting an appreciable part of our thoughts and abilities to the study of the innumerable problems facing the developing countries - and subsequently proposing solutions to those problems;

- by making voluntary contributions to the fund "Scientists for development" to be transferred to the International Science Foundation, so that the scientific community may keep constant track of its operations and, at the same time, offer tangible evidence of its help to fellow research-workers in the developing nations;

- by reasserting at the international and national levels the need for a scientific, i.e. rational and detached, approach in the attempt to solve not only strictly scientific problems but also those at stake - internationally and nationally - in political, social and economic circles.

20th PUGWASH CONFERENCE ON SCIENCE AND WORLD AFFAIRS

Fontana, 9-15 September 1970

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* Observer

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Queen Elizabeth on Her Uppers

Fort Lauderdale, Fla.

The once-proud British liner Queen Elizabeth, beset by money problems, is up for auction.

The elegant Queen, 83,673 tons and once the world's largest passenger liner, has flopped as a tourist attraction and is being auctioned here Wednesday and Thursday.

A group of businessmen in Tampa said it would submit a $4 million bid for the ship. Don Kelly, president of Cargo Gasoline Company and a spokesman for the Tampa group, said the men want to have the ship towed to Tampa and turned into a hotel, convention center and tourist attraction.

MUSEUM

The Queen Elizabeth's older sister, the Queen Mary, is becoming a sea museum and hotel convention center in Long Beach, Calif.

The Queen Elizabeth's problems started in 1968, with the 1031-foot ship's retirement from 28 years of active duty in the Atlantic, including service as a World War II troop ship.

A Philadelphia group offered to buy the liner for use as a showpiece there, but the $7.75 million deal fell through. The Cunard interests then brought it into Port Everglades at Fort Lauderdale as a tourist attraction, with plans to develop it as a resort and convention center.

When this failed to work, Cunard sold the ship for $8.6 million to Utilities Leasing Corporation of Philadelphia and three of the proposed buyers, Stanton and Robert Miller and Charles Williard, all from Philadelphia.

TOURS

The group, calling itself Queen Ltd., took over in July, 1969, and has been conducting guided tours of the vessel.

Queen Ltd., proposed a $13-million public stock sale, but the Securities and Exchange Commission opposed the plan and Queen Ltd. then filed voluntary bankruptcy proceedings in Philadelphia.

N. Phil McConaghey, vice chairman of the Port Everglades authorities port commission, charged that several million dollars still is owed on the vessel's purchase and 146 Florida creditors are owed more than $1 million. More than $600,000 is owed to the local, State and Federal governments in back taxes, he says.

Associated Press

UPI Telephoto

A Minneapolis policeman escorted Sophia Mae Mosby, 49, from her house, one of the buildings damaged by the bomb blast on the sidewalk.

Suspected Killer of 8 Captured

Creston, B.C.

Dale Merle Nelson, wanted in connection with the murder of seven Canadians, was captured without a struggle yesterday about 100 yards from his cabin in this southern British Columbia town.

Later, the body of an eighth victim, Cathy Phipps, 8, was found. Royal Canadian Mounted Police said the girl had been stabbed to death.

Authorities said Nelson was armed with a rifle when captured, but no shots were fired.

VICTIMS

The victims, including five children, all were members of two families. They had been shot and mutilated.

Nelson, 21, was charged with one count of noncapital murder in the slaying of Shirley Wasyk, 30, one of the seven victims.

Under Canadian law, noncapital murder does not carry the death penalty. Capital murder charges, carrying a death penalty, are filed only in connection with the slayings of police or jail guards.

"We found him in a prone position beneath a tree," RCMP Corp. James Barr said. "He seemed quite dazed and put up no resistance."

CABIN

Barr said Nelson apparently had circled back to his cabin during the night and slit a plastic window to get food and water.

"We didn't have members (RCMP) stationed at the shack, but they were in the vicinity and didn't hear or see anything," Barr said. About 20 newsmen and local residents were in the area where Nelson was arrested.

"He didn't make any statement after we got him," Barr said, "but he answered 'yes' to some of our questions." The corporal indicated some questions concerned the location and disposition of the young Phipps girl.

Associated Press

Van Sought In Desert Murders

Las Vegas

Lawmen in 12 Western States were on the alert yesterday for a van that was sighted near a desert gully where a couple was shot to death and the bodies stacked on top of each other.

An all points bulletin issued Saturday night for a brown metalic van with no side windows and painted with flowers and snow flakes.

The victims tentatively were identified as Robert Lemmon, 55, a San Diego automobile dealer, and his wife, Florence, 57. The Lemmons lived in Del Mar, Calif., and disappeared en route to Wyoming on vacation.

The man and woman were shot to death with two separate caliber weapons — a .32 automatic and a .22 caliber weapon. The bodies were found Friday by a highway work crew.

The hands of both victims were bound behind them.

United Press

Schools in Mobile

CORE Gives Up On Integration

Mobile, Ala

The Congress of Racial Equality, an established force in black America's pursuit of equal opportunity, has officially forsaken integration as an effective technique for achieving that goal.

The shift to racial separatism was formally recorded here this weekend at the organization's national convention.

The meeting attracted nearly 600 Negro leaders from all across the country.

The new position was articulated in an endorsement of a public school plan for this city premised on "desegregation without integration," a concept enthusiastically welcomed by disgruntled white parents of Mobile county.

This departure from the orthodox credo of the civil rights movement, in which total integration in public education has been regarded as a critical requisite for the achievement of equal rights, may also serve as an indication of the philosophical distance now separating CORE and various other organizations from the NAACP and other groups and individuals for whom integration remains an important objective.

Roy Innes, the national director of CORE, confirmed that breach in public statements here during the three-day convention.

Innes predicted "an all-out war with the NAACP" as well as with the "activist-bureaucrats" of the United States Department of Health, Education and Welfare and the "old line, die-hard, failure-prone, civil rights aristocracy."

CORE announced plans to participate in litigation of Mobile's eight-year-old school desegregation case, which the U.S. Supreme Court has agreed to hear next month.

If such participation does occur, it will most likely be in the form of a "friend of the court" brief that challenges the efficacy of a desegregation plan for mobile based on the premise of "racial balance."

Such a plan has been approved by the United States Court of Appeals for the Fifth Circuit and is to be implemented here this week by the schools in the Mobile county system, the largest in Alabama.

But, instead of elaborate and intricate zoning charts designed to create a racial ratio in the individual schools comparable to the over-all ratio of Mobile (60 per cent white, 40 per cent black), CORE is proposing two separate districts. One would be predominantly Negro, the other predominantly white, with mutual transfer privileges.

The two districts would be established along natural, existing black-white neighborhood lines and would, in the woods of Innes, "preserve the neighborhood school concept."

Victor Solomon, and associate director of CORE, said "Mobile is an excellent example of an area where you have a sizable, compact black community with schools staffed by blacks but run by whites," he said. "The blacks have no access to the source of control."

But, under the new plan, the Negroes of Mobile, with a separate school district entirely their own, would be able to control it, Solomon believes.

Innes, a 35-year-old former chemical research engineer, said the separatist plan produces true equality because it provides for autonomy and independence within the black community and within the white community.

"People of a particular interest or ethnic background do things their own way, Innes said. "That's the way we do everything in our society."

New York Times

Premature Explosion Kills Bomber

Minneapolis

The bomb a man was carrying down a South Minneapolis street exploded yesterday, blowing him to bits and doing extensive damage to four blocks, police said.

"Now we need to know where he came from, where he was going, and who he was," said Deputy Chief of Detectives Joe Rusinko.

The bomb went off at 3:11 a.m. on the sidewalk in front of a row of deteriorating two-story frame houses fronting a freeway that leads into the heart of downtown Minneapolis.

There was extensive structural damage to three homes, at least two cars were demolished and windows were blown out as far away as across the freeway. There were no reports of serious injuries to residents.

The explosion was the eighth in the Twin Cities area in five weeks and the first to cause a death. Hundreds of threats have been checked out since an August 1 blast rocked a used car sales building.

United Press

Design Contest

Belgrade

An international contest for the design of a building to house the new Belgrade opera and theater was announced yesterday.

Associated Press

New State Chief

How It Looks to A Labor Leader

Union members must not let their distaste for the "terror and absolutism" of leftist radicals distract them from their own concern about social democracy, the California Labor Federation's new leader said in his Labor Day message.

"Although labor is no longer acknowledged as the principal agent of change in American society, it is the one progressive force with capacity to build a new and nobler nation," John F. Henning said.

Henning, 54, is a former state and federal labor relations official and ambassador to New Zealand.

He was appointed secretary-treasurer of the labor federation last spring — making him nominal leader of California's 1.3 million union members. The appointment was confirmed at the federation's conference here last week.

Henning's Labor Day message asserts labor must keep its eye on the problems which underly the current social crisis in the United States.

"It is not by accident that the Nixon Administration has separated the minorities and the young and the liberals from national government," he said. "There is no place in the Washington of Mr. Nixon for Americans who dare to question the values of a corporate culture.

"Labor must lead America back to social order and social democracy. Labor must remind Washington that the bounty of the richest nation of history must be the possession of the people and not simply the preserve and property of the conglomerates," Henning said.

DECENT

"Labor teachings must be honored if the nation is to enjoy liberal priorities, if the nation is to know full employment, racial amity, academic freedom, adequate housing, decent health and the social services of a contemporary state.

"There remains the matter of tactics," Henning said. "Labor opposition to terror and absolutism of the left must never be taken for approval of a materialistic, grasping system."

Henning added that "labor must never be the apologist for the reactionary powers of our national life. We are committed to the enobling and not the exploitation of man."

SUPPORT

The federation's delegates last week voiced support of a number of social, environmental and economic proposals. They include:

- A ban on the use of hard pesticides.
- "Careful consideration" of supersonic transport development until studies prove conclusively it will not irrevocably pollute the upper levels of the atmosphere.
- Reassessment of ecological damage threatened by the State water plan.
- Strong government action to protect consumers in both retail and loan transactions and against privately owned utility companies.
- Increased federal aid for education.
- Elimination of the federal capital gains and mineral depletion allowance tax loopholes.
- Repeal of the so-called right-to-work section (14b) of the Taft Hartley Act.
- A national health insurance program covering all Americans.

Panthers Day for Workshops

Philadelphia

The Black Panthers and their radical sympathizers, assembled here to rewrite the American Constitution, settled down yesterday to the task of debating how their brave new world should look.

Earnest young men and women collected in 15 "workshops" or seminars throughout the city to discuss such questions as "self determination for national minorities," "sexual self-determination" and "revolutionary artists."

As a result of this activity, sponsored by the Panthers and styled "Revolutionary People's Constitutional Convention," Philadelphia is enjoying one of its quietest weekends in years. In the Black Belt 22nd precinct in North Philadelphia, site of the two principal convention centers, only one arrest was made Saturlay night. Police said it was the quietest Saturday there in their memory.

The Panthers are exercising a very close control over their followers with "security guards" watching everyone who comes in and out. The police, still mourning the death of one of their members and the wounding of six others in three incidents the previous weekend, are acting with a maximum of professional restraint and a minimum of irritating visability.

Times-Post Service

Two Bodies Recovered From the Bridge

Two unidentified bodies — one that of a man believed to have jumped from the Golden Gate Bridge — were found in the Bay yesterday.

Authorities said a partially-clothed body was spotted about 300 yards west of the bridge after an unidientified caller reported seeing a man jump from the east side at midspan.

A second male body was recovered fully clothed near the Ferry building last evening.

Money for Schools

Jerusalem

The Israeli military government announced yesterday it had allocated $715,000 for construction and expansion of schools. *Associated Press*

Inflation, Not War, Is 'Gut Issue,' Meany Says

Washington

George Meany, president of the AFL-CIO, said yesterday he believes inflation — and not labor's dislike for anti-war demonstrations — will be the prime issue for union workers in this fall's elections.

In a television interview, he also predicted more strikes and accused the Nixon Administration of causing much of labor's problems through ill-advised economic programs.

"We've got the cost of living going up . . . and at the same time, the real spending, the earning power of the blue-collar workers is going down," he said. "This, I think, will be the gut issue.

"It's always been the real issue — the issue that hits the pocketbook."

On a different TV program, Secretary of Labor James D. Hodgson agreed that the economy will play a role in the coming elections but disagreed with Meany's assessment on the cause of labor's problems.

Hodgson defended the policies of the Administration and predicted the nation is only a few months away from a "sizable improvement in the unemployment rate." *Associated Press*

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Public Fears, Political Pressure

Birth Control Impasse

By David Perlman
Science Correspondent

The quest for new methods of birth control is a desperately slow affair, its progress delayed by obstacles born out of public fears, political pressures, financial shortages and the scientific obstinacy of the problem itself.

Because of these barriers, any major new birth control achievements will almost certainly be years if not decades in coming, an eminent chemist predicts.

And if the achievements come at all, he fears, they may not arrive before the world succumbs to a full-blown crisis of famine and war, born out of inexorable population pressures.

MAJOR

The search for more widely useful birth control techniques could in fact yield results more swiftly, but only if the major industrial countries — most notably the United States — undertake a research revolution on the way, the chemist believes.

That revolution, he feels, requires vital government decisions designed to encourage research by changing patent policies, offering financial incentives, and above all revising the often-illogical regulations that now circumscribe every stage in animal and human tests of new contraceptive drugs.

Proponent of these measures is Dr. Carl Djerassi, professor of chemistry at Stanford University and one of the pioneers in the hormone research that led to today's birth control pills.

BIGGEST

A member of the National Academy of Sciences, Djerassi also has long experience in the pharmaceutical industry. He is a director of Syntex Corporation, one of the biggest firms in the world of The Pill, and is president of Syntex Research in Palo Alto.

Djerassi has just published what is probably the first major logistical study of the problems inherent in improving man's relatively new chemical approaches to birth control. His study appears in the current issue of the journal Science.

Like virtually all scientists and demographers, Djerassi is aware that the world's population is increasing precipitously and dangerously.

PLANET

In a few countries birth rates may be transiently dropping — as they have in the United States — but with universally improved health measures, the planet must soon reach a population far greater than the world's exploitable resources can sustain.

In his analysis Djerassi offers no support for anyone who thinks there is a realistic prospect of involuntary "population control" through such Orwellian measures as introducing contraceptive chemicals in reservoirs or food supplies.

The obstacles are scientifically insuperable and the concept absurd, Djerassi contends.

For example, any such substance would have to be active in both males and females; it would have to be uniquely selective for humans, and thus could never be tested first in animals; it would have to be chemically stable in water pipes, in changing light, in heat or cold.

Since half the world draws its water from wells no central authority could possibly control them all.

Nor is there any hint on any horizon that a chemical to sterilize populations or a chemical to reverse such sterility is anywhere at hand, Djerassi insists.

GRAVE

George Orwell, according to Djerassi, "can rest easy in his grave, because birth control by governmentally imposed methods . . . is totally unfeasible by 1984."

Can any voluntary methods for chemical birth-control — safer, cheaper and simpler than today's — be made available before the doomsday year of 1984? Most probably not, unless things change, Djerassi contends.

In his study in Science, Djerassi notes how relatively meager the support has been so far for birth control research.

American and European drug firms probably spent no more than $100 million in the field from 1965 through 1969, he estimates.

SPEND

The U.S. government has only begun to spend federal funds — less than $20 million this year. Private foundations like Ford and the Population Council have earmarked up to $7 million a year ago.

These sums are far short of what's needed for major new achievements, Djerassi insists.

A promising birth control possibility, for example, could be a "once-a-month" pill for women that would prevent fertilization or — if fertilization had already occurred—induce a safe and prompt abortion.

Research toward this kind of drug would be prodigious, Djerassi notes. Given today's testing requirements and the cost of the chemical quest, it would take at least $18 million to develop that one drug — and the cost might well be double that, Djerassi calculates.

MALE

Another approach to better birth control might be a male anti-fertility chemical — better, that is, if men could be induced to be reliable. But to achieve such a drug, Djerassi estimates, would cost at least $6 million in research and testing — perhaps $12 million.

Djerassi's unique and systematic analysis of the problems shows that the time scale from the start of research to final approval for marketing of such drugs is also appalling.

A major new female agent, such as a "once-a-month" pill, would take more than 17 years to develop, from the start of research to ultimate marketing, he estimates. A male chemical could take up to 20 years before it wound its way through the maze of required animal and human tests.

FEARS

One of the toughest problems, in Djerassi's view, is that the public's growing fears about the impact of chemicals on the human body has led to unrealistic demands that any new drug be virtually guaranteed as absolutely safe before it can be marketed.

There is no such thing as a totally safe drug, Djerassi contends, any more than there is a totally safe airplane.

(As he argues privately, people clamor against any risk in the pills they use, yet they seem to accept without qualm the major risks of the cigarettes they smoke, the alcohol they drink, and the deadly cars they drive.)

URGENT

To shorten the unacceptable time span of 15 or 20 years from birth control laboratory to birth control pill, Djerassi offers a set of urgent recommendations.

The tortuous process of securing Food & Drug Administration approval of new drugs, Djerassi feels, could be greatly shortened — and obstructive "hypercaution" minimized — if drugs could be "conditionally approved" following meticulous and closely-supervised early tests.

Federal monitors could then help administer further clinical tests on a wide scale, while the drug was being marketed. And drug company profits could be earmarked by government rule to finance this testing.

HARM

The FDA, Djerassi believes, should play a strong role in protecting consumers against harm and fraud, but it should never be asked to make impossible guarantees that a drug is both wholly effective and wholly safe.

With research costs rising astronomically, Djerassi contends, government help will be needed if drug companies are to continue looking for new birth control chemicals.

The help might take the form of longer-lasting patents on successful drugs, or partial government financing of clinical research, or federal underwriting of long-term toxicity studies.

CREATE

The government help could be repayed through royalty payments by companies that create successful drugs, Djerassi says.

At the moment the outlook is dim enough, Djerassi says: new birth control methods are unlikely before the 1980s at the earliest, and only then if major innovations are permitted in research and testing.

Without those changes, Djerassi says, "birth control in 1984 will not differ significantly from that of today."

The High Toll Of Accidents

Chicago

Accidents are the leading cause of death for persons between the ages of 1 and 37 in the United States and the fourth leading cause of death for all U.S. age groups, the National Safety Council said yesterday.

Accidents in 1969 caused 115,000 deaths and 10.8 million disabling injuries in this country, the council said in its annual book "Accident Facts — 1970."

Of the 1969 death toll, motor vehicle accidents killed 56,400 persons, 14,200 died as a result of accidents at work, 27,000 were killed in home accidents and the rest died in accidents involving water, air and railroad mishaps, firearms, fires and other accidents in public places.

The council figures showed 475,000 persons in the United States were killed in motor vehicle accidents during the decade of the 60s when 280,000 died in accidents at home, 140,000 deaths occurred from accidents at work and 190,000 persons were killed in accidents in public places. The total: 1.05 million. *United Press*

2 Raging Brush Fires

San Bernardino

Two major brush fires covering 1000 acres were burning out of control yesterday in Southern California with containment "nowhere in sight."

A 700-acre brush fire was burning in the mountains two miles north of the city of San Bernardino and a 300-acre fire was out of control at the west end of Riverside county, south of Lake Elsinore and extending into the Cleveland National Forest.

The Elsinore fire broke out shortly after noon and was being battled by 425 men, seven air tankers, nine bulldozers, 24 fire trucks and a helicopter.

Firefighters said it had burned nearly to the top of Elsinore Peak in steep, rocky terrain, with no inhabited areas threatened.

The other fire broke out shortly before 9 a.m. in tinder-dry brush in the San Bernardino mountains, forcing evacuation of about 200 persons from the Upper Waterman Canyon area.

California 18, the highway between here and Crestline, was closed. The fire was 2½ miles from the mountain village, a fire spokesman said. Using 57 trucks, two bulldozers, six aircraft and two helicopters against the flames.

Two minor injuries were reported to firefighters.

United Press

Match-Making Flops in Hungary

Budapest

Communist Hugary's first marriage-matching agency chalked up only five marriages in its first 12 months.

Its directors blamed the low success rate yesterday on the fact that unwed and marriageable women in the city outnumber men in that category by 4 to 1.

More Cholera

Jerusalem

Thirteen cases of cholera were reported in the Jerusalem area over the weekend, bringing the total number in Israel and the occupied territories to 59, the Health Ministry said yesterday.

Associated Press

Serendipity for Redevelop Chief

By Bill Workman

M. Justin Herman, doughty director of the San Francisco Redevelopment Agency, found it hard to contain his excitement.

"I consider this the single most important event on our agenda for 1970," said Herman, in a voice almost pleading for his listener to grasp the significance of what had taken place only moments before in Federal district court here.

Agency lawyers had just filed a petition for a lifting of the injunction which has stalled the $385 million Yerba Buena Center renewal project on Judge Stanley A. Weigel's insistence that insufficient relocation housing is available for residents to be displaced by the project.

KEY

It wasn't the simple act of filing court papers, however, that had Herman riding on a high emotional plane last Wednesday, but a key federal document among them.

The document represented the United States Department of Housing and Urban Development's unconditional approval of the development Agency's relocation housing plan for residents of the South of Market renewal project.

It constituted, in effect, recertification by HUD Secretary R. George Romney of the agency plan — and maintained that San Francisco has more than enough housing available for displaced Yerba Buena residents and at rents they can reasonably afford.

SAFE

Judge Weigel has previously rejected similar HUD certifications on grounds of inadequate data to assure that Federal law was being followed in providing renewal-uprooted persons with "decent, safe and sanitary" replacement housing.

The latest HUD approval, however, was touted as the most exhaustive, detailed analysis of the San Francisco relocation housing market ever conducted by the federal agency in connection with the Yerba Buena project.

Among HUD's findings:

M. JUSTIN HERMAN
A key document

- Projections of existing and planned housing units to be built within the present 19-month renewal timetable for relocation indicate there would be enough housing not only for those displaced by the Yerba Buena Center project, but also by Western Addition redevelopment.

- The Housing Authority has given first priority for public housing for single persons to Yerba Buena project residents. By February, 1972, some 2000 of these low-rent units are expected to be available around the city.

Even if all 1325 single persons now waiting relocation were to take advantage of their priority status, HUD noted, there would still be a surplus of such units.

- A one-day survey last May of 69 acceptable low-rent downtown hotels found 417 permanent or monthly accommodations vacant on that date.

BITTER

The HUD survey also agreed with the Redevelopment Agency's long-standing argument in the bitter legal dispute over the Yerba Buena project that suitable relocation housing anywhere in the city should be acceptable to displaced project residents.

Federal renewal law requires that persons dislodged by renewal bulldozers must not be rehoused at an inconvenient distance from their jobs.

However, HUD said in effect, that because of San Francisco's relatively small geographic size and its "excellent" public transportation system, the agency's all-over-the-city plan met the law's requirements.

ACTION

Judge Weigel, who on the strength of his tough stance in the Yerba Buena suit is rapidly gaining a national reputation as a social action jurist, isn't likely to view the HUD recertification in the same way as does Justin Herman.

Weigel already has adopted a special mediator's report of former governor Edmund G. Brown calling for the Federal and city agencies to agree to build 2000 units of low-income housing in the six-block project area before the injunction would be lifted.

Throughout the 10-month old court hassel, the federal judge has consistently upheld the position of the Neighborhood Legal Assistance Foundation — representing South of Market tenants — that the agency's plan is inadequate.

CONTEMPT

And he's also hinted from the bench that he may find agency officials in contempt of court for violations of his order prohibiting involuntary relocation of project residents.

However, agency officials are obviously hoping that other factors, more political than legal in implication, will count for something in the court's consideration of the bid to have the injunction dissolved.

One developer of the proposed convention-hotel-office-sports arena complex already has pulled out, and another has halted architectural plans.

The building trades unions are starting to grumble about the possible loss of thousands of construction jobs if the project goes down the drain.

And recent fires, one of which claimed one life, in vacant Yerba Buena project buildings barred from demolition by the court injunction, have pointed up hazards growing out of the drawn-out court fight.

Los Angeles Times
202 WEST FIRST STREET
LOS ANGELES 53, CALIFORNIA

Dr. Gertrude Weiss Szilard 1 Sept, 1970

Dear Trudy:

I hope that the conference thus far is proving to be fruitful. The reason for the note is that since we spoke, a good friend from Israel has arrived and wants to see us for dinner on Saturday evening. So, we shall not be going to the Hollywood Bowl. I, indeed, am sorry, but we also looked forward to going.

The invitation to spend Saturday evening at our house, still stands. We shall not be home, away at the dinner meeting. If you still want me to pick you up at the airport and bring you to the house, or other place, let me know.

If you decide not to come here, then I certainly shall be calling you when I come down to La Jolla in the near future. So, if you still would like to spend Sat. nite at our home, you are welcome, and we hope to hear from you. If you decide otherwise, you need not call us. Stay well and have a good meeting.

Warm regards,

Irving

Irving S. Bengelsdorf

Sec 4

Development not all that good
Also threat to peace (Hansen)
Responsibility of developed
countries of evaluating
and teach that not to do.
Price we pay for development
U.S. one of highest developed
is in crisis - cited by McNamara

Skip

Drugs
overpriced
of type.

Urban
Pollution
Transportation
Health care system
Hosp. cost $100 day
Uneven distrib.
Medicine great advance
practice
Network of large
Med. Centers &
satellite smaller
local clinics + hospitals
& transfer back + forth
of pts + doctors
positive through improved
communications

Eg. of Undeveloped
Areas in this
country

Sept 2

~~? Get appt. for devel. comm. i.e. ?Hansen, Varvarsky~~

~~? Suggestion for ... ps.~~

~~Weiss — Am. Univ.~~

~~Sjetsen — this is the ...~~ → analysis
another reason

~~this Rept.~~ San Neko
Jackson Rpt, Pearson Rpt.

~~cars — ? Hansen ? Sjetsen~~, Hoppe
~~Hoppe — OECD description ...~~
~~Video — ... — satellite Sjetsen~~

Sept 3

UN Ind. Devel. Organ. —
Vienna
Asst. Dir. Research
Gen. D. Bernard

No cars / inhab
No cars produce.

~~Brilian – Beard – Automatic?~~

Hairspray

~~Razor.~~

~~Foto Camera~~

~~Sept 1~~ (1)

Brazil
Rio São Paulo
R.G. Sul.
Arg – Buenos Aires

~~Buzzati – cor~~

~~? Haraty – Puffer~~

~~? Varenne – ask Buzzati~~

~~Pepsid – Philips flashes~~

~~Coleman – Sc.A. – 'Samples~~

~~Xerox – cor from Vis Lemaye, Coffeehouse~~

~~Foto shaving phosphorescent – ? Hadden~~

~~Bac'polupo – globe~~ 

~~Adams – Geof, or Afgan~~

Lehman. – cor

~~Sept 2~~

Diczfalusy – WHO, Family planning
~~? Klein~~
Travelling Seminars
(Karolinska Institute)
Inventory of Research
needs + Resources
Treas: clinic institute

~~Oldham – Psc. Vahoota~~
~~Sussex~~

~~Pearson Report~~

Sept 3

Re Dizzpolicy - Xerox more CV

Porzgeli - CV

Xerox

? Where was D. trained

Reference to Torin's + Djerassi's
? Health component article

Car → Djerassi

Ask Ruth re Kreiger.
Toto
Tom's background

Get things back from Engel

Obollman

Olga Esther Simpson
+ take Jones list

Dizzpolicy -
Nepal

Development not a good thing [always]
Urbanization
Erosion a 20
Overprod. of physicians
Dropout from schools + College
Drug problem
Pharm. Thalidomide
Cyclamate
Iatrogenic disease

hosp.
100 a
day

(2)

Price we pay for development evaluation

Nutrition

Carcinogens

So called fluoro area

Health Care System

knowledge — how apply

diphtheria and treat in Texas

drug explosion

2 steps

new knowledge

appl what we alr. know

Blackett: Science
Feb 24, 1967

~~July Prog. Newsletter: Ghurkas[illegible]~~
~~Extra Copy?~~

Science from Rehman.

---

① Buzzati – Nepal

Agricultural Revolution
(Reville)

---

② Buzzati : Commerce, culture
: Rouzak?

---

③ Date for Buzzati + Dyczfalusy
Not in Paris: Sept 23 – 28
Some weekends
In Paris Sept 7 – 22

Geneva Sep 13 – 18
Stockholm " 18 – 27
Not in " Sept 27 – Oct 27

Give "car" to Peter

References Jackson Rpt, Pearson Rpt.
Djerassi + Ooltiainko Science

Diczfalusy – Reres

Ask Ruth re Veregu
Toto
Hutrecht

Sept 4

? Varenna date

Reference – Aspen Conference

Bookstore: Happiness

Bulian
Nosou
Felice
Hainegray
Jackson – Happiness

1. green blue cotton drape
2. " " flare cotton
4. 3 pc pink wool
wh slacks + green blouse
3. dirndl blau

Not for release before Sept 15

E. RABINOWITCH

SPEECH FOR LAKE GENEVA CONFERENCE

(1)

Pugwash is thirteen years old. Since Powell's death, there are only two people left -- our General Secretary and myself -- who have stayed with the movement uninterruptedly throughout its history.

Bertrand Russell, the prime inspirer of Pugwash, is dead, so is Leo Szilard, its pioneer gadfly, and Alexander Topchiev, the first Russian to bring it his wholehearted support. Gone are our friends Enzio Boeri of Ferrara and Morton Grodzins of Chicago, Leopold Infeld of Warsaw and Victor Kargin of Moscow., Max Born and Gerd Burckhardt. We remember them all with affection.

A new generation has arisen; it must take over Pugwash. They will do so only if the movement seems to them worth their effort. Is it?

When the participants of the first Pugwash conference came together in a remote corner of Nova Scotia in July 1957, they were pioneers -- the first to bridge the gulf between the intellectual communities of Eastern Europe, dedicated to a disciplined and centrally planned way of life, and those of the Western societies, dedicated to individual freedom in political and economic life.

At Pugwash, scientists from both halves of the divided European world found much that united them. It was not only preoccupation with the facts and laws of nature -- these ties had never been fully severed, and were eloquently reaffirmed two years earlier, at the first "Atoms for Peace" Congress in Geneva. Their common concern was, above all, with the dangers and promises of the onrushing scientific revolution, with challenges this revolution presented to all peoples: the threat of a breakdown of civilization, perhaps even extermination of mankind in a full-scale nuclear war; and the promise of an unprecedented increase in production, offering, for the first time, reasonable hope for economically satisfactory life to all.

Thirteen years later, Pugwash survives on this early established community of concerns. But in the meantime, the world has changed. The two alienated halves of industrial civilization, the "East" and the "West," have advanced, however grudgingly, towards mutual accommodation. The communication channel opened by the early Pugwash conferences, is not as unique now as it had been then. Many others are available, including a direct line from the White House to the Kremlin. On both sides of the dividing line that runs from the Arctic to the Adriatic, nations have accepted the fact of a nuclear deadlock. Even Germany is moving towards acquiescence to this division, although the dividing line runs across its ethnic body. Leaders of East and West now understand that any attempt to break the deadlock by military force will engulf all of them, and all their peoples.

The danger that led to the convocation of the first Pugwash conference, was the danger of nations stumbling into a nuclear war because of inadequate understanding of its consequences and unthinking extension of traditional concepts of weapons superiority and military victory into the nuclear age. This danger has abated, even if it is by no means permanently eliminated.

Among nuclear nations, only China still professes to believe that another major war is inevitable, that it will lead to world-wide triumph of communism in its Chinese interpretation; and that in the wake of this victory, mankind will enter an era of unprecedented progress. Whether the Chinese leaders really believe in this wishful dream, or merely find it profitable to pretend that they do so, we don't know.

One important task Pugwash can hope and strive toachieve, is pioneering in the resumption of communications with scientists from mainland China (who have withdrawn from Pugwash Conferences in 1960). When the Chinese leadership will permit its scientists to return to Pugwash, this will mean that the facts

of the nuclear deadlock, and the futility of hopes to resolve it by force, are being realized there, too.

But even if the Chinese join the rest of the world in understanding that major war has ceased to be a rational means for attaining political aims, this will not be enough. Something more than universal paralysis of fear is needed to make mankind truly viable in the age of the scientific revolution.

Passive, grudging "coexistence," in continued mutual isolation, can be only a first step away from the old pattern of international behaviour, made obsolete by science and technology. A valid, constructive alternative to power politics must be evolved. This alternative cannot lie in mere "coexistence," but only in active collaboration of all nations, in cooperative utilization of the vast powers given to mankind by science for the common benefit of all.

(2)

One can argue that continuation of the Pugwash enterprise is justified even if its participants do no more than stay a few steps ahead of their societies in exploring the immediate possibilities and long-range problems of arms control and disarmament; if, coming home from their conferences, they urge their governments to follow policies stretching out and broadening the precarious armistice now prevailing between the two camps -- even while these camps remain committed to the pursuit of conflicting power interests and spread of mutually inimical ideologies. In fact, this <u>is</u> a worthwhile task. Even a most tenuous armistice is better than open war -- particularly when war means wholesale destruction! As the Russian proverb says -- "A bad peace is better than a good quarrel."

But this aim will hardly kindle the imagination of the youngest generations, whether in the West or in the East. These generations look for creative action on behalf of a positive ideal, not for patient balancing on the edge of a precipice.

It seems to me that Pugwash should aim at something more imaginative than mere day-by-day maintenance of a tenuous armistice. Scientists must be aware, more deeply and more clearly than their societies at large, of the radical change the scientific revolution has brought into human affairs. They know that a new chapter of history must be opened if history is not to end. Pugwash must work not for armistice, but for peace.

The scientific revolution, while providing organized societies with unbelievably powerful tools of mutual destruction, also endows them with unprecedented capacity for creation of new wealth. To make full use of these powers, nations must make a choice -- giving priority to common constructive purposes over continued pursuit of divisive, self-centered interests. They are as yet far from making this choice -- even if facts of human existence in the age of science urge it on them.

Not so long ago, realistic politicians could argue that strong military shield was a necessary price to pay for healthy economic progress. The economic growth of Bismarck's Germany after the Franco-Prussian War was a good example. But since then, the cost of military preparedness has gone up by many orders of magnitude, while the possibility of shielding a nation from destruction in case of war has gone down and down, until the very word "security" has become a mockery.

The rise of the two losers in the Second World War, Germany and Japan, has shown that prosperity does not require domination over extensive territories or possession of natural resources, and military power to secure it, but intelligent application of science and technology.

These realities of the international situation are making continuation of traditional power policies between nations not only intolerably expensive and incredibly dangerous, but also barren of real success. As scientists, we are aware of this situation -- and must use all our influence to change it.

(3)

The scientific and technological revolution has put man's status in a new light. Man may be the apex of biological evolution on Earth; but he is not a unique, central phenomenon in the universe. The landing on the moon, the fly-bys near Venus and Mars, suggest that Earth may be the only planet carrying life in the solar system; but this system is only an infinitesimally small fraction of the universe. Millions of life-carrying planets probably exist in various galaxies. Life on Earth, and human life in particular, is but a small, passing phenomena. It will end in some future -- distant on our human scale, but minute on the scale of cosmic phenomena. But we can destroy it millions of years before its natural end -- and no ripple will disturb the universe. Since the scientific revolution, life on Earth is given now into man's keeping. It is our choice to protect this little flame or to blow it out.

The evolutionary concepts, which dominate modern biology make us see the social organization of mankind, with its division into more or less closed, self-centered societies as a product of selection. History has evolved this type of social organization as most successful, in the case of man as well as in those of bees and ants.

But evolutionary selection is determined by the habitat of a species. One aspect of man's habitat on Earth, (in common with that of many other animals), has been scarcity of natural resources on which he depended for

survival -- be it forests for the hunter, fishing grounds for the fisher, fertile lands for the farmer, or metal ores and fossil fuels for the machine builder and engineer. There had been a few exceptions -- tribes living in isolation, on some lush islands in the Pacific, which developed rather loose, peaceful societies. (Some of our youth are foolishly dreaming of recreating such civilizations on our overcrowded continents.) But the predominant part of mankind has always lived in a habitat of scarcity, of competition for limited natural resources. This has led to the formation of organized, militant societies, able to count on fealty of its members in gaining and holding the tribal territory, and raiding or appropriating the resources of other societies. This was the basis for agricultural and industrial progress in all past history. Organized military power, and intellectual capacity, placed into the service of this power -- as in the development of the atom bomb during the Second World War -- have been the twin mainstays of national success.

Now the human habitat is changed by the scientific revolution. This change has two main aspects; in the first place, continuation of armed competition between self-centered societies has become deadly dangerous and self-defeating; and in the second place, wealth available to man has ceased to be limited. "Synthetic," man-made wealth is increasingly supplementing natural wealth. This new type of wealth is not an object of competition, of a zero-sum game; it is something that all can utilize at the same time -- a game in which everybody can win. These changes alter radically the international situation. Instead of prime consideration of every nation being advancement of its separate, competitive interests, the prime rational aims of all of them is becoming common -- common security and common prosperity -- aims that can be best approached by a cooperative effort.

Since the traditional forms of social existence of men -- in contrast to those of bees and ants -- are not instinctive, but learned, there is reasonable hope that rational adaptation to the new habitat can be achieved in the -- relatively short -- available time. Hope -- but no certainty; and the aim of Pugwash, and of scientists in general, must be to strengthen this hope and speed up the adaptation.

Of course, there will always remain important differences between societies -- differences in immediate interests, and differences in beliefs what is important for human well-being, and what are the best methods to secure it. A change is occurring, however, in the order of importance of common and divisive considerations. In all past history, divisive interests of closed societies had been of prime importance, while common interests had been superimposed on them as a kind of embellishment, a luxury, a superstructure. With mankind's adaptation to its new technological habitat, the reverse relation is becoming valid.

All this sounds like wishful dreaming -- and will be undoubtedly dismissed as such even by some Pugwash scientists. And yet, it represents the only realistically tenable evaluation of man's existence on Earth in the age of science.

Scientists are accustomed to serve common interests of mankind, whatever their national or ideological commitment may be. Science is truly the first common enterprise of mankind. It is proper for scientists to accept responsibility for weaving this thread into the fabric of human society!

What was once valid for a single society -- united we stand, divided we fall! -- is becoming true of mankind as a whole.

This is why I believe that in addition to continuing work on maintaining and improving the armistice between East and West, Pugwash has a more creative role to play -- that of exploring and implementing constructive cooperation between all parts of mankind.

(4)

There are now two areas in which constructive cooperation between scientists of all countries is imperative if mankind is to surmount the challenges of the scientific revolution. The first challenge is narrowing the gap between the rich and the poor nations -- roughly one-third of the world population in the van of the technological progress, and about two-thirds living in a pre-scientific habitat. This situation is inherently unstable, particularly since a population explosion has been unleashed by the introduction of elementary hygiene into childbirth and child rearing.

The second immediate challenge is preservation and restoration of healthy habitat, endangered by unthinking pursuit of industrialization. This task, too, is made much more difficult by the rapid population growth.

A proper function of Pugwash is to mobilize the scientific communities, East and West, North and South, for exploration of these challenges and cooperative efforts to deal with them.

Perhaps we can do better in the field of development than in that of arms control. As Lord Snow pointed out, the inherent, rational optimism of the scientific profession can find better expression in dealing with things which should be done, than with things that should be left undone!

Of the two areas, "development" and "environment," the second one has recently caught the interest and imagination of wide circles, particularly in America. Youth has picked it up, with the enthusiasm for immediate action

of which it is capable. Development, on the other hand, after a short burst of interest, has become almost forgotten. Yet, I am convinced (together with many thoughtful minds of our time) that development of the undeveloped countries is the key to the future of mankind. In the age of instant communication, humanity cannot survive with a relatively small minority getting richer and richer, while a steadily increasing majority -- 2/3 now, 3/4 by the turn of the century - subsists in hopeless poverty. Yet, this is the direction in which mankind seems to move, despite some islands of successful development emerging above the sea of poverty.

Nobody knows for certain what will happen if the fight for development is lost, or the two billion people living in the "developing" countries ever dispair of success. Gunnar Myrdal and Barbara Ward, among others, have conjured visions of spreading unrest, rebellion, disease, and anarchy, from which the technologically advanced countries of the Northern hemisphere will be unable to isolate themselves. Mao Tse Tung and Lin Piao have prophesized a revolutionary war of the "world village" of the colored races -- led by China -- against the "world city," of the ultimate man.

Whatever vision will prove prophetic -- that of a mounting chaos, anarchy and despair, or that of a world-wide revolution of "poor" against the "rich" nations -- either one will be evidence of failure of our scientific and technological civilization. This danger is real -- more so than the danger of technological civilization in the advanced countries sinking in the morass of pollution, although at the present time the latter danger is much more acutely troubling the western mind.

Scientists everywhere must see the possible failure of technological civilization with horror. Science has created the concept of progress. It has replaced the ideal of a past golden age with belief in a golden age of

the future. It has extended biological evolution, which led from primitive amphibians to highly complex organisms, with Homo sapiens at its apex, into economic and technological evolution of society towards ever-growing and ever-spreading knowledge, power and prosperity.

Science is the child of the human brain. Rational response to the threat of chaos, rising from the resistance to rational change of traditional attitudes of individuals, and traditional institutions of society, is the scientists case par excellence.

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It is not given to many to remain hale and active in the pursuit of their beliefs as long as our founding father, Bertrand Russell, and our early sponsor, Mr. Cyrus Eaton. When the Pugwash enterprise was started, in 1957, most participants thought of it as a short-time, emergency operation. We have learned better. Adaptation of mankind to its new scientific habitat will require efforts of not one, but many generations.

In approaching the end of my involvement in Pugwash, I know that I will, at best, see some light at the end of the tunnel. But I do hope to see an increasingly vigorous involvement of scientists in the Pugwash movement, and of the Pugwash movement in an effort to apply the economic and intellectual forces of all nations to the advancement of presently underprivileged groups, nations and continents, thus creating a viable foundation for man's future. In this constructive effort, Pugwash cannot fail to find support in the younger generations of scientists.

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VOSS

SCIENCE AND DEVELOPMENT IN INDIA -- SOME REFLECTIONS[†]

Yash Pal*

Tata Institute of Fundamental Research, Bombay 5, India

Just to put the picture together. We are talking about a country about half the size of the United States and with a population of over 550 million. It is a country where twenty years ago only 16% of the population could read and write and where the present level of literacy is only about twice that figure. A nearly constant birth rate and a falling death rate, due to improved health measures and eradication of large scale epidemics, have resulted in a rate of population growth of over 2.5%. Thus there are 12 million more Indians every year to feed, clothe and send to school. The national income of the country was 95 billion rupees in 1950 and has increased to about 330 billion in 1970; however, the prices and the population have also gone up, so that over the last 10 years the real per capita income has increased only by $\sim$ 6%. The absolute per capita income at current prices is $\sim$ Rs 600 or about $90 per year. 75% of the population is devoted to agriculture and produces about half the national wealth.

In juxtaposition with this one should also look at another picture. The country has skills and expertise comparable to the best in the world. Its expert manpower includes those who have built and can build large dams and power plants, nuclear reactors and turbines, accelerators and aeroplanes,

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[†] Talk at the Pugwash Symposium on Science and Development (Stanford, Sept. 1-4, 1970)

* Currently visiting professor of physics at the University of Maryland, College Park, Md.

motor cars and railways, steel mills and oil refineries, microwave links and radio-telescopes, radio-sets and computers-practically all the wherewithal of a modern technical society. It has economic thinkers of depth and administrative skills of high order. You find great medical schools and large machine tool factories. There are about 70 national research laboratories. There are over 70 universities and over 2,000 colleges with a total enrolment of about 2 million. There are about 450 engineering schools, turning out about 40,000 engineers every year. The total inventory of natural science and engineering graduates in the country is 250,000 to 300,000, which is nearly half that in the United States. And yet our yearly production of wealth is less than one-twelfth that of the U.S.A.

So why do all these ingredients not combine to form a living structure- a structure which can spread roots and grow into a fast multiplying organism. All the inorganic constituents are present, but the type or organisation which characterises life seems to be lacking. Is the mix wrong? Or do we have to wait for as yet unrecognised catalysts? Or, more likely, is there an already existing organism which resists the growth of the new structure? If so, can we tilt the balance against the existing structure by a relatively minor change in the mix? It may, for example, be argued that even a small shortfall in the number of technical people may have very drastic consequences for the economy. That this is not the case with the present situation in India is shown in a pathetic way by the unemployment figures among some of the best trained engineers in the country.

As I see it, technical inputs <u>alone</u>, either in terms of plant and know-how or in terms of more scientists and engineers, will not change the complexion

of the development process significantly. The basic problem seems to be social and organisational. As it turns out, what at one time was considered as the major bottleneck--namely the training of scientists and technologists--is a relatively simple task. Quite substantial steps in this direction have already been taken. There is, actually, a danger that the apparently unproductive nature of this effort may lead to a backlash--that the administrators may even be tempted to slow down the progress in this direction. What has been found difficult to develop are the social, managerial and organisational patterns which would enable an efficient utilization of the available skills and competent manpower. One of the important problems here is a lack of self confidence, particularly on the part of national managers. We suffer from an underdeveloped syndrome. The traditional attitudes have been that technical skills abroad are always better, that our scientists are all right but we can't yet entrust difficult and expensive jobs to them. In general these attitudes still remain with us. As a result the majority of the scientists (including engineers) remains largely unchallenged. This is a vicious circle. Academic school learning remains untempered by the real-life problems around. University teachers train university teachers who train more university teachers, who train more.... and this goes on until there are not enough universities and hence no more jobs. A large fraction of the technical personnel is insulated from national life. This naturally reflects on the type of students they train.

Many of the trained engineers outside the universities are assigned routine jobs which involve no more than turning knobs and watching dials and seldom do they get a challenge to solve a significant problem. The "underdeveloped" managers do not realise that in applied areas the effectiveness and relevance of scientific effort grows only with continuous interaction with

problems, that useful knowledge is only discovered through application. Denied that, much of our science ends up industrially sterile.

A qualitatively new and bold effort in this direction was made by Homi Bhabha, with the strong backing of Jawaharlal Nehru. Bhabha showed that if difficult and challenging tasks are indeed entrusted to young scientists and engineers, they do rise to the occasion and grow with the job. Similar vigour and self-confidence are being displayed by a few of the leaders in scientific enterprises. As Vikram Sarabhai once said, several islands of self-confidence have been created. But these are only islands. Bhabhas and Sarabhais do not run much of the Indian economy. One wonders whether they shouldn't.

Fundamental Science

It is imperative that in order to grow a deep scientific culture in the country we take part in the general crusade of humanity towards an understanding of nature. But does the fact that science is a truly international discipline necessarily imply that everyone must work at the same point on its broadly advancing frong, irrespective of the chances for achievement and consequent satisfaction? Is not the individual or group achievement a necessary catalyst for creativity and further advance? As it turns out, some of the sectors on the front are more fashionable than others, and most of these fashions are currently set abroad. One can almost say that there is some sort of scientific imperialism in operation because the very definition of what is good science is determined by what is being done in the U.S., U.S.S.R. or some other countries of the west. For example, currently a significant fraction of our good theoretical physicists is working in the area of particle physics, a branch of science whose great developments during the past decade and a half have been possible mainly because of the very large experimental laboratories set up in Europe, U.S.A. and the U.S.S.R. We have some excellent

centres of particle physics theory in the country. However, it is nearly impossible to have a first rate development of the particles physics area as a whole without the experimental thrusts of a magnitude which we can ill afford at the present time.

On the other hand there are several significant areas of scientific endeavour and of great potential advantage to us and to mankind where we do very little. For example, very few of our universities even offer any courses in meterology or in the borad area of the earth-sun relationship.

By the very nature the quality of fundamental research done anywhere must conform to the best world standards. This alone stresses the need for selecting areas of emphasis on the basis of not only fundamental importance, but also local advantages in terms of expertise, resources and geographical locale. Without some achievements, the necessary fervour, confidence and atmosphere cannot be generated. The significant position of India in the field of cosmic-ray astrophysics shows that such an approach works.

The Green Revolution

One of the most hopeful things that have happened in India and south Asia generally is the coming in of the green revolution. The fact that food production in 1967-68 jumped up by $\sim$28.8% compared to the previous year and by about 7.4% compared to the record year 1966-65 has created a tremendous impact. Since agriculture accounts for 50% of the national product this represents a substantial increase in total wealth. This has also rather dramatically, exploded the myth that the Indian farmer is wedded to his old ways and would never accept new agricultural strategies. One of the greatest gains has been that a large fraction of the country's population has come to believe in the relevance of science for solving the practical problem of poverty. However one must realize that the story of green

revolution is not only a scientific success but also an administrative and managerial triumph in some selected areas.

I am sure there will be set backs. New economic disparities and regional imbalances will create new problems, but the newly established relationship between science and India's major industry would be a permanent asset.

This is an area where both scientific and managerial strategies have to be largely indegenous. Cooperation with international science can only be lose and of a general nature. However mutual cooperation of countries in the same ecological climate would be of immense advantage.

Political Problems and Useless Expenditures

Indian national income is ∿330 billion rupees, which is about $90 per person. The national budget is ∿33 billion rupees. Out of this about 10 billion is spent on defense. This constitutes about 30% of the national budget and about 3% of the national income. Compared to the spending of many other countries it is not very large. But in relation to the money available for investment and for import of economically strategic materials this is quite substantial. Under the present political situation in that part of the world it is unlikely that this can be decreased.

It is not known what fraction of the defense budget involves foreign exchange which is a very critical commodity.

There is one aspect of the defense spending of developing countries which makes this item of expenditure specially pernicious. In the industrial countries the national effort to equip armies involves a large amount of industrial effort. The weapons of war this generates become more and more expensive. When they become obsolete they are sold off to grateful clients,

probably at substantial profits. The industrial application to war feeds the economy in some way - by technological fall outs, if nothing else. But when we buy those weapons it is money down the drain. This price of political animosities is paid year after year.

Whether international science can or should do anything with regard to complex political issues is not clear. But it is certain that these problems contribute greatly to the slow pace of development. I ask myself the question: is it possible to have a movement called the Indio-Pakistan Scientists for peace and development, and have the support of international colleagues in our efforts? Of course I am not envisaging slogan shouting, poster carrying and peace doves. The ecologies of our two countries are very similar. Our farmers are dependent on the vagaries of monsoon. In both countries rising water table takes away enormous amount of good fertile land every year. Floods from the same rain and often the same rivers sweep away our villages. Cyclones brewing in the Bay of Bengal descend unheralded on the coastal towns of India and Pakistan. The sun pours enormous amounts of energy on our parched lands, while we starve for fuel resources. We share desert lands next to the sea where ground water is brakish and where a breakthrough in desalination could make the sand yield fruit and flowers. In all these I am not talking about engineering and construction problems but very challenging scientific problems. Just for a start can we set up a first rate effort to understand and forecast the onset and intensity of the Monsoon, and in this call in the high advice and help of our colleagues abroad?

We read about cyclone havoc once or twice every year, but I do not recall a proper advance warning every issued to the vulnerable areas. In these days of satellite weather watch can we jointly set up a cyclone patrol and warning system?

If we do start on these cooperative scientific ventures which have a wide human impact, it would be easy to go on to more esoteric and academic areas in which also we could do a lot of things together. And maybe this would affect our politics also - and the money we spend on defense instead of development.

General

This talk is supposed to point out what international science can do to help in development of underdeveloped countries. As I mentioned earlier, in my opinion the main problem is social and organizational and the individual countries have to find their own solutions. If initiatives of the type I just mentioned in relation to Indian and Pakistan are taken, the cooperation of the international scientific community would be essential.

In a more general way, from the global point of view the importance of first rate research in areas like family planning, solar energy and desalination is much greater than indicated by the resources and intellectual effort being spent on these.

Next few years are going to see a qualitative increase in the efficiency of communication between different parts of this world. The new means of communication will certainly be used for exposure of the till now insulated communities to the commercial and cultural forces of the dominant sections of human society. It is possible that this would also open the way for a more effective and productive partnership of the underpriviliged sections of human society for general good. To give some examples: is it possible that some of the U.S. based computer firms would find it profitable to generate the soft ware and even some hard ware for their computers in firms located in populous and educated areas in South Asia, Africa or Latin America?

In a cost study for doing bubble chamber physics, it was found that an Indian Laboratory analysing about 100,000 events per year would spend, over a five year period, less than a fifth of what an American Laboratory would do. People are available for this. If the communications are good, it is irrelevant as to where the analysis is done. Are there not many areas of this type, both scientific and industrial, where a shifting of some operations to the developing countries would lead to lower costs of goods and services, in addition to supporting developmental activities in those countries? Perhaps this process should first be encouraged at the scientific level - because here one is relatively free of fears of exploitation and domination.

Lastly I want to touch on a point which is usually considered to be outside the province of science. When I think of a village in Punjab, which probably has about twice the average per capita income of India, I do not see a picture as desperate as would be suggested by the ratio 3,300 to 180 between the incomes of an average American and a Punjabi farmer. The Punjabi **Jat** eats quite well; his children are healthy and go to school; he has adequate clothes; he sings and dances at the village fair; his wife sits at the door step on a sunny winter afternoon munching carrot and horseradish and gossips about the dowry the neighbors are preparing for their daughter; he owns a bullock cart, maybe a tractor, and certainly a radio, which hangs over his shoulder as he bicycles his way to the market.

How underdeveloped is this, in terms of the real human condition? By a factor of 20 compared to his American country part? The current definition of human progress in terms of more G.N.P. per person - should it not be questioned? In view of the problems currently faced by the "overdeveloped" countries where each solution leads to several new problems about the human condition, about environment and ecology, should we not consider whether it is necessary for whole of human society to go through this phase, even if it

is much better than what most people currently are in? Is there a possibility of finding new directions for the socio-economic forces? Is it possible to find short cuts for the so-called underdeveloped countries, so that a "catching up" may not really be necessary - or may really become possible in the long run?

I do not know what the answers to these questions are but we should not become tools for perpetuating the modern myths about the means to a happy and contented society. At least we should question this and think about possible alternatives.

African Research Center

International Insect Study

By David Perlman
Science Correspondent

The ambitious imaginations of an African entomologist and an American chemist, fused by an international peace-seeking scientific movement, have produced a new research center that may become a model for science in the world's developing countries.

The center is being born at this very moment in Kenya. Its first full-time researcher is leaving Stanford University for Nairobi today, and its laboratiories will soon be running on a million-dollar-a-year budget.

Its major research goal: the fundamental study of physiology, behavior, genetics and ecology of insects.

PURPOSE

Its ultimate purpose: to find new and non-polluting ways to control the dreadful insect infestations that damage crops, spread human disease, and decimate livestock throughout Africa.

The story of the new center was told at Stanford yesterday by its 39-year-old director, Dr. Thomas Odhiombo, a founder of the east African Academy of sciences and an internationally known insect specialist. Dr. Odhiombo is also a professor at the University of Nairobi and dean of its agriculture faculty.

His American colleague in conceiving the new research venture is Dr. Carl Djerassi, professor of chemistry at Stanford and president of Syntex Research in Palo Alto.

DR. THOMAS ODHIAMBO
The center's director

CENTERS

Three years ago, Dr. Djerassi and Dr. Odhiombo independently advanced the idea that scientific research in developing countries could be best stimulated by creating "centers of excellence" where noted senior researchers from all over the world could direct younger scientists in fundamental and practical inquiries.

Dr. Djerassi made his proposal at a Pugwash Conference on Science and World Affairs in Sweden. Dr. Odiombo detailed his ideas in the American Journal of Science. Yesterday both men disclosed that the first such international center is now a reality and they described it at another Pugwash symposium—this one at Stanford.

A major problem in newly emerging areas such as East Africa, Dr. Odhiombo noted, is that there is very little first-quality scientific research, and very little support for it.

PROBLEMS

Researchers all too often come from abroad, stay a few weeks, and carry away their results. Students from the African nation all too often train abroad and don't come back. The research is only insecurely linked to local needs.

The new Nairobi venture, however, is different. As Dr. Odhiombo described it, some 20 research fellows with doctoral degrees will form the core of the staff. They are being recruited internationally and will be supervised by a dozen eminent senior research directors who will come to Nairobi from the world's major scientific institutions for brief periods three or four times a year.

The center in Kenya is being supported enthusiastically by the government and the university, with financial help from academies of science and foundations in many foreign countries.

TRAINING

The center will serve as a training ground for new cadres of African technical specialists, and it will focus on problems important to the life and economy of all African nations.

The first research fellow, for example, is a young Stanford chemist named Dr. Danny L. Elder, who leaves for two years in Nairobi today. His work in Africa will be truly international, for it will be directed by a famed Japanese scientist, Dr. Koji Nakanishi.

Dr. Elder will be investigating the newly discovered and surprising similarity between certain important insect hormones and substances in certain plants.

According to Dr. Odhiombo, African nations — like many others elsewhere — are becoming urgently aware of the ecological hazards of many of today's pesticides.

East Africa's landlocked Rift Valley lakes, for example, are becoming polluted by chemicals such as DDT.

Many insect species are now resistant to the pesticides. In the case of DDT the chemical has permitted the eruption of new destructive insect species in place of those wiped out. Substitute methods of insect control are badly needed.

AREAS

At the Nairobi center, Dr. Odhiombo said, researchers will concentrate in several major problem areas: They will explore mutant strains of disease-bearing mosquitoes that might replace deadly ones. They will study the hundreds of insect pests that ravage such African crops as coffee, cotton and tea. They will investigate the tse-tse fly that kills cattle, and the ticks that carry lethal diseases to cattle, swine and humans.

Their studies will concentrate on life cycles, on migration patterns, on sensory physiology and behavior, on ecology and heredity.

"At first sight," Dr. Odhiombo commented, "what we are doing looks terribly fundamental and egghead. But it has direct application to our most urgent problems in Africa and in other developing nations. It is also in the mainstream of international science, and it will help to build a truly African scientific community that is essential to our future economic development."

Nairobi'snew International Center for Inset Physiology and Ecology is a symbol of the Pugwash Movement's efforts to apply scientific methods to problems of development as well as disarmament. If it succeeds it could Jaunch a series of science centers in the service of man.

Cable Car Hangup

A cable rip caused a two-hour halt yesterday in cable car service between Powell and Market streets and the Washington-Mason street carbarn.

The Powell-Mason lines contined to operate, however, from the carbarn to the outer terminals at Fishermans wharf and Aquatic Park.

The rip was discovered at 11.10 a.m. and repairs were completed by 1:15 p.m.

THE ORGANIZATION OF RESEARCH IN DEVELOPING COUNTRIES

Dr. C.M. Varsavsky

From inspection of the first Agenda proposed for this conference (Centers of Excellence, International Science Foundation, etc.) it seemed to me that it was aimed more at the problem of the development of scientists in developing countries rather than at that of the development of the countries themselves and how can scientists best contribute to it. Obviously, able scientists must exist before they can contribute to the development of their countries, but their existence, although a necessary condition is not a sufficient one. Worse yet, certain scientists can be actually an obstacle to development because they themselves do not contribute to it and, further, they misguide young scientists who potentially could.

Therefore, I do not feel it is out of place to insist in a clear definition of the purpose of this Conference. To me it should not be to devise ways and means to help individual, or small groups, of scientists to do research on the basis that they are "good" investigators or that their results are publishable (in foreing journals). Such a job is already being carried out by many money granting institutions.

Being an interdisciplinary group with no money to give an no axes to grind, we are in a unique position to discuss the other aspect of the problem, namely, how can scientists and technologists best contribute to the development of their countries. If we accept that this is our basic goal, the training of scientists from developing countries falls into its proper perspective: it is a mean to reach an end and not an end in itself. The logical train of our reasoning should, then, be:

What does a country wish to achive through development.

What actions are required to reach the above goal and what is the part that corresponds to science and technology within those actions.

How many of what kind of scientists and technologists will the country need.

How can they best be trained and in which way can international cooperation contribute to their training.

In other words, before we judge the success of efforts such as the Centers of Excellence or the potential success of an International Science Foundation we have to agree on a set of values to base our judgements. In what follows I intend to propose one such set.

In principle, scientists can do research on anything that is technically possible (by "technically possible" I mean conceptually and /or experimentally within our reach). Up to now the scientific community at large has done that. It is quite obvious, however, that not all research that is technically possible has the same social value; however, although each individual can probably make his own classification of research projects in a scale of social desirability, the scales of different individuals will in general be different.

Apart from differences which are likely to occur among individuals taken at random, differences will also occur among averages taken over large numbers of individuals belonging to different societies (I will leave the definition of society very loose: it could mean Africa as opposed to Western Europe or central Argentinians as opposed to patagonian Argentinians). It is on the basis of these differences among societies or, rather, of the coincidences within a society, that we may work out a set of values applicable to that society. In this way we could establish what differences may exist in judging the desirability of different branches of research between the society of developing countries versus that of developed countries.

Obviously, I have not carried out such a survey of world opinion. All I can do is, therefore, to express, as a citizen of a developing country, what I would answer to whoever were conducting the survey in question.

I would first point out some factors that lead to undesirability of research projects, whether carried out in developed or developing countries. In general terms I find undesirable research whose (successful) end result brings unhappiness to man, either by attempting against his physical well-being, his mental well-being or his freedom. Governments justify expenditures on this type of research on the basis of national security. The justification is questionable, to say the least, but we can not go into that problem here. In any case, Pugwash is certainly not going to get involved in the promotion of decidedly undesirable research.

If we turn to research that is not morally undesirable, the choice of the kind that ought to be supported is not so clear. We cannot proceed by naming subjects at random and classifying them as desirable or un - desirable. Also, a given country has limited amounts of money and of human resources that it can use for research activities, and in planning these activities it has to be kept in mind that money or people put in one project means that another project is left without them. In such a case research that is not morally undesirably does not necessarily qualify for support.

In my opinion, for a line of research to be desirable in a developing country it has to fulfill the basic condition of satisfying a specific and very concrete need of the country.

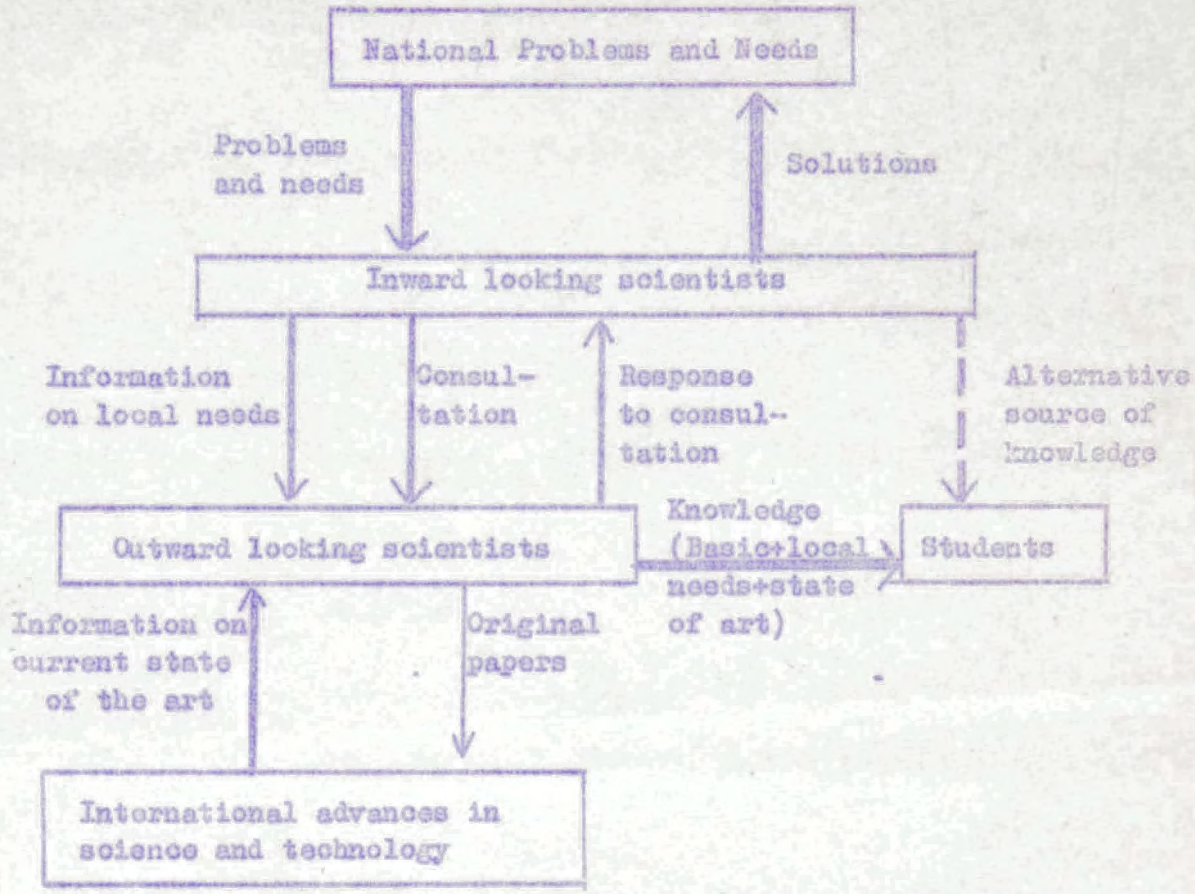
This condition that does not apply to the highly developed countries and, in particular, to the U.S.A. constitutes the biggest difference in the judgement of desirability of research between developed and developing countries, and it may be difficult for the scientists of the former (and sometimes even for those of the latter) to comprehend and accept it.

I should, perhaps, clarify what I meant by "specific and very concrete" need of the country. The clarification brings me back to the line of reasoning mentioned at the beginning of this paper, where the first point was: What does a country wish to achieve through development, and the second one was: What actions are required to achieve the above goals. The specific needs of each country will arise from the answers to these questions, and since the answers are going to differ very strongly from country to country (in particular with regard to the second point) it is practically impossible to give general rules that will be valid to all developing countries (except the general rule that the needs will indeed arise from those answers). Therefore, all I can do to make my point more clear is to give some examples. In the area of population, for instance, India may need medical research in the field of fertility control, while Argentina may need socio-economic research to promote immigration. In the area of efforts to increase exports, Bolivia may need research in mining techniques while Perú may need research on the detection of fish colonies. The list of examples, could, of course, be continued forever but this is probably quite unnecessary. It will be more profitable to refer to the next two points of my line of reasoning.

How many of what kind of scientists andtechnologists will a country need cannot, again, be answered in detail except in reference to individual countries, but at least a general pattern can be sketched.

I visualize the scientific and technological community of a developing country as consisting of two components, of which one will seek its inspiration outside the country and the other within it (both components may coexist in one individual scientist). By this I mean that part of the community, or some individuals (during part of their time) will keep up with the latest advances of science and technology in the rest of the world and will carry out its research mostly inspired by such advances, and keeping in close touch with those colleagues who work abroad in the same field. The other part of the community (or some individuals during the other part of their time) will look at the national problems and needs for their inspiration and, collaborating from time to time with the outward looking sector, will solve those problems and needs.

The system is shown in the figure, where I include the students.



The diagram is reasobable; one could even say that is a truthful diagram of the way a scientific community can operate. I shall attempt to show later, however, that thruthfulness alone is not sufficient, in the sense that a scientific community could operate according to the diagram but still not fulfill its functions. Before I go into that, however, let me say that in the developing countries that I am familiar with the diagram is not followed at all, the inward looking scientists being totally absent. The lack of linkage between scientists (and, hence, students) and the national needs alienates the scientists and makes them prone to emigrate. The result is the well-known phenomenon of "brain-drain". It is quite obvious that the brain-drain will not be solved by giving the outward looking scientists better working (or worse yet, as some people totally devoid of imagination propose, living) conditions . The only action that will prevent the brain-drain is to establish strong ties between the scientist and his country. And by strong ties I do not mean sentimental ties: I mean deep involvement of the scientist in the process of development.

Such words as "strong" and "deep" used in the previous paragraph were not inserted there for literary purposes; rather they take me to my next point, namely that fulfillment of the diagram does not imply fulfillment of the function.

I said that the diagram is truthful; by that I meant that it is true that the relationships represented by the arrows, and only those, should exist. But to the concept of truth we have to add that of importance. The effort spent in creating each arrow should be proportional to its importance. For example, scientists can contribute to the development of their countries even if they severe their ties with the international scientific community (as happened in China); they cannot if they severe their ties with their own countries. Students can be taught by the inward looking scientists; they cannot be taught without danger of alienation if the outward looking scientists fail to interact with their countries. Therefore, when resources are limited, priority should be given to the more critical arrows, and even if resources were very ample, a well balanced scientific community will dedicate more of them to those same arrows. When discussing the training of scientists in developing countries, and how the international community can assist in their training, we have to recognize that the prime mover, the fundamental box in our diagram is "National Problems and Needs", and that the bulk of the scientific manpower and money should go into the "Inward Looking Scientists". (Mind you, nowhere in this paper I differentiate between pure and applied science -such a division may be truthful, but is decidedly unimportant-; I only distinguish between science certain to be useful to the country and foreign science -which may or may not be useful).

It is my impression that the international effort has not proceeded according to the scheme suggested herewith. The proposed International Science Foundation, some Centers of Excellence (such as the Trieste Center) and the work of most Foundations seems oriented to strengthen the outward looking group, without due regard of the fact that such action may be detrimental to the development of the country. To improve such a situation, a revision of the policies of the money-granting institutions of the developed countries is required. In addition, however, greater interaction among the developed countries themselves is urgently needed. In this respect it may be opportune to transcribe some paragraphs of the Report of Working Group 4 of the Eighteenth Conference (Nice, 1968). The Group recommended the organization of Regional Symposia "in different regions of the developing world" and in reference to them it said: "These Symposia would also examine the important question: what are the objectives the people of a region have for the development of the region? For example, it may be inappropriate for a particular developing region to adopt in detail or to imitate the methods, values and patterns for life as seen in many of the present advanced countries, and it may be far

better for them to work out structures for themselves, consonant with their local heritage and resources. The strategy of development can be defined only after the objectives of development have been defined. ..."Participation in these Symposia should, as far as possible, be confined to scientists of the regions concerned; there could additionally be some recognized specialists in the areas under discussion and some person long active in the Pugwash Movement to convey the Spirit of Pugwash to these Symposia. Later, under the heading "Co-operation between Developing Countries", the Group stated: "The Working Group felt that too often consideration was given only to relationships between developed nations and developing nations and to aspects of aid, technical assitance, etc. that could be provided by the former to the latter. It would like to emphasize, however, that every country in the world can in some respects be in the position of a donor country. It is clear that much closer ties should be established among the developing nations themselves, who are faced with similar situations and problems and are attempting to reach similar goals. International co-operation for peaceful purposes among the developing nations can be an important factor for development".

This paper has more than its fair share of obvious truths. I will incur, however, in one more. All I have said is valid for countries whose governments are committed to develop them in freedom from power blocks and with freedom for their citizens. It just happens that the main obstacle to development is that very few countries have such governments. How to overcome such obstacle is totally beyond the scope of this paper.

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[COMMITTEE PRINT]

PANEL ON SCIENCE AND TECHNOLOGY
NINTH MEETING

KEYNOTE ADDRESS

BY

Hon. GEORGE D. WOODS

PRESENTED TO THE

COMMITTEE ON
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KEYNOTE ADDRESS

APPLIED SCIENCE AND WORLD ECONOMY

BY

Hon. GEORGE D. WOODS
President
International Bank for Reconstruction and Development

Presented before
The Committee on Science and Astronautics
U.S. House of Representatives

at its
Ninth Meeting with the Panel on Science
and Technology, January 23–25, 1968, at
Washington, D.C.

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BY

Hon. GEORGE D. WOODS

PRESIDENT

INTERNATIONAL BANK FOR RECONSTRUCTION

AND DEVELOPMENT

Mr. Speaker, Chairman Miller, Members of the Committee, distinguished guests, and ladies and gentlemen.

It is an honor for me personally, and for the World Bank Group which I head, to be invited to open the proceedings of this Panel. I am delighted to participate in your deliberations on applied science and the world economy, the implications of which are both widespread and provocative.

Every now and then the World Bank receives a communication or a questionnaire from some other intergovernmental body wanting to know what the Bank Group of institutions is doing about applying science and technology to the problems of the developing countries. I remind you that two-thirds of the population of the world lives in those countries. Of course, we are a financing organization, and our activities do not automatically yield the kind of information and reports that these inquirers have in mind. But we do our best to give them an answer. And on the whole I think it is a good thing that we occasionally have to do this—and that the President of the Bank occasionally has to appear at this type of seminar—because it makes us stop and think about the relationship of our activities to the vast and extremely important range of problems to which your Panel will be addressing itself. And when we do this, we are always reminded that our work has quite a lot to do with the application of technology to economic problems.

The World Bank's business, fundamentally, is to help increase the production of useful goods and services in the parts of the world which, by today's standards, are poor. The only way to do this on any significant scale is to apply modern technology to production and distribution. If you will permit me to be brief and rather dogmatic about matters which are quite complex, I would say that we have learned four main lessons concerning the matters you are considering in the twenty-one years since we commenced operations.

First, technologies do exist that can provide the developing countries of the world with the basis for a satisfactory rate of economic growth. The job is not hopeless.

Second, despite an impression in some quarters that "foreign aid" isn't working and that the developing countries are not progressing, economic development is taking place in many countries, and with a vigor that cannot be denied. The process almost invariably involves the employment of modern technologies.

Third, technologies cannot be transferred without also adapting habits, standards and institutions. The World Bank and other institutions, as well as governments, spend a great deal of effort, and a not inconsiderable amount of money, on institution-building and in trying to improve the management of economic affairs in the poor countries. There is no more important task.

Fourth, the road ahead is probably even longer than the road we have already traversed. Twenty-one years ago there was a prevalent notion that existing technologies—some new and some not so new—could easily be applied in countries that had no part in their creation. Today we know that it is not so simple. The task will take a long time; it requires much patience.

Not long ago, Dr. Albert Dietz of the Massachusetts Institute of Technology expressed the fear that engineers in this country have been busy, and I quote, "solving the wrong problems." By this I believe he meant that our technological artillery may have been aimed too much at improving high-speed transport, establishing rapid communications and generally altering the physical environment and too little at some of the problems created by the very pace at which we advance materially—air and water pollution, the consequences of drastically altering ecological systems and the like. I believe there is a similar danger that in approaching economic and social problems we may spend too much money and effort on applying modern technology to the wrong problems, merely because it is easier and more in accord with our habits and predilections to do so. It is important that we do not attempt to transfer and apply modern technology *indiscriminately* in the poor parts of the world, but rather in accordance with some reasoned judgments about priorities. Three sectors in which it seems to me clearly *right* that we should concentrate efforts are education, agriculture and population control, and I would like to refer briefly to each of them.

No problem of our time is more challenging than the application of improved technology to that sector of society which is the very birthplace of technology itself, and the ultimate source of a nation's capacity to use it effectively—I refer to education. Educational expenditures in many countries are increasing today about 10% each year, which is often more than double the rate of growth of gross national product. Where this is the case, education is likely to reach the limit of its allowable share of resources long before it has begun to meet legitimate national needs and aspirations. This is a classical case of a human activity in desperate need of a new technology if it is to satisfy human demands.

Education is most countries is still provided on what can best be described as a "handicraft" basis. Even in the comparatively rich countries we are discovering that there are just not enough resources available to educate all those who want and need to be educated unless we can economize drastically in the use of the resources we have. How much more must this be true for the poor countries. Yet the means to modernize education are at hand, particularly in the form of television

combined with satellite transmission, which can reach every corner of even such large countries as India, Indonesia or Brazil. The application awaits the adaptation of institutional structures and curricula to enable it to be applied.

The situation is very much the same with respect to agriculture—technologies exist which can bring about a great increase in agricultural production, but they will only be effectively applied after they have been adapted to local conditions and after governments have adopted the policies and created the institutions necessary for their functioning. Let me cite fertilizer as an example.

Five years ago an ammonia plant with a capacity of 300 tons per day was considered to be large. Today, plants with a capacity ranging anywhere from 600 to 1,500 tons per day are coming into existence. The striking feature of these "second generation" plants is that their capital cost per ton of capacity is so much lower than that of the smaller, older plants. This development—a real technological breakthrough—is occurring at a time when the receptivity of farmers to the idea of applying fertilizer is very high and is spreading to countries and regions where lack of interest has long been the main obstacle to wider use. At such a stage in the development process the cost of the input becomes all important. And it is precisely the capacity of these huge new plants to reduce drastically the cost of nitrogenous fertilizers that makes these new technologies exciting to all of us in the development business.

I should also mention briefly the tremendous effect on productivity of the new high-yielding seeds that have been developed, notably for wheat, maize and rice. These are now becoming available in India, Pakistan, Korea and many countries in Africa and Latin America.

In birth control, where the obstacles to change inevitably go deep, methods developed in recent years, and being steadily refined, have provided the means to reduce birth rates to more manageable proportions.

In several countries a marked reduction of birth rates has been recorded. India, where the problem is of gigantic proportions, has lately both extended and intensified its program, and assistance from many sources is being focused on that critical area.

Mr. Chairman, birth control, along with education and agriculture, offers an excellent example of what I believe to be a general principle: there are no purely technological solutions to economic and social problems. Although armed with technologies that we know can do the job, we are nearly helpless until we can discover ways to persuade tens of millions of persons to use the new methods.

As a banker, not an expert on technologies, much less a scientist, looking to the years immediately ahead, there seem to me to be a number of technological developments that offer possibilities for major breakthroughs on some of the most pressing problems in the developing world.

One field in which new ground is being broken is in the application of linear programming and simulation techniques to development planning. A major study of the water and power resources of West Pakistan was recently completed which employed the best talent and the latest technology available in Europe and North America. This study provides a complete plan, including the recommendation of specific projects, for the development of the water and power resources of West Pakistan, an area as large as Texas plus Louisiana,

over a 10-year period. It suggests steps for further development of these sectors for a second decade and discusses prospects through the remainder of the century. Planning in this depth, on this scale, and with this degree of sophistication, has never been carried out before anywhere in the developing world.

There are other new technologies which capture the imagination. The perfection of vertical-take-off-and-landing aircraft offers the possibility of a large jump forward in solving transportation problems in densely populated areas. But VTOL will also enable us to penetrate the vast interiors of Africa and South America, jumping technologically right over the railroad and highway ages. It will become possible to deliver power units, communications equipment and the like to these now inaccessible regions without a huge investment in conventional airports.

I have mentioned the potential of communications by satellite in connection with education. But I understand that there are also important developments immediately ahead in the use of geodetic and earth resources satellites for scientific data collection, establishment of boundaries, identifying areas of diseased plant life, and otherwise greatly improving our knowledge of the location and nature of natural resources. Satellites are in the works that will permit direct-voice broadcasts from any part of the globe to any other part of the globe, eventually at low cost.

The desalination of sea water is a subject of intense research. I expect that we will soon find that technological breakthrough here, comparable to those that have occurred during the last 10 years in the use of nuclear energy for the generation of electric power, will bring down the cost of desalination to a level that will not only meet growing requirements for human consumption, but will make possible agricultural uses in some now desolate areas at reasonable cost.

Perhaps somewhat further ahead, but within sight, is the possibility of producing edible proteins from inedible substances such as petroleum, by methods vastly more efficient than those by which the long-suffering bovines of the world convert their food into ours.

Mr. Chairman, I hope you will forgive me if in concluding these remarks at the opening of your panel discussion, I say a few words about development finance—a necessary ingredient in all applications of technology to the development of the world economy. All concerned with these matters agree that the principal responsibility for generating capital for development rests with the developing countries themselves. But it is also generally agreed that to achieve a reasonably satisfactory rate of growth, they need some outside financial help.

Indeed, there is so much talk about the needs, and about the potential, of developing countries—about the size and difficulties of their problems—that people sometimes get the impression that the amounts of money that could usefully be employed as "aid," in the broad sense of that term, are completely out of sight, and that to make such amounts available would impose an intolerable burden on the rich countries. In my judgment, nothing could be further from the facts.

In 1962, the 15 countries that together supply what we call development assistance furnished a net sum of about $6 billion to the developing countries. At that time, the combined national incomes of the developed countries was about $830 billion. There was not then, and

has not subsequently appeared, any evidence that this flow of finance caused any economic strain in the supplying countries.

In 1966, the most recent year for which I have figures, the same 15 countries had a combined national income equivalent to about $1,100 billion—an increase of over 30%. But the net flow of official development assistance was just under $6 billion—no increase at all. Had the rich countries allocated the same percentage of national income to development assistance in 1966 as they did in 1962—about three-quarters of one per cent (0.72%)—the aid figure would have been around $2 billion higher. I submit that the provision of development finance at this level would not involve any significant sacrifice on the part of the citizens of the rich countries. But the cost of not providing it might well be immense. I urge you to bear in mind that the application of science and technology to world economic problems must involve not only goodwill, not only the willingness to share know-how, but also capital.

Finally, I wish you well in your deliberations.

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The Times
Section E
Sunday, Aug. 30, 1970

IN THIS SECTION:

ATOMS AND MEN

Scientists to Discuss the World's Ills

BY I. S. BENGELSDORF
Times Science Writer

This August marked the 25th anniversary of the first use of nuclear weapons. Each of the "Model-T" nuclear fission bombs (A-bombs) dropped on Hiroshima and Nagasaki in 1945 resulted in great loss of life and severe damage to the Japanese cities.

Yet, only nine years later, in 1954, thermonuclear fusion bombs (H-bombs) had been developed that not only were 100 times as powerful as the Hiroshima-Nagasaki bombs, but also could contaminate the enitre planet with deadly radioactive pollution.

In response to this global peril, the late Bertrand Russell, in a speech over British radio on Dec. 23, 1954, warned of the catastrophic consequences that would follow a war involving the use of the incredibly destructive power of thermonuclear weapons.

Following up on his speech, Russell, on July 9, 1955, issued a statement signed by 11 outstanding scientists and Nobel laureates, including Albert Einstein. This statement has become known as the Russell-Einstein Manifesto.

Three Survive

Of the 11 scientists who signed the statement 15 years ago, only three survive: Linus Pauling, Joseph Rotblat and Hideki Yukawa. The eight who since have died are Max Born, P.W. Bridgman, Leopold Infeld, J.F. Joliot-Curie, Herman J. Muller, C.F. Powell, Einstein, and Russell.

In part, the Manifesto reads: "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. Shall we put an end to the human race or shall mankind renounce war?

"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 . . ."

Name Sticks

Where should scientists assemble? And who would finance the meeting? There were two offers. Aristotle Onassis, Greek shipping magnate, offered to finance the meeting if it were held at Monte Carlo. And Cyrus Eaton, Cleveland industrialist, offered his help if the meeting were held at Pugwash, Nova Scotia, a small Canadian fishing village that was his birthplace. The latter was accepted.

And so, on July 7-10, 1957, participants from 10 countries—15 physicists, 4 biologists, 2 chemists and a lawyer—met at the first Pugwash Conference.

Since this initial conference, these international meetings on science and world affairs have been continued. Although they now are held all over the world, the original name has stuck and they still

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ILLS

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are referred to as the Pugwash Conferences.

The most recent Pugwash Conference on Science and World Affairs, the 19th, took place on Oct. 22-27, 1969, at Sochi, a Soviet resort city on the Black Sea. Of the 125 participants from 29 countries at Sochi, 28 were from the Soviet Union, 20 from the United States, 11 from the United Kinglom, and 6 from France. These four countries accounted for more than half the participants.

The next Pugwash Conference will be held Sept. 9-14, at Lake Geneva, Wisc. It will be the first Pugwash Conference held since the death of Bertrand Russell, the man most responsible for the conferences.

Th Pugwash Conferences provide a forum for world scientists to exchange views in frank, informal, private, off-the-record discussions.

Although it would be difficult to prove, because of the nature of the private discussions, it is believed discussions at these conferences have contributed to such developments as the Partial Test-Ban Treaty; the Nuclear Non-Proliferation Treaty; the Strategic Arms Limitation Talks (SALT), the first rounds of which were held recently in Helsinki and Vienna; The Paris peace talks on Vietnam; the worldwide examination of the perils of chemical and biological warfare, and the focusing of the world's attention on the accelerating, costly, ever more dangerous arms race between the Soviet Union and the United States.

But the world of 1970 is faced with even more dangers than that of 1957. Not only is global thermonuclear holocaust still a peril, but two further dangers threaten the planet: the population explosion and the ever-widening economic gap between developed and underdeveloped nations.

Conference Prelude

So, on Tuesday through Friday, as a prelude to the 1970 Pugwash Conference, a "little Pugwash Conference" will meet at Stanford University to explore ways science and technology can help underdeveloped nations. Dr. Noel Vietmeyer of the Stanford chemistry department is serving as coordinator of the conference.

About 50 scientists are expected to attend; six from Africa, seven from Asia, one from the Middle East, five from South America, eight from Europe, and sixteen from the U.S.A. As usual at international scientific conferences, the number of Soviet scientists who will arrive —and their identity—will not be known until the conference is under way.

The theme of the Stanford Pugwash Symposium on Science and Development is derived from the "twin threats of our time:" the power struggle between East and West (the U.S.S.R. and the U.S.A.), and the widening economic split between the technologically developed Northern Hemisphere and the technologically underdeveloped Southern Hemisphere.

Dual Threat

The symposium's statement reads, in part, "Both threats are products of the scientific revolution. This revolution has provided nations with weapons so destructive that their use in war would bring utter destruction to both sides, and it has made the situation of technologically underdeveloped countries antenable by combining a 'population explosion' (caused by elementary preventitive medicine and sanitation applied to child birth and rearing), with a 'revolution of rising expectations' (caused by instantaneous and universal communication among all parts of the world).

"The Pugwash program (up to now) has been primarily directed to reducing the first threat—that of nuclear war within the developed world. Many of us, however, feel keenly the second danger to peace and viability of mankind to be no less critical than the first one. Scientists should contribute importantly to resolution of both critical challenges."

STANFORD UNIVERSITY
STANFORD, CALIFORNIA 94305

DEPARTMENT OF CHEMISTRY

August 12, 1970

Dr. Irving Bengelsdorf
Science Editor
Los Angeles Times
Los Angeles, California

Dear Dr. Bengelsdorf:

In view of your previous interests in Pugwash Conferences and the technological problems of developing countries, the Pugwash Committee extends to you an invitation to visit and participate in the Stanford Pugwash Conference September 1-4. I am sorry that this invitation comes at a late date but we had to manoever around previous Pugwash policies to have you and Dr. Perlman of the Chronicle attend.

Further details of the program and the Conference site are enclosed.

Our budget is of course very tight and will not cover your expenses. Meals at Stanford will be $12.00 per day and a room in Stern Hall (a student residence without private baths) is $6.50 a night.

Would you please let me know whether you will be able to attend; of course I will answer any questions you may have.

Cordially,

Noel Vietmeyer

Noel Vietmeyer
Conference coordinator
321-2300, Ext. 2858

NV:ds

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Some Notes on the Pugwash Conference on "The Role of Science and Technology in Development" to be held at Stanford University, September 1 to 4, 1970

The Conference Coordinator is: Dr. Noel Vietmeyer
Department of Chemistry
Stanford University
Stanford, California 94305

Phone: [415] 321-2300, extension 2858

Any questions regarding your arrangements or stay at Stanford should be directed to him.

Stanford University is located forty miles south of San Francisco and fifty-five miles from the University of California at Berkeley. The Conference will be held in rooms on the campus and participants will be housed in a residence hall (also on the campus).

The San Francisco Airport is located approximately half way between the University and the city of San Francisco, and participants should plan flights to this Airport. Arrangements have been made for limousine service from the Airport to the Conference residence. You should contact the representative (uniformed) of Charter Sedan Service at the Baggage Claim area of the Airport. In order for you to be met in this way you must send your airline, flight number, date and time of expected arrival in San Francisco to:

Charter Sedan Service
2766 Scott Boulevard
Santa Clara, California 95050
Phone: [415] 246-4444

Any last minute changes should also be communicated directly to the limousine service. It is very important that you remember that the limousine driver will be waiting at the Baggage Claim area (at the large carousel that dispenses your luggage). He will be wearing a black cap with silver band and on his left breast pocket a pin saying "Charter Sedan."

Cars may be rented (at your own expense) at the Airport, and to reach Stanford University drive out of the Airport and south towards San Jose on the Bayshore Freeway (U.S. 101). After approximately twenty miles take the second Palo Alto exit, Embarcadero West, which leads directly onto the University Campus and becomes Galvez Street. The remaining route is designated on the accompanying Stanford map.

The weather in Palo Alto varies from cool in the mornings and evenings to temperatures in the 80's during the middle of the day. On Wednesday evening we are planning a wine tasting and dinner at Ridge Vineyard located south of Palo Alto at 2200 ft altitude with a superb view of the Bay, and it would be a good idea to have walking shoes which can get dirty and a warm sweater for the cool evening. Temperatures in San Francisco are usually considerably cooler than in Palo Alto

and if you are planning to spend some time there after the Conference some warmer garments are suggested. For those who would like to do this, we will make advance reservations and would suggest the Beresford Hotel (single room $9 to $14, double $14 to $18). You should note that Monday, September 7 is Labor Day, a legal holiday in the United States; businesses will be closed and many people will be travelling on the highways throughout the weekend.

Participants will live, eat, and meet in Stern Hall. This is one of the best student residences, and each participant will have a private room. The rooms do not have private baths but very adequate facilities are available on each floor. All linens and maid service will be provided. Free parking space is adjacent to the residence.

You should plan to arrive at Stanford on Monday August 31. Meetings begin Tuesday morning and will cover four full working days. The conference organizers strongly suggest that you plan to leave on Saturday, September 5 rather than Friday the 4th which is the last conference day.

The Stanford Museum and the Gallery, as well as the University's libraries, bookstore and recreation facilities (including an 18-hole golf course for which a nominal fee is charged) will be open to you.

Mail for you should be addressed in care of:

Professor Carl Djerassi
Department of Chemistry
Stanford University
Stanford, California 94305

Telephone Service: Your telephone callers may reach you at Stern Hall from 7 a.m. until 11 p.m. by dialing [415] 327-2920.

Participants who are continuing on to the Pugwash Conference at Lake Geneva, Wisconsin may wish to stay on at Stanford until September 8. If you wish to do this, please advise the Conference coordinator immediately and arrangements will be made to continue your accommodation.

The Conference funds are not sufficient to cover the costs of wives who accompany participants, but if any members of your family are indeed coming please advise the Conference coordinator.

Please forward a copy of papers you intend to present at the Conference in order that they may be duplicated for other members and the press.

AGENDA

STANFORD SYMPOSIUM:

SCIENCE AND DEVELOPMENT

SEPTEMBER 1 - 4, 1970

Sponsored by the American Academy of Arts and Sciences Pugwash Sub-Committee on the Role of Science and Technology in Development; Stanford University; and the Center for the Study of Science and Society at the State University of New York at Albany

FIRST DAY Tue - Sept 1

Morning Session: 9:00 - 12:00

WELCOME FROM DR. RABINOWITCH AND DR. DJERASSI

REPORTS

Topic: "What scientists from developing countries see as main problems of development in their own countries, particularly from the point of view of possible assistance from and cooperation with scientists from developed countries"

Speakers:

Professor Antonio Bacigalupo
Dr. Jose Barzelatto
Dr. James Coleman
Dr. Nurul Islam
Dr. John A. Katili
Mr. A. R. Abdel Meguid
Professor Yash Pal
Mr. A. Parthasarathi
Professor F. G. Torto
Professor C. M. Varsavsky

Afternoon Session: 2:00 - 4:30

Discussion of Reports

SECOND DAY We - Sept 2

Morning Session: 9:00 - 12:00

REPORTS

Topic: "What scientists have attempted to do in assisting development"

Speakers: Dr. David Carney
Dr. Julian Engel
Dr. W. David Hopper
Dr. John McKelvey
Prof. Thomas Odhiambo
Dr. C.H.G. Oldham
Prof. V. A. Oyenuga
Dr. Victor Rabinowitch

Afternoon Session: 2:00 - 3:30

Discussion and Criticism of Report; Possibilities of Improvement of Existing Programs and Developing New Programs

4:45

Trip to Ridge Vineyard for Wine Tasting and Dinner

THIRD DAY - Th Sept 3

Morning Session: 9:00 - 12:00

REPORT

Topic: "International Science Foundation"

Speaker: Dr. Roger Revelle

Afternoon Session: 2:00 - 4:30

Discussion of Report

FOURTH DAY - Fr Sept 4

Morning Session: 9:00 - 12:00

Planning of Future Programs

Afternoon Session: 2:00 - 4:30

Planning of Future Programs

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