

April 1980 Volume 17 No. 4

Pugwash Newsletter

issued quarterly by the Council of the Pugwash Conferences on
Science and World Affairs

PUGWASH NEWSLETTER

Vol. 17

No. 4

April 1980

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PUGWASH AND POLITICS - CONTINUED

The two Pugwash meetings held since January - one on nuclear forces in Europe, the other on international satellites for peace-making purposes - illustrate well the different ways in which our organization can and does exert political influence, additional to those steps mentioned in the preceding issue of the Newsletter.

The second Workshop on "The Current Crisis on Nuclear Forces in Europe" was held in Geneva 11-13 April (p. 79) and had many of the same participants as the first meeting held some three months previously. This was advantageous since old ground did not have to be covered again, and the participants were able to concentrate on the working documents prepared for the meeting (p. 81). Charts and tables emerged during the animated discussions which showed how different were the perceptions of relative strengths in nuclear forces of the NATO and WTO powers.

The most important paragraph of the report - the one calling for no practical steps to be taken which might change the present balance of nuclear forces in Europe pending and during negotiations - was the result of several hours of discussion and negotiation. The agreed compromise on wording, with further precision to be worked out by the two sides, was considered a distinct achievement by many of the group who felt that a new dimension could now be added to political discussions at official levels. The workshop will have succeeded in one of its primary aims if in fact the cited recommendation is acted upon by both sides. Let us hope it will be raised and discussed during Schmidt's forthcoming visit to Moscow, since the voice of Pugwash is sometimes heeded by high government officials to whom the results of such meetings are transmitted directly.

The symposium held in Avignon 14-17 April on "An International Agency for the Use of Satellite Observation Data for Security Purposes" (p. 86) was of an entirely different character than the workshop mentioned above. The idea was discussed in Pugwash some years ago and was introduced by Giscard d'Estaing at the UN Special Session on Disarmament in 1978. Since then the French Government has sponsored the idea in UN circles, despite great reservations on several of its aspects, expressed, not surprisingly, by the USA and USSR, the only two countries now capable of - and actually employing - the expensive and complex technology involved.

In Avignon we were concerned with arriving at a technical assessment, with political and legal overtones, of the nature and requirements of a tool that will undoubtedly have to be used sooner or later if a peaceful world is to be achieved. The technical considerations were covered by a highly qualified group of experts. The results comprise an excellent first approximation of a difficult subject which is now actively being discussed in the UN and other circles where our report has been received with great interest and praise. Quick implementation, of course, cannot be expected, given the great cost and other difficulties involved, but the project can now be examined in a realistic framework.

Looking ahead (see calendar, p.104) our programme of meetings for the next year has reached the saturation point. The Executive Committee at its meeting in April gave particular attention to the forthcoming Conference in the Netherlands on 20-25 August where the Council will also meet as usual before and after the Conference. Apart from some 125 scientists and scholars expected to attend the Conference, we plan to have a number of young scientists from different countries. Our hope is that we can thereby encourage the dissemin-

ation of Pugwash ideas and approaches among the younger generation who have the greatest stake in the future (see also Pugwash Newsletter of January 1980, p.75).

Warm thanks are in order for Phil Smith and his colleagues in the Dutch Pugwash Group for their excellent and conscientious preparations for the Conference in Breukelen. We look forward to a quieter ambiance there than we would have were the meeting to be held in its namesake in New York.

M. M. Kaplan

On Dorothy Hodgkin's Seventieth Birthday

The Pugwash President, Professor Dorothy Hodgkin, will celebrate her 70th birthday on 12 May 1980. I am sure I speak for all Pugwashites in congratulating her and wishing her many happy returns.

This is a suitable occasion to reflect on the very special position she occupies not only in the scientific community but in society as a whole. Despite the undoubted impact of science on society, the proportion of scientists who fulfil their social responsibility is very small, particularly of those with the courage to stick out their necks and speak out against iniquities and social injustice. Despite the equal opportunities in modern society, the proportion of women scientists is still low and the probability of one of them reaching the very top of scientific attainment is thus very small. If one multiplies those two small probabilities, one must arrive at the conclusion that Dorothy Hodgkin is a unique phenomenon.

The award to her of the Nobel Prize in chemistry was the official recognition by the world of science of her remarkable scientific skill. The conferment on her of the Order of Merit - the most prestigious of the truly meritorious honours in Gt. Britain (hers was the first to be given to a woman since Florence Nightingale) - was an expression of the great esteem in which she is held even by the "establishment" which does not generally see eye-to-eye with her. But more important than all the formal acknowledgements is the admiration, comradeship and love which she inspires in all who get to know her. For with all her brilliant career and imposing stature, she remains a simple human being, devoted to her family. She is warm-hearted, gentle, approachable, and always ready to help when needed.

No wonder she is so much sought after and so many calls are made on her time, and that in her "retirement" she is more active than ever. We, in Pugwash, are most fortunate that she takes such an interest in our work, that she is not a figure-head President, but an active member of the Movement, attending not only the Annual Conferences, Symposia and Workshops, but also meetings of Council and Executive Committee. Her infrequent interventions, made in a very quiet, almost shy manner, always show much commonsense, and often help to resolve difficult issues. In saluting her on her 70th birthday, we express our sincere hope that she will give us many more years of support and inspiration.

J. Rotblat

SECOND PUGWASH WORKSHOP ON
THE CURRENT CRISIS ON NUCLEAR FORCES IN EUROPE *

Geneva, Switzerland, 11-13 April 1980

Topic Headings

- a. Perceptions and realities of security for NATO and Warsaw Pact powers.
- b. Destabilizing and balancing factors of nuclear weapons deployments in Europe.
- c. Interactions with MFR and SALT.
- d. Bases for negotiations aimed at stopping and reversing the race for strategic nuclear weaponry in Europe.

List of Participants

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Prof. Christian Dominicé, Director, University Institute for Graduate International Studies, Geneva, Switzerland.
Prof. Paul Doty, Director, Centre for Science and International Affairs, Harvard University, Cambridge, Mass., U. S. A.
Mr. Valentin Falin, former Soviet Ambassador to FRG, and member of the Central Committee of CPSU, Moscow, U. S. S. R.
Prof. B. T. Feld, Professor of Physics, M. I. T., Cambridge, Mass., U. S. A.
Prof. Jacques Freymond, Chairman, Centre for Applied Studies in International Negotiations, Geneva, Switzerland.
Prof. E. E. Galal, Adviser to Minister of Health, Cairo, Egypt.
Ambassador Garcia Robles, Head of Mexican Delegation to the Committee on Disarmament in Geneva, Mexico City, D. F., Mexico.
Prof. Z. Kaczmarek, Academy of Sciences, Warsaw, Poland.
Dr. M. M. Kaplan, Director-General of Pugwash, Geneva, Switzerland.
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Dr. R. J. H. Kruisinga, former Minister of Defence, Netherlands.
Mr. Jan Lodal, formerly in charge of SALT negotiations, National Security Council, Washington, D. C., U. S. A.
Prof. Øle Maaløe, University of Copenhagen, Denmark.
Colonel W. Mark, Federal Military Department, Bern, Switzerland.
Acad. M. A. Markov, Academy of Sciences, Moscow, U. S. S. R.
Prof. Jorma Miettinen, University of Helsinki, Finland.
Gen. (ret.) Mikhail Milstein, Professor, Institute of US and Canada Studies of Academy of Sciences, Moscow, U. S. S. R.

Senator Nino Pasti (formerly General, NATO forces in Italy), Member of Parliament, Rome, Italy.

Dr. Vladimir Pavlichenko, Academy of Sciences, Moscow, U.S.S.R.

Prof. J. Rotblat, Emeritus Professor of Physics, University of London, U.K.

Prof. Adam Rotfeld, Polish Institute of International Relations, Warsaw, Poland.

Dr. Lothar Ruehl, FRG-TV, German Society for Foreign Affairs, F. R. G.

Prof. A. C. Sjaastad, Norwegian Institute of Foreign Affairs, Oslo, Norway.

Dr. A. de Smaele, former Minister of Economic Affairs, Brussels, Belgium.

Wayland Young (Lord Kennett), House of Lords, London, U.K.

Report

The Pugwash Workshop wishes to stress the necessity for all States to behave in a manner consistent with the provisions of the Final Document of the UN Special Session on Disarmament approved by consensus at the first special session of the United Nations General Assembly devoted to disarmament on 30 June 1978. Among those provisions, the following are particularly relevant in the case of nuclear weapons' deployment in Europe:

1. that while the attainment of the objective of security is an inseparable element of peace, "the accumulation of weapons, particularly nuclear weapons, today constitutes much more a threat than a protection for the future of mankind";
2. that "the adoption of disarmament measures should take place in such an equitable and balanced manner as to ensure the right of each State to security and to ensure that no individual State or group of States may obtain advantages over others at any stage";
3. that at each of the disarmament stages "the objective should be undiminished security at the lowest possible level of armaments and military forces".

An objective analysis of the existing situation in Europe carried out in the light of the above provisions leads to the conclusion that a workable agreement to limit nuclear weapons' deployment is possible and would be advantageous to all parties. Increased security for all is more likely to be achieved by limiting - and still better, by reducing - nuclear weapon deployments, than by an escalating arms race, quite apart from the economic gains.

Every effort, therefore, should be made as a matter of urgency to start immediate negotiations before a point of no return is reached in a qualitative nuclear weapons race which would be an ominous development of incalculable and most dangerous consequences.

Bearing in mind the relevant statements made by responsible officials both from NATO and the WTO, it seems feasible that the two sides should adopt the few preliminary measures which would be required in order that the negotiations on a workable agreement on the limitation of nuclear weapons' deployment in Europe may begin without further delay.

Such measures, to be adopted within the framework of the three agreed principles on the Final Document quoted above, could in the opinion of the Pugwash Workshop be as follows:

To facilitate negotiations under more favourable conditions, it is proposed that during the preparation of the negotiations and during the negotiations themselves, both sides should agree not to take any practical steps that would change the present balance of nuclear forces in Europe.

The Workshop also discussed two papers, which had been submitted for its consideration: "Criteria for an Agreement on Nuclear Weapons in Europe" and "Safeguarding Détente: Neutrality or Non-interference". Other subjects discussed included: the causes and consequences of recent setbacks to détente, including events in South-West Asia; the appropriate forums for negotiation on European nuclear arms controls; and a proposal for the de-nuclearization of Central Europe.

* This meeting was arranged with the financial and organizational assistance of the Centre for Applied Studies in International Negotiations, Geneva.

F. Calogero and J. Rotblat

CRITERIA FOR AN AGREEMENT ON NUCLEAR WEAPONS IN EUROPE

I. Basic Assumptions

1. Any workable agreement to limit nuclear weapons' deployment in Europe must be advantageous to all parties; arms control and disarmament are not a zero-sum game.
2. An agreement advantageous to all parties is possible. Increased security for both sides is more likely to be achieved by limiting weapon deployments⁽¹⁾, than by an escalating arms race, quite apart from the economic gains.
3. The quest for arms control agreements must continue notwithstanding an unfavourable political climate. For one side to give it up because of extraneous international developments would imply that the arms control measure is advantageous only to the other side.
4. Short-term advantages should not be sought at the price of long-term risks. A myopic perspective, often displayed by military planners and decision-makers, usually increases the potential for conflict in the long run.
5. A fundamental criterion in the evaluation of arms control negotiations and agreements is their impact on the global situation, i. e. beyond the particular confrontation that constitutes

the specific focus of the negotiation. In this respect the risk to jeopardize any future viable prospect of nuclear arms control, and to stimulate world-wide nuclear proliferation, is crucially relevant.

6. A sense of urgency needs to pervade the process of negotiation. Protracted negotiations often defeat their object: by the time agreement has been reached on reducing the nuclear stockpile, the reduced numbers may be much higher than those in existence at the start of the negotiations.

II. A Possible Platform for Negotiations on Weapons Deployment in Europe

7. A platform for a workable agreement on nuclear weapons' deployment in Europe could be provided by the following principles.

- A. No deployment by NATO in Europe of nuclear missiles capable of hitting the heart of the Soviet Union.
- B. No deployment by the Soviet Union of a force that includes many delivery vehicles with accurate nuclear warheads.

8. The rationale for principle A is:

- (i) The deployment by NATO of intermediate range nuclear delivery vehicles in Europe⁽²⁾ might be perceived by the Soviet camp as a way to circumvent SALT;
- (ii) Such a deployment is not essential for NATO strategy in view of the existence of a sea-based long-range deterrent force assigned to NATO.

9. The rationale for principle B is the justified concern by NATO about any shift of Soviet nuclear forces towards a war-fighting posture. The "modernization" associated with the projected extensive introduction of SS20s and Backfire bombers is perceived by NATO as a significant modification of an existing balance.

10. The most dangerous aspect of the prospective nuclear developments in Europe is the development, production and deployment of long-range very accurate, guided by TERCOM (terrain-contour matching) cruise missiles. Due to the difficulty of monitoring the number and characteristics of these delivery vehicles, their introduction is bound to have a long-term destabilizing effect, and make any future strategic arms control limitation agreement unworkable - an event of dramatic global importance. It will act as a powerful stimulant to nuclear-weapon proliferation, due to the ambiguous nature of the cruise missile, i.e. no clear-cut threshold between the short-range conventionally-armed tactical cruise missiles, which are now produced and possessed by many countries, and the longer-range accurate nuclear-armed strategic cruise missiles like those that are being developed in the USA for deployment in Europe.

11. Although the long-range accurate cruise missiles appear at the moment to be technologically highly sophisticated, both in propulsion and guidance, there can be no doubt that,

once they have been developed, produced and deployed by the USA, they will also be developed, produced and deployed by the Soviet Union, and by other countries. The avoidance of such an ominous development is in the best interest not only of the Soviet Union and the WTO but the USA and NATO as well; it is achievable as long as this weapon system has not been fully flight-tested.

12. In view of the above considerations, the following guidelines appear appropriate to the present nuclear situation in Europe:

- (i) to aim at an agreement that would impede the introduction of long-range accurate cruise missiles;
- (ii) to achieve such an agreement as soon as possible.

III. Goals for Pugwash

13. If the above considerations on the global impact of an arms control agreement in Europe, especially the lack of such an agreement, are correct, then they support the notion that such an agreement is advantageous to all the parties, or that the lack of any agreement and the ensuing developments are dangerous for everybody.

14. In the present international climate an East-West agreement does not appear immediately feasible. Our goals in Pugwash are therefore clear:

- (i) we should convey to decision-makers the need and urgency to extricate themselves from a course that has torpedoed detente and may lead to a dramatic confrontation. (The relevance of this goal is not limited to the European nuclear situation).
- (ii) we should explore the terms of a nuclear arms control agreement in Europe, and make an attempt to draft it.

15. The principles and guidelines that have been set out in paras. 7 and 12 are meant to provide the basis for a discussion aimed at implementing the second of the goals indicated above. The Pugwash Workshop in Geneva in April appears to be an appropriate forum for such a discussion. A further objective of the Workshop is an exploration of ways and means to achieve an effective arms control agreement at an early date, through formal intergovernmental negotiations or otherwise.

16. It would have been premature for us to outline in greater detail the terms of a possible agreement. For this reason we have not attempted in this paper to set out numbers, although we hope that the discussion at the Workshop will be more specific. Clearly, the perceptions held by each side about numbers and performance of the hardware may crucially affect the likelihood of an agreement.

Notes

(1) "Indeed, it can be argued that no small portion of the approximately 7000 nuclear weapons NATO deploys in Europe today are more dangerous to the Alliance than to the potential adversary they are designed to deter". U.S. Senator Sam Nunn (D., Ga) arguing in favour of the "modernization" of NATO theatre nuclear weapons in Europe at a German-American round table discussion sponsored by the Institute for Foreign Policy Analysis and the Konrad Adenauer Stiftung of the Federal Republic of Germany, on October 22, 1979; as quoted in the USIA release EUR-40 (10/24/79), (PD-101).

(2) Intermediate-range nuclear forces in Europe[†]

	<u>Number</u>	<u>Maximum Range (km)</u>	<u>Warheads</u>	<u>Yield (kt)</u>	<u>CEP (m)</u>
<u>Missiles</u>					
<u>NATO</u> (proposed deployment)					
Pershing II	108	1500 - 1800	1	1-400 (3 yields)	< 40
GLCM	464	600* - 3000	1-4	1-100 mobile	~ 30
<u>WTO</u> (estimated present deployment)					
SS4	~ 400	2000	1	1000	> 2000
SS5	~ 100	3700	1	1000	"
SS20	60-120	4200 - 6400	3	150-350 mobile	400-600
	growing to 450 by 1985			(MIRV'ed)	
<u>Bombers</u>					
<u>NATO</u>					
F111	~ 250	~ 10000			
<u>WTO</u> (estimated)					
Badger (TU16)	~ 600	~ 6500			
Backfire (TU22M)	40-120	5600 - 8800			
	growing to 300 by 1985				

* This is the upper limit permitted under the SALT II Protocol due to expire at the end of 1981.

† Data collected from a variety of sources, primarily SIPRI and IISS.

E. E. Galal

SAFEGUARDING DÉTENTE : NEUTRALITY OR NON-INTERFERENCE

During the first session of this workshop last December I proposed two overriding pre-requisites for managing the crisis of world peace.

- a) Considering the features of modern military technological development, the stabilization of the strategic military balance can only be ensured through an embargo on new generations of weapons of mass destruction.
- b) Considering the lessons of the events over the last two decades, peripheral frictions in Third World conflicts are the least manageable potential trigger for a world military conflict. Areas of mutually guaranteed non-interference in such triggering zones is the most logical method of containment.

Since that session tangential references to the neutralization of Afghanistan, one of the acute triggering zones, have been made by several concerned states though the approaches appear to be radically different.

The Soviet notion seems to emanate from the consideration that the present Afghanistan

Government reflects the legitimate will and interest of the people, and so presume that neutralization would mainly involve the external forces that directly, or through support to the opposition, destabilize the status quo and shift the strategic balance intolerably. The Western notion seems to emanate from the assumption that Soviet military interference enforced a system against the legitimate will and interest of the Afghanistan people in addition to causing a radical shift in the strategic balance in a sensitive area. Thus neutralization should mainly involve this military interference.

Even assuming that neutralization can be agreed upon in such a manner that active, open or undercover, military interference is evenly prohibited, the question remains whether such a solution represents an effective containment of triggering potentials in a viable and globally implementable manner.

Afghanistan, the Middle East and other potential triggering zones in the Third World lack the internal political and socio-economic stability that is a prerequisite of neutrality. Achieving such stability can either be gradually worked out as peacefully as possible in a stabilizing international environment or can be frozen artificially by political, military or socio-economic pressure. Such pressures, by their very nature, must initiate counter action and must be continuously upgraded as the artificiality of the freezing increases, thus raising the fierceness of the explosion when it comes, as is evident in Iran.

On the other hand a stabilizing international environment cannot be guaranteed by simple military disengagement of interfering forces. Political and socio-economic pressure is often, in the long run, a more effective weapon in freezing peaceful resolution of conflicts and thus initiate its parallel counter-actions.

The concept of areas of non-interference as a global approach to containment of trigger zones merits fuller consideration, not as an adjunct to détente but as a fundamental component of this policy. Certain characteristics of the proposed "Non-Interference" can be identified for consideration:

- 1) Non-interference must be a holistic policy covering the military, political and socio-economic relations.
 - 2) It can be a viable policy if it ensures the geo-political balance. Thus generally it must be perceived in terms of zones, and not single states. Such triggering zones usually involve several Third World states. Those states may have complex, diametrically opposed interests and conflicts with the West and East. The resolution of the conflicts with the whole zone, in addition to abolishing triggering risks, may balance potential unilaterally pursued interest.
 - 3) Member states of such a zone must share responsibilities, thus undertaking to follow a policy of peaceful resolution of conflicts within the zone or with the outside world according to international laws and obligations.
 - 4) A code for rearmament and arms trade must be worked out among member states of such zones and countersigned by the parties to the non-interference agreement in the two camps. This arrangement would include a status of Nuclear-Free zones.
 - 5) Conjoint cooperative socio-economic undertakings must be eventually promoted by the member states of the zone and must be accepted as the priority model for bilateral assistance by all states members of the two global camps West and East.
 - 6) Guarantees by member states of the zone of abiding by the UN Charter and other international agreements in connection with human rights.
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34th Pugwash Symposium
AN INTERNATIONAL AGENCY FOR THE USE OF SATELLITE OBSERVATION DATA
FOR SECURITY PURPOSES

Avignon, France, 14-17 April 1980

Agenda

- I. Role of an International Agency for the collection and utilization of Satellite data
 1. Security implications
 - a. Crisis Management
 - b. Monitoring Disarmament Agreements
 - c. Interaction with Conventional Data and Security Information
 2. Possible civilian implications
- II. Types of information available: selection and dissemination
 1. Short-term utilization of available satellite data
 2. Long-term development of an independent satellite observation system.
- III. Place of Agency in international structures.

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List of Papers

- J. F. Beckman - Satellite-Borne Methods for Monitoring Missile Deployment: Advantages and Difficulties.
- H. Bortzmeyer - The Implications of Establishing an International Satellite Monitoring Agency for Disarmament: Prospects of the U.N. Study.
- S. Chandrashekar - Possible Technologies Required for an International Peace-Keeping Satellite.
- M. Dupuy - Structure and Role of an International Satellite Monitoring Agency: Legal Aspects.
- D. S. Elliott - Peacekeeping from Space: The Unrealized Vision.
- W. Epstein - Some Institutional and Constitutional Considerations.
- E. E. Galal - Global Accessibility and Participation: An Overdue Shift in Crisis Management.
- B. Jasani - A Role of Satellites in Verification of Arms Control Agreements.
- K. Tsipis - Technical, Operational, and Policy Considerations and Alternatives for the Use of Satellite Observation Data for Security Purposes.
- C. Voûte - Comments on Some Options for a Long-Term Development of an Independent Satellite Observation System for Security Purposes.
- C. Voûte - Comments on Some Options for Operational Applications of Satellite Remote Sensing Data.

Requests for papers to be addressed directly to the authors.

Report from the Symposium

A. Introduction

The Pugwash Conferences on Science and World Affairs have since 1957 been concerned with the avoidance of nuclear war and with problems of international security. In addition to the scientific and technical components, wherein lie the main Pugwash contribution, such security issues must perforce also involve economic, political, legal, social and military aspects. Furthermore, over and above immediate considerations of keeping the peace, global security issues must also be considered in a larger time frame, in the context of the world of the next few decades - in which arms control and disarmament considerations will be of predominant importance - as well as of the disarmed world of the 21st Century, towards which we must all strive.

Some time ago, at an earlier Pugwash meeting, the idea was advanced of an international satellite for the purposes of arms control and crisis management. This would be used in conjunction with a global system concerned with the verification of arms control agreements, the enhancement of confidence among nations, the avoidance of crises and their management in case of breakdowns in international relations. Such a system could be an important component of an international security system.

On the initiative of the French Pugwash Group, an international Pugwash Symposium on "An International Agency for the Use of Satellite Observation Data for Security Purposes" was convened in Avignon, France on 14-17 April 1980. At this Symposium, 31 participants from 14 countries, meeting in their individual capacities, considered proposals for an International Satellite Monitoring System (henceforth, for the sake of brevity, referred to as ISMOS) such as has been proposed by the French Government. A list of participants is given. Regrettably, in spite of attempts at a more universal coverage, the Symposium did not succeed in attracting participants from all important regions of the world.

The following is a summary of the most important considerations and ideas discussed at the Symposium.

The Symposium was timely because of the proposal, made by the President of the French Republic in May 1978 at the Tenth Special Session of the UN General Assembly devoted to disarmament, of an International Satellite Monitoring Agency. The proposal envisaged the progressive development of the system in three stages:

- 1) ISMOS would receive and process data acquired from states which own and operate such observation satellites.
- 2) ISMOS would build and develop its own data collecting and processing facilities.
- 3) ISMOS would launch and operate its own satellites.

A resolution requesting the Secretary-General of the UN to prepare a study of the implications of this proposal was adopted at the 33rd regular session of the General Assembly in December 1978 by 121 votes in favour, none against and 18 abstentions.

These developments took place against the background of remarkable progress in the field of space technology and specifically with respect to earth observation satellites. Observation satellites for both civilian and military purposes have attained a very high level of accuracy and precision.

At present, information from such satellites is collected and processed by the Union of Soviet Socialist Republics and the United States, the two countries with the greatest experience in space technology. It has already played an important role in the verification by "national technical means" of their bilateral agreements for arms limitation. The potential usefulness of this technology to the international community as a whole is great - in the field of verification of multilateral disarmament agreements, in supporting UN peacemaking and peacekeeping efforts and in the field of international crisis management on a local or global basis. It also has great importance in the economic and social fields.

Several other countries now have the capability to operate earth oriented data acquisition systems. More countries will acquire this capability within the next five to ten years.

It was therefore considered that Pugwash might make a useful contribution if it were to study the implications of using this technology for the purpose of enhancing international security.

The purpose of this Symposium was to study the technical, political, legal and financial implications of an International Satellite Monitoring System (ISMOS).

B. Technological Aspects

The technology is now available for useful satellite monitoring systems, and it will become available to ever increasing numbers of technologically developed countries in the coming years. The status of this technology, as compiled and summarized by an expert group at the Symposium, follows:

1. Background technology

It is felt that a number of technologies, currently available to Europe, Japan, and other industrialized nations without recourse to either superpower, can be integrated into a total information delivery system within reasonably short order - given a guarantee of resources and single-minded management focusing on a defined objective. For purposes of this overview, a development and test period of 5 to 7 years from initiation appears sufficient for the initial deployment of a useful system.

2. Application to particular methods of observation

The technologies available and deemed applicable to the particular function of international security information acquisition and dissemination fall into several categories:

- 1) Panchromatic optical digital imagers with spatial resolutions of some 3 metres or larger can, within bit rate limitations, afford routine access to preselected global areas on a revisit pattern of perhaps 4 to 5 days. Daylight scene conditions establish the maximum duty cycle to about 40%.
- 2) Infra red optical sensors, capable of spatial resolution in the 50 metre-or-larger class and of temperature resolutions within ± 1 or 2K, offer complementary coverage capabilities and can operate usefully at night.

- 3) Imaging microwave systems (radar) can provide all-weather day-night scene coverage in the 10-metre spatial resolution range; limitations of data rate management suggest rather low routine duty cycles of the order of 5 to 15%.
- 4) Non-imaging radar used in the altimetry mode as a profile-meter can, over time, build up three-dimensional models of selected terrain areas with good relative accuracy.
- 5) Satellite-based ground sensor interrogation, location, and relay system that continually report to a central station have been proven operationally. Ground sensors can be fixed or mobile, and can be tuned to a wide variety of change detection and environmental reporting tasks.

3. Trade-offs

In developing any system concept, one must take into account the need to circumvent various inherent limitations by technical trade-off activities. Total observable area may be traded for enhanced resolution by sensor manoeuvre and even orbital altitude changes for closer look, if deemed necessary. Images at relatively lower resolution can be used to direct those at much higher resolution from another sensor set, aimed at a smaller area of particular concern.

4. Applicability to international security enhancement

- 1) The sensor types noted above appear competent to provide reasonably unambiguous data on significant facilities of interest, such as airfields, ships, lines of communication, bunkers, or fortified positions and large weapons test ranges; these represent relatively slowly changing capabilities, and to monitor rates and direction of change appears routinely feasible.
- 2) Movement of men and materials can be observed with low ambiguity when traffic is concentrated and directional (rather than subsumed in a normal traffic pattern). Depending on the frequency of observation and the rapidity or magnitude of such movement, the sensor set noted above should be able to provide multiple data sources about such observables.
- 3) The existence and location of relatively static forces or material stocks may be observed but probably not measured without significant ambiguities, given normal background clutter and the multi-purpose character of vehicles, buildings, and men.
- 4) There are many classes of events and items of international security interest that must be classed as not observable from space (although circumstantial activities and events may suggest probable purposes): among these are the normal industrial processes carried out in existing indoor facilities, infiltration of men, and the purposes of generally used vehicles or facilities. In addition, it is recognized that countermeasures (camouflage and deceptive actions) can defeat or confuse some of these observation systems.

5. System concept

To arrive at an operational system concept within available technology limits,

space segment and ground segment characteristics as well as operational modes have to be taken into account.

- 1) Space segment. The combination of the performance of the sensors as described is obtained most efficiently in a three spacecraft system, each spacecraft carrying one type of sensor, in orbits suitably spaced in plane and altitude. Sensors on board each spacecraft will have a degree of stable angular manoeuvrability and the spacecraft themselves may have limited altitude change capabilities but no change of plane is presently contemplated.
- 2) Ground segment. The ground segment of the system is essentially composed of a secure data acquisition, processing and dissemination centre. The centre comprises the emit/receive antennae, computer facilities with associated archival and retrieval capability, visualization and reproduction equipment as well as communications hardware.

To ensure continuity of operation in a non-cooperative environment where no support from friendly up-and-down-link installations can be expected, mobile data acquisition and telecommand stations, possibly air-transportable, may be required. In case of inadequacy of data transmission links physical delivery (aircraft) may become necessary.

- 3) Operational characteristics. The operational activity and procedures will cover essentially three types of situations:
 - A) Static conditions. Data acquisition, building up of data banks, routine interpretations, methodological improvements are carried out in a continuous learning process.
 - B) Slow rate of change situations. In relation to situation A) data acquisition is focused more precisely on specific zones, retrieval and interpretation activity increases and periodic data format outputs are performed commensurate with the observable rate of change.
 - C) Rapidly evolving situations. When one or more rapidly evolving situations are notified a priority resource allocation status comes into effect. All system elements including the imaging capabilities of the space segment, the up and down links whether fixed or mobile, the relay facilities to and from the processing centre are activated to enable the data centre to provide, within the shortest practicable time span, the data formats which are appropriate to the situations.

For the system outlined the time span from notification to initial output is estimated to be between 2 and 3 days. In the case of most favourable spatial relationship between satellites and zone to be monitored at the moment of notification this time span can be as small as a few hours. Under worst case conditions the delay in initial output of a meaningful format should not exceed six days.

After initial format output, regular updating and refinement will proceed, following the cycle: acquisition, relaying, recording, preliminary analysis, comparison with previous set of data, conclusions, and progression to the succeeding cycle.

6. Technical development forecast

- A. In the time span 1990-2000 and beyond, several technical developments can reasonably be expected to occur.

The first category consists of products of R&D programmes not related to ISMOS types of operations and include:

- 1) overall improvement of IR sensing capabilities (reduction of detector size and improvement of cooling techniques)
- 2) handling of high to extremely high bit rates and associated on-board storage needs
- 3) on-board data compression
- 4) improved data recording techniques (alternative to tape)
- 5) new techniques for lifting heavy loads to geo-synchronous orbits by slow propulsion from lower orbits.

The second category concerns R&D more directly related to ISMOS types of operation and includes

- 6) development of machine intelligence for improvement of interactive functions and generation of self-correcting capabilities.

These technical developments allow

- improved observation capabilities (1.2.3)
- improved repetition rate of observations, continuous and world-wide monitoring (5)
- improved information capability, faster, better and less ambiguous information with integration of information from different sources (4 and 6).

- B. The design, development, testing and execution of a new satellite system takes 5 to 7 years.

The learning process for a new satellite system and implementation of its full operational capabilities also requires 5 to 7 years, the lifetime of one satellite generation.

ISMOS operations require continuity to serve their objectives. For this reason the second generation of ISMOS satellites should be a duplicate of the first generation with only normal (relatively minor) improvements.

At the time of launching the second generation, around 1990, a decision has to be taken with regard to the development of a third generation. This decision should be based on both the experience gained so far and new technological capabilities, and should include a re-definition of functions and modes of operation of the system.

At this stage a study could be made of possible additional uses of the third generation satellites for other programmes whose information requirements are comparable: disaster relief activation (UNDRO) and WMO programmes.

Schedule and Cost of Deployment and Operation of ISMOS System

	Year	1-2	4	6	8	10	12	14	16	18	20
System Design and Development:											
Space Segment		\$1,000 - 1,500 million									
Ground Segment		\$200 million									
System Operations:											
Satellite Lifetime (phase 1)			-----								
Satellite Resupply (phase 2)							\$500 million			-----	
Data and Information Services			\$125M/Year								
3rd Generation:											
Decision, Design and Acquisition						\$?					
Deployment and Operations										\$? →	

Footnote to table

System cost assessment

Space segment

Optical satellite \$300M. Infrared satellite \$350M.
 Radar satellite \$300M.
 Estimated cost range (including R&D) \$1,000 to \$1,500 million.

Ground segment

Initial investment \$200 million. This includes the analysis centre with its computers, data retrieval and processing systems, plus the fixed and mobile command and data links and transportation.

The running costs

\$125 million per annum. Includes \$55M on trained operations personnel (1000). \$15M on R&D personnel (100). \$25M on software development contracts and the balance for equipment maintenance and small-scale R&D in house.

C. The role and functions of ISMOS

In order that ISMOS may make its greatest contribution to international peace and security it is important that the information acquired be made available, under agreed rules and procedures, in accordance with the Charter of the UN.

In its initial stages the political utilization or application of the data should be restricted to such obvious and necessary special situations as:

- 1) Where an individual country requests information or data about itself to be made available to it or be made public.
- 2) Where two or more countries agree that information or data about them be made available to them or be made public.
- 3) In accordance with the terms of any arms limitation or disarmament agreements.
- 4) Pursuant to any cease-fire ordered by the UN Security Council.
- 5) In the case of any situations, disputes or threats to the peace when ordered by the UN Security Council.

The information gathering, processing and use might best be handled in a manner appropriate to each of the above categories.

Among the many missions or functions where satellite monitoring might play an important role, the following come most readily to mind:

- a) Reassurance and confidence-building as an inducement to enter into agreements.
- b) Verification of compliance with international agreements.
- c) Surveillance as a deterrent to violation of agreements.
- d) Conflict anticipation for preventive diplomacy.
- e) Early warning of preparation for possible attack.
- f) Evidence of aggression (border violations, etc.) for adjudication.
- g) Monitoring of cease-fires and of demilitarized zones.
- h) Communication with international observers.

Certain participants questioned the full effectiveness of satellite technology in undertaking these tasks. They maintained, for example, that for strategic arms limitation, satellite observations are useful in those circumstances when the parties do not camouflage their activities, while for many tactical situations interpretation of confusing detail would give satellite imaging limited value. For crisis situations it is by no means clear to what extent a nation which felt threatened or the responsible international bodies could make effective use of information supplied by ISMOS. These views were not shared by most, who nevertheless agreed that ISMOS could not by itself provide the answers to all the problems mentioned. More affirmatively, some participants stressed the need to consider ISMOS within a wider network of arrangements designed to promote regional and global confidence and security, necessitating a variety of means for their implementation.

D. Constitutional considerations

The original French proposal envisaged that the satellite monitoring system should be established as a specialized agency of the UN. Most participants considered that it was a desirable goal that ISMOS should be a part of the UN system, but some felt that if it were an internal organ of the UN linked to the Security Council that might provide the best chances of

enlisting the cooperation of the two superpowers. Its integration into the UN would most clearly show it to be at the disposal of the widest possible international community, and at the highest level. Moreover, it could operate immediately within an established legal framework of guidelines governing sensitive decisions. However, other participants noted that the US and the USSR, which possess the major satellite capabilities, had expressed reservations or doubts about any ISMOS, and therefore suggested that it might prove necessary to consider alternative ways of initiating ISMOS.

Two other possible models for starting ISMOS were considered. In one, the western European countries would take the initiative, in the light of their technical capabilities, but a much wider group of nations would be progressively involved. In the other, a group of countries acceptable as "neutral" by the potential users would operate ISMOS, buying their technology where necessary, and also involving other (including Third World) countries, in the implementation and decision-making processes.

Some participants wished to know whether, in the absence of the resources of the USA and the USSR, ISMOS would be in a position to accomplish its assigned goals. It was felt that while some of the required technology would be immediately accessible, other aspects would need development effort. This would not be beyond the reach of the consortia of nations considered, provided that enough financial and human resources were brought to bear. It would be necessary for a steady effort to be deployed over a period of years, and this pre-supposed the required political will.

Certain participants emphasized the particular political difficulties which would arise if the two superpowers were not members of ISMOS. Even those disposed towards organizing ISMOS in the first instance outside of the UN hoped that progress made in obtaining the cooperation of the US and USSR would lead towards eventual UN auspices, with full superpower agreement.

E. Political and legal considerations

It was generally recognized that each state or any group of states had the sovereign right to acquire information necessary for its security by any means permitted by international law.

The question of national sovereignty as affected by the overflight of monitoring satellites was discussed in the context of international law. It was pointed out that the international community, despite opposition expressed from time to time, has more or less accepted the existing situation as far as military and earth resources satellites are concerned. The question would, however, become more pointed if such data were transmitted to third parties.

Dissemination of information was felt to pose special difficulties, largely political and legal in nature. To disseminate raw data would discriminate against those nations not possessing the technical means to process it. Many states would object to the automatic dissemination of economic as well as of military information without the consent of the state or states concerned. Some participants felt that these problems might be more readily solved within the UN framework. Others pointed out that the use of previously agreed guidelines for settling disputes about dissemination, together with a case-by-case attention to specific problems was an approach which could be used with success irrespective of the framework of operation.

It was felt that some problems would arise for ISMOS regardless of its institutional framework. These were principally about the sensitivity of data, its safe storage and confidentiality, and its objective interpretation and fair dissemination in accordance with agreed rules. Examples were cited illustrating the importance of verification in the interpretation of satellite data by comparison with information obtained on the ground for co-operating member states. The importance of training image interpreters during the early phases of ISMOS, and obtaining data on a regular basis in order to be able to monitor changes were also stressed in this context.

On the positive side it was noted that as the capabilities of civilian earth resources satellites improved, and a global "open skies" situation was approached, some of the objections raised against ISMOS would lose their force. Some participants were hopeful that ISMOS would prove to be a sufficiently effective component in a global security system that the two superpowers would feel able to act fully and cooperatively with it. All agreed this to be a highly desirable objective that would be attainable if the implementations of ISMOS came to be accepted as an important part of a cohesive policy directed towards the long term preservation and promotion of international peace and security.

F. Conclusions *

1. An international satellite monitoring system (ISMOS) is technologically feasible at the present time, given the necessary political will and economic resources for such an undertaking. From a realistic viewpoint, however, substantial technical, political, legal, organizational and financial obstacles would have to be overcome.
2. Such a system under appropriate circumstances could be an important component of a global security system set up for the purposes of verification of certain arms control agreements, the implementation of decisions of the UN Security Council, and in the management of some military crises.
3. The precise role and function of ISMOS would have to be defined in the treaty or statute establishing the system. This instrument would have to define the rights and duties of the parties and the rules and procedures for the collection, storage, interpretation and dissemination of the data.
4. At best, some years would be required before a highly effective satellite monitoring system could be mounted and be made fully operational. To hasten this process, further steps and studies should be undertaken as soon as possible, and in parallel, to promote this proposal both within and outside the UN framework. The eventual incorporation of ISMOS into the UN system is envisaged.
5. Several optional modalities for the establishment and development of ISMOS should be explored. These should include the extensive use of existing satellites and data collection, analysis and dissemination systems with the ultimate aim of achieving an independent and self-sufficient mechanism which would evolve with experience to meet its objectives and purposes.

* These conclusions, discussed in the final session of the Symposium, represent a consensus among the discussants. However, it should be stressed - in the spirit of Pugwash - that being listed as a Symposium participant does not necessarily imply acceptance of every item in these conclusions as stated.

SPEECH BY ADMIRAL OF THE FLEET THE EARL MOUNTBATTEN OF BURMA

on the occasion of the award of the Louise Weiss Foundation Prize to SIPRI
at Strasbourg on the 11th May 1979

Do the frightening facts about the arms race, which show that we are rushing headlong towards a precipice, make any of those responsible for this disastrous course pull themselves together and reach for the brakes?

The answer is 'no' and I only wish that I could be the bearer of the glad tidings that there has been a change of attitude and we are beginning to see a steady rate of disarmament. Alas, that is not the case.

I am deeply saddened when I reflect on how little has been achieved in spite of all the talk there has been particularly about nuclear disarmament. There have been numerous international conferences and negotiations on the subject and we have all nursed dreams of a world at peace but to no avail. Since the end of the Second World War, 34 years ago, we have had war after war. There is still armed conflict going on in several parts of the world. We live in an age of extreme peril because every war today carries the danger that it could spread and involve the superpowers.

And here lies the greatest danger of all. A military confrontation between the nuclear powers could entail the horrifying risk of nuclear warfare. The Western powers and the USSR started by producing and stockpiling nuclear weapons as a deterrent to general war. The idea seemed simple enough. Because of the enormous amount of destruction that could be wreaked by a single nuclear explosion, the idea was that both sides in what we still see as an East-West conflict would be deterred from taking any aggressive action which might endanger the vital interests of the other.

It was not long, however, before smaller nuclear weapons of various designs were produced and deployed for use in what was assumed to be a tactical or theatre war. The belief was that were hostilities ever to break out in Western Europe, such weapons could be used in field warfare without triggering an all-out nuclear exchange leading to the final holocaust.

I have never found this idea credible. I have never been able to accept the reasons for the belief that any class of nuclear weapons can be categorized in terms of their tactical or strategic purposes.

Next month I enter my eightieth year. I am one of the few survivors of the First World War who rose to high command in the Second and I know how impossible it is to pursue military operations in accordance with fixed plans and agreements. In warfare the unexpected is the rule and no-one can anticipate what an opponent's reaction will be to the unexpected.

As a sailor I saw enough death and destruction at sea but I also had the opportunity of seeing the absolute destruction of the war zone of the western front in the First World War, where those who fought in the trenches had an average expectation of life of only a few weeks.

Then in 1943 I became Supreme Allied Commander in South East Asia and saw death and destruction on an even greater scale. But that was all conventional warfare and, horrible as it was, we all felt we had a 'fighting' chance of survival. In the event of a nuclear war there will be no chances, there will be no survivors - all will be obliterated.

I am not asserting this without having deeply thought about the matter. When I was Chief of the British Defence Staff I made my views known. I have heard the arguments

against this view but I have never found them convincing. So I repeat in all sincerity as a military man I can see no use for any nuclear weapons which would not end in escalation, with consequences that no-one can conceive.

And nuclear devastation is not science fiction - it is a matter of fact. Thirty-four years ago there was the terrifying experience of the two atomic bombs that effaced the cities of Hiroshima and Nagasaki off the map. In describing the nightmare a Japanese journalist wrote as follows:

"Suddenly a glaring whitish, pinkish light appeared in the sky accompanied by an unnatural tremor which was followed almost immediately by a wave of suffocating heat and a wind which swept away everything in its path. Within a few seconds the thousands of people in the streets in the centre of the town were scorched by a wave of searing heat. Many were killed instantly, others lay writing on the ground screaming in agony from the intolerable pain of their burns. Everything standing upright in the way of the blast - walls, houses, factories and others buildings, was annihilated ... Hiroshima had ceased to exist".

But that is not the end of the story. We remember the tens and tens of thousands who were killed instantly or worse still those who suffered a slow painful death from the effect of the burns - we forget that many are still dying horribly from the delayed effects of radiation. To this knowledge must be added the fact that we now have missiles a thousand times as dreadful; I repeat, a thousand times as terrible.

One or two nuclear strikes on this great city of Strasbourg with what today would be regarded as relatively low yield weapons would utterly destroy all that we see around us and immediately kill probably half its population. Imagine what the picture would be if larger nuclear strikes were to be levelled against not just Strasbourg but ten other cities in, say, a 200 mile radius. Or even worse, imagine what the picture would be if there was an unrestrained exchange of nuclear weapons - and this is the most appalling risk of all since, as I have already said, I cannot imagine a situation in which nuclear weapons would be used as battlefield weapons without the conflagration spreading.

Could we not take steps to make sure that these things never come about? A new world war can hardly fail to involve the all-out use of nuclear weapons. Such a war would not drag on for years. It could all be over in a matter of days.

And when it is all over what will the world be like? Our fine great buildings, our homes will exist no more. The thousands of years it took to develop our civilization will have been in vain. Our works of art will be lost. Radio, television, newspapers will disappear. There will be no means of transport. There will be no hospitals. No help can be expected for the few mutilated survivors in any town to be sent from a neighbouring town - there will be no neighbouring towns left, no neighbours, there will be no help, there will be no hope.

How can we stand by and do nothing to prevent the destruction of our world? Einstein, whose centenary we celebrate this year, was asked to prophesy what weapons would be used in the Third World War. I am told he replied to the following effect:

"On the assumption that a Third World War must escalate to nuclear destruction, I can tell you what the Fourth World War will be fought with - bows and arrows".

The facts about the global nuclear arms race are well known and as I have already said SIPRI has played its part in disseminating authoritative material on world armaments and the need for international efforts to reduce them. But how do we set about achieving practical measures of nuclear arms control and disarmament?

To begin with we are most likely to preserve the peace if there is a military balance of strength between East and West. The real need is for both sides to replace the attempts to maintain a balance through ever-increasing and ever more costly nuclear armaments by a balance based on mutual restraint. Better still, by reduction of nuclear armaments I believe it should be possible to achieve greater security at a lower level of military confrontation.

I regret enormously the delays which the Americans and Russians have experienced in reaching a SALT II agreement for the limitation of even one major class of nuclear weapons with which it deals. I regret even more the fact that opposition to reaching any agreement which will bring about a restraint in the production and deployment of nuclear weapons is becoming so powerful in the United States. What can their motives be?

As a military man who has given half a century of active service I say in all sincerity that the nuclear arms race has no military purpose. Wars cannot be fought with nuclear weapons. Their existence only adds to our perils because of the illusion which they have generated.

There are powerful voices around the world who still give credence to the old Roman precept - if you desire peace, prepare for war. This is absolute nuclear nonsense and I repeat - it is a disastrous misconception to believe that by increasing the total uncertainty one increases one's own certainty.

This year we have already seen the beginnings of a miracle. Through the courageous determination of Presidents Carter and Sadat and Prime Minister Begin we have seen the first real move towards what we all hope will be a lasting peace between Egypt and Israel. Their journey has only just begun and the path they have chosen will be long and fraught with disappointments and obstacles. But these bold leaders have realized the alternative and have faced up to their duty in a way which those of us who hunger for the peace of the world applaud.

Is it possible that this initiative will lead to the start of yet another even more vital miracle and someone somewhere will take that first step along the long stony road which will lead us to an effective form of nuclear arms limitation, including the banning of Tactical Nuclear Weapons?

After all it is true that science offers us almost unlimited opportunities but it is up to us, the people, to make the moral and philosophical choices and since the threat to humanity is the work of human beings, it is up to man to save himself from himself.

The world now stands on the brink of the final abyss. Let us all resolve to take all possible practical steps to ensure that we do not, through our own folly, go over the edge.

B. T. Feld and J. Rotblat

THE "TEST EXPLOSION" IN THE SOUTH PACIFIC

The Director-General received the following letter from Professor Galal, on behalf of the Pan-African Pugwash Group.

"In view of: a) the conclusive evidence of a South Africa nuclear explosion as indicated by satellite observation and fallout in Australia; b) the alarming apathy of the nuclear states in contrast to previous incidents; c) the very special risks involved with South Africa's racial

and expansionist policy and its previous suspected involvement in secret cooperative efforts in nuclear explosive and delivery research with Israel and western European scientists, I am proposing that this matter be taken up urgently by the Executive Committee at its next meeting."

The Executive Committee has asked us to look into this matter and to report in the Pugwash Newsletter.

The letter from Professor Galal refers to conclusive evidence but does not give it. In fact, not only do we not know of any "conclusive" evidence, but the various items of information that have been published do not add up to anything even remotely conclusive.

The most detailed study was made by a panel of experts set up by President Carter. In its report, the panel, which included several Pugwashites, concluded that the event observed by the U.S. surveillance satellite was "technically indeterminate". The observation consisted of a double pulse of light, which is characteristic of a nuclear explosion, but which also could be caused by an artifact. Another, independent piece of evidence suggesting an explosion was a ripple through the ionosphere, seen by a radio telescope, at about the same time and from the same direction as the flash seen by the satellite. However, what would have been the most important evidence, namely the finding of short-lived fission products in rain water, which was reported from a New Zealand laboratory, was subsequently stated to be due to a contamination. No other finding of radioactivity has been reported and this weakens considerably the correlation of the light and radio effects with a nuclear test.

Unless, and until, further evidence becomes available, we have to conclude that the probability of the event being due to an artifact is greater than it being due to a nuclear explosion.

This somewhat unsatisfactory answer points to two problems. One arises from the fact that no technically-based system can be 100% perfect. Any monitoring system will occasionally yield an ambiguous response to some signal. But this inherent imperfection of all man-made systems should not call into question the uncontested ability of national verification systems to monitor satisfactorily a universal atmospheric nuclear test-ban agreement. The fact that the ambiguous observation in question occurred in one of the most politically sensitive regions is unfortunate, and should call for a future systematic strengthening of the monitoring capabilities in just such regions.

The second, but related, point concerns false alarms. A nuclear war can start in a number of ways, one of which is by accident. This could result from the false reading of the surveillance instruments. Several such misreadings have been reported in the past. A few months ago a nuclear alert was sounded in the U.S.A. which later was found to have been caused by a wrong program being put into a computer. As the warning time is getting shorter, and the possible severity of a surprise attack is becoming greater, the nervousness on reading a signal on a monitor increases, and pressures will develop for the response to be "launch first, investigate later". Particularly in time of an international crisis, when tension is high and the fear of a nuclear attack is real, an accidental trigger of a warning system could result in a nuclear holocaust.

For these reasons it is important to stress the need to keep cool and exercise great caution not to jump to conclusions based on insufficient evidence.

Publications

FEEDING AFRICA. Proceedings of the 2nd Symposium of the Pan African Pugwash Group (PAPG) held at Cape Coast University, Ghana, 28 May - 3 June 1978. 230 pages, price including postage \$6, PAPG, 4 Ahmed Hishmat Street, Zamalek, P.O.B. 2594, Cairo, Egypt.

If surnames are a reliable guide, about 12 of the 51 participants in this symposium of the Pan African Pugwash Group were not of African origin. As would be expected, most of the participants were from Ghana; unexpectedly, there seems to have been no one from Nigeria although it is the most populous African country. The proceedings contain Group Reports on "Patterns of agricultural development in Africa", "Increasing food production in Africa" and "Education, training and technology in agriculture and food processing". These are followed by 15 papers by named authors.

As is the custom in Pugwash Conferences, strenuous effort was obviously expended on getting agreement for the wording of the Group Reports. This leads to a little equivocation and, sometimes, to the unresolved presentation of conflicting points of view. There is however no equivocation on two issues that are often contentious: the urgent need for birth control, and the shortage of protein in many African diets. Other conferences in "Third World" countries have condemned propaganda for birth control as part of a conspiracy among the "haves" to diminish competition for resources from the "have nots". Here, that point of view is recognized but not accepted as valid. During the last decade, many organizations that ought to know better have argued that protein deficiency is a myth and that all would be well with world nutrition if more of the traditional foods were available. Here, the need for more protein is specifically stated. Most emphasis is put on animal production as a means for increasing the African protein supply, but one paper calls attention to the merits of plant protein concentrates.

Conventional methods for increasing the supply of animal protein, e.g. by making improvements in the breeds of cattle, the water supply and the forage species, are mentioned. The curt dismissal of work on tsetse fly eradication as a "superficial action to keep one's conscience clean" is more unexpected. That work is contrasted with the lack of research on bovine infertility and the 50% death rate of calves. Two interesting papers stress the importance of improving the lot of nomadic pastoralists so as to discourage them from drifting into urban slums. The authors recognize that there is an optimum size of herd for each area and that when, because of human population pressure or for other reasons, larger herds than this are kept, the vegetation on which they depend will inevitably be destroyed. The main means suggested for developing non-destructive nomadism are that rural leaders, rather than urban strangers, should be found to instruct their neighbours, and that nomads should be given adequate incentives to slaughter animals as soon as they have passed the age of maximum weight gain. The essential point that should be brought home to pastoralists is that an animal is an expensive means of storing capital: if it is not producing a calf or putting on weight, it is wasting forage.

These two papers are by Europeans. They illustrate an unfortunate tendency of scientists in "Third World" countries to neglect the improvement of traditional methods and to assume that the methods of the ex-colonisers should be adopted. It is pleasant therefore to find that it is an African paper that advocated small-scale production units. The example chosen is sugar manufacture. A small unit costs a third as much per ton of sugar, and an eighth as much per worker, as a large one.

The position of cash crops for export was one of the unresolved issues. They attract most of the research, occupy the best land, and pesticides etc. get subsidies when used on them. Consequently, in some countries, they generate 50% of export earnings while using only 10% of the cultivated land and employing only 5% of the agricultural labour. No one pointed out explicitly that the real fault with cash crops is that very little of the money they earn gets back to the primary producer. The point was made peripherally in one paper which referred to the 6500 million dollars spent annually by African countries on arms, and in another which stated "If we can do to food crops what we have done to achieve success with export crops, there should be no problem in increasing food production in Africa". That is the solution to the problem of Feeding Africa. If its land and labour were used to produce food for local consumption, rather than to produce profits in other countries, and if that food were evenly distributed, there is no reason to think that any malnutrition would remain.

N.W. Pirie, FRS.

OBITUARIES

We regret to announce the death of the following Pugwashites:

SIR EDWARD BULLARD, of the UK, died on 3 April 1980 at the age of 72. Professor Bullard was a geophysicist of the highest distinction, and for many years he was head of the Department of Geodesy and Geophysics of the University of Cambridge. He was an active Pugwashite in the early years of the Movement, and for a time he was one of the British members of the Continuing Committee (now the Pugwash Council). He took part in the 7th, 8th and 9th Pugwash Conferences, as well as in the special meeting of experts to study the arrangements for a Test Ban Treaty in 1963.

PROFESSOR GORDON MANLEY, of the UK, died on 29 January 1980 at the age of 78. He was a geographer who made important contributions to climatological studies. Until he retired he was Professor of Environmental Sciences at the University of Lancaster. He took part in the 5th Conference at Pugwash in 1959, as well as in the 10th Pugwash Conference in London.

CALENDAR OF FUTURE MEETINGS

1980

- 26 - 29 June Symposium on New Directions in Disarmament, Wingspread, Wisconsin, U.S.A. (for agenda see January 1980 Newsletter).
- 20 - 25 August 30th Pugwash Conference, Breukelen, Netherlands (for agenda see July & October 1979 Newsletter).
- 11 - 12 October Pugwash Workshop on Averting Nuclear War: The Role of the Media, Austria (see below for subjects for discussion).
- 10 - 12 December Symposium on New Weapons Systems and Criteria for Evaluating their Dangers, London, U.K. (see below for agenda).

1981

- March (tentative) 8th Workshop on Chemical Warfare, Bad Saarow (near Berlin), G.D.R.
- 9 - 11 April Symposium on Confidence Building Measures, Hamburg, F.R.G.
- May (tentative) Symposium on The Future of Pugwash, Israel.
- 26 - 31 August 31st Pugwash Conference, Banff, Canada.

1982

- August 32nd Pugwash Conference, Warsaw, Poland.

Workshop on Averting Nuclear War: The Role of the Media,
Austria, 11-12 October

A Pugwash Workshop on crisis management held in December 1978 dealt with political and psychological aspects of nuclear confrontation. One of the conclusions of the meeting was the need for a discussion between scientists, political analysts and media representatives of crisis situations created by the dangerous arms spiral of our days. The urgency of this problem was reaffirmed by a Pugwash Workshop called together in January of this year on the current crisis brought about by the deployment of nuclear forces in Europe and the breakdown in East-West relations.

The theme of the Workshop is "Averting Nuclear War: The Role of the Media". Under this general heading the following distinct, though not unrelated, topics will be discussed: crisis management; European nuclear forces; the Middle East; SALT II; breakdown of détente; nuclear proliferation. The media will attend as full participants and not as reporters.

Symposium on New Weapons Systems and Criteria for
Evaluating their Dangers, London, 10-12 December
Agenda

1. Threshold concepts in current arms-control and military doctrine.
 2. Trends in non-nuclear force in relation to threshold concepts.
 3. Trends in nuclear force in relation to threshold concepts.
 4. Criteria other than threshold concepts for assessing dangers in new weapons developments.
 5. Constraints: Given the existing intergovernmental negotiating fora, how might new criteria for assessing weapons dangers be applied in the negotiation of arms-limitation measures?
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