Pugwash

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Nobel Peace Prize 1995

Eliminating Chemical and Biological Weapons

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Cover: UNSCOM destroys Iraqi CW rockets

UN photo #159092

To the Pugwash Community

On April 1, as participants were gathering in Seoul for the Pugwash workshop on East Asian Security, events some 3,000 kilometers to the southwest were driving home the fact that security relations in the Asia-Pacific region are emerging as the most potentially explosive of any around the world. The mid-air collision between a Chinese F-8 fighter jet and a US Navy EP-3E reconnaissance plane led to a tense 12-day stand-off between the US and Chinese governments before the US crew of 24 was released from Hainan Island.

The diplomatic fraying of nerves over the spy plane incident was followed three weeks later by the decision of the Bush administration to sell advanced weaponry, including diesel submarines and Kidd-class destroyers, to Taiwan, despite heated protests from Beijing. While the Taiwan arms sales did not include such contentious items as Aegis guided-missile cruisers or Patriot PAC-III missiles, US-China relations deteriorated still further, with China accusing the US of "inflammatory" actions.

The Pugwash workshop in Seoul included extensive discussions on issues relating to China, the US, and Taiwan, as well as on the Korean peninsula security situation and the ramifications of national and theater missile defenses for East Asia (see the workshop report on page 33 and essays by John Rhinelander and Li Bin beginning on page 52). During the meeting, George Rathjens and Joseph Rotblat had an opportunity to meet with South Korean President Kim Dae-Jung, while the group as a whole traveled to the DMZ and participated in military briefings at Panmunjom.

Especially noteworthy was a two-day visit to Pyongyang by Joseph Rotblat and Mark Suh, where they met with top government officials and held extensive discussions on reinvigorating North Korean participation in upcoming Pugwash meetings (their trip report is on page 3–4). The trip also included a stopover in Beijing and similar discussions with individuals from the Chinese Pugwash group.

A week earlier, in late March, Pugwash was hosted by the India Pugwash Group for a workshop in New Delhi on the prospects and means for reducing and ultimately abolishing nuclear weapons (the workshop report and relevant articles by Joseph Rotblat and Ejaz Haider are also included in this issue). Following that meeting, George Rathjens traveled to Islamabad for two days of meetings with Pakistani Foreign Minister Abdul Sattar and a wide array of government and research specialists (see page 3).

With the 51st Pugwash Conference this year being held in Agra, India in November, there will be further opportunities to engage policymakers and specialists in detailed discussions and analysis of crucially important security issues emerging throughout the Asian-Pacific region.

Pugwash Governance

Continuous efforts have been underway since late 2000 on a number of issues related to the future of Pugwash. The search committee for a new President and Secretary General, comprised of Michael Atiyah, Ana María Cetto, Francesco Calogero, and George Rathjens, have conferred regularly and will report their progress soon to the Pugwash Council. The new President and Secretary General are scheduled to take office immediately following the conclusion of the 52nd Pugwash Conference in La Jolla, California in August 2002.

Two other subcommittees established by the Pugwash Council at the 50th Pugwash Conference in August 2000, charged with drafting new quenquennial documents on Pugwash goals/principles/structure and publications/publicity respectively, will present drafts of these documents for Council consideration at the Agra annual conference in

November. These bylaws of Pugwash, establishing guidelines for the period 2002-2007, will likewise be adopted at the 52nd Conference in La Jolla in 2002.

Publications, Website, Outreach

The first in a new publication series, *Pugwash Policy Briefs*, will be published in June 2001 and will examine the effects of the US embargo on Cuba on scientific and academic cooperation between the two countries. Featuring an article by Kenneth Bridges, M.D. (see page 24), on the potential benefits for sickle cell anemia research if full and open scientific research were allowed between Cuban and American health specialists, the *Pugwash Policy Brief* will be released at a special session being convened by the American Association for the Advancement of Science, in Washington, DC on June 18, that will examine the broad effects of US policy toward Cuba on the free exchange of information and research.

The Pugwash website continues to expand and incorporate new features, the latest being the hosting of individual web pages for several national Pugwash groups. As of May, web pages were posted for the French, Belgian, and UK national groups, with direct links provided to the separate web sites of Canadian and Netherlands Pugwash, and to ISODARCO. Other national groups are encouraged to contact Anthony Baird (abaird@amacad.org) for assistance in creating additional national web pages.

Acknowledgments

As always, the Pugwash Conferences are grateful to those whose financial support helps Pugwash maintain and expand its publications, including the Cyrus Eaton Foundation, the Italian National Research Council, the German Research Society, and the John D. and Catherine T. MacArthur Foundation. The views expressed by authors and workshop rapporteurs in the *Newsletter* are their own, and do not represent the views of either the Pugwash Conferences or its funders.

The Editors

Sir Michael Atiyah, President of Pugwash, in Seoul

Pakistan, Korea and China

Pakistan

by George Rathjens

With our having had three workshops in New Delhi in the last several years in which nuclear weapons and Indo-Pakistani tensions and differences were prominent issues for discussion, I had felt the need to talk more with Pakistanis about these matters, the more so because not many Pakistanis had been able to travel to India for our meetings there, due to Pakistani governmental restrictions. The importance and urgency of visiting Pakistan was reinforced when we were informed that Tanvir Ahmed Khan, a senior Pakistani who had planned to participate in our most recent workshop in New Delhi would be unable to do so because of health problems.

So, I went to Islamadbad immediately after our March workshop in New Delhi, to meet with Tanvir and with Abdul Sattar, the present foreign minister (and Pugwash participant, having most recently attended the 48th Pugwash Conference in Jurica, Mexico in 1998). Tanvir had also arranged for me to meet with 25-30 Pakistani foreign relations and defense policy specialists at two seminars, and I also spoke, less formally, at a small luncheon hosted by Abdul Sattar. In all three meetings I reviewed what had happened in the New Delhi workshop, but in addition, and somewhat to my surprise, there was considerable discussion—more, it seemed to me, than in the New Delhi workshop—of various arms control proposals, e.g., a fissionable materials cut-off, de-alerting of nuclear weapons, and security guarantees. These discussions reflected broader and deeper interest in such measures than I had expected; and I left Pakistan with a sense that there is a larger and better informed group of international relations/arms control/defense specialists in the country than I had been aware of. Clearly, we have missed a lot by not having more of them involved in Pugwash.

My meetings in Islamabad occurred at the time when the Taliban destruction of the Budda staues in Bamiyan was getting press attention, and when questions were being raised about the efforts of Pakistan and of other countries to influence these activities, and other Taliban practices, that have been widely deplored outside of Afghanistan. We discussed these somewhat, and this has caused me to wonder if there might be a role for Pugwash in trying to influence Taliban behavior by facilitatating communication with the broader world community, even as we have attempted in other instances of so-called "rogue states and regimes".

Korea and China

by Mark B.M. Suh

Sir Joseph Rotblat, the founder and president emeritus of the Pugwash Conferences on Science and World Affairs, and other members of the Pugwash Council paid a visit to the two Koreas and China from April 2nd to April 10th. This visit was timely and significant as US-Chinese, US-North Korean, as well as North and South Korean relations were experiencing difficulties, during a time when the new administration under President Bush was reviewing the overall policy of the Clinton administration with regard to North Korea and was promoting deployment of national and theater missile defenses. Further steps in the high-level dialogue between the two Koreas had also been postponed or cancelled since early March. The purpose of this visit was to get first-hand information about the situation in the region and to engage the two Koreas in peaceful contact, to seek ways and means to improve the situation in East Asia, and to set up a Pugwash National Group in North Korea.

In Seoul, Sir Joseph and other members of the Pugwash Council actively participated in the first Pugwash Workshop on East Asian Security, where 30 renowned experts

President Kim Dae-Jung and Sir Joseph Rotblat

from 11 countries exchanged views on the current situation in the region and sought possible solutions. The Korean media gave him a warm welcome and wrote widely about his life and his activities in Pugwash. He was even awarded an honorary citizenship of Seoul, sister city of his birthplace Warsaw by the Mayor of Seoul, Hon. Ko Keun.

On April 3rd, Sir Joseph, Secretary-General Prof. George Rathjens, and Dr. Mark B.M. Suh, member of the Pugwash Council, were warmly received by President Kim Dae-Jung in his office and spent almost an hour discussing the situation on the Korean Peninsula. Sir Joseph congratulated President Kim Dae-Jung on his Nobel Peace Prize for 2000 and encouraged him to continue his endeavor to end the cold war on the peninsula. Kim Dae-Jung expressed his appreciation and assured his guests that he would continue to seek reconcilation and cooperation with the North.

Shortly after the Pugwash workshop in Seoul, Sir Joseph and Dr. Suh visited China at the invitation of the Chinese People´s Association for Peace and Disarmament (CPAPD). The Chinese hosts stressed the need for Pugwash to pay more attention to East Asia, as the situation was worsening with the Bush administration´s determination to push for NMD and TMD. The Chinese hosts expressed a keen desire to participate and to organize various Pugwash activities in the region.

Sir Joseph and Dr. Suh continued their journey to North Korea at the invitation of the Korean National Peace Committee (KNPC) from April 7th to 10th. They were warmly greeted at the airport by the Vice Chairman of the Korean National Peace Committee, Li Song-Ho, and by Kim Song, secretary-general of the KNPC. In Pyongyang, there was a series of discussions in a friendly atmosphere between the KNPC and the Pugwash delegation.

The highlight of the visit was the high-level political contact with Mr Yang Hyong-Sop, Vice President of the Presidium of the Supreme People's Assembly. In North Korea, the titular Head of State is the President of the Presidium of the SPA, who was abroad at the time. Mr Yang, himself a former President of the Presidium, was the Acting Head of State. An in-depth dialogue focused on NMD and TMD, relations between the USA and North Korea, as well as between the two Koreas. Mr. Yang expressed a strong interest in the creation of the Nuclear Weapons Free Zone in the region and stressed his concern about the new US policy toward North Korea and China. He also showed interest in the conversation which Sir Joseph had in Seoul with Kim Dae-Jung. He expressed his objection to any mediation between the two Koreas by any third party. In the end, he expressed his full support for Pugwash activities, and the participation of North Koreans in them.

There were also contacts with scientists in North Korea. A meeting at the Kim Il Sung University with a number of nuclear scientists, chaired by the Dean of the Faculty of Atomic Energy, was held in a friendly atmosphere. Sir Joseph spoke at length about the history of Pugwash, while Dr. Suh shared his views on security issues in the region and talked about the Pugwash National Group in South Korea. North Korean scientists expressed much interest in the work of Pugwash and a wish to participate in future meetings of Pugwash.

Our visit was too short to get a full view of the country, but it was an important and successful undertaking in establishing relations between Pugwash and North Korea. Sir Joseph succeeded in convincing the North Koreans that Pugwash has an important role in reducing tensions and in bringing peace to Korea. Our North Korean hosts agreed to establish the North Korean Pugwash Group and to participate in future Pugwash activities including this year's annual meeting in Agra, India. Through this brief but important undertaking, Pugwash had and will continue to have a positive impact in this part of the world.

14th Workshop of the Pugwash Study Group on the Implementation of the Chemical and Biological Weapons Conventions: *Key Issues for the Fifth BWC Review Conference 2001*

Geneva, Switzerland, 18-19 November 2000

Report

by Pamela Mills and Daniel Feakes

This was the fourteenth of the current Pugwash workshop series on chemical and biological weapons (CBW), held in collaboration with the Harvard Sussex Program on CBW Armament and Arms Limitation (HSP). Like the six preceding workshops of the series held in Geneva, it was hosted by the Swiss Pugwash Group. Financial assistance for the meeting was provided by the Swiss federal government and by the Canton of Geneva through the Swiss Pugwash Group. The meetings were held on the premises of the Graduate Institute of International Studies, University of Geneva. Participating by invitation were 60 people from 18 countries (Australia, Belgium, Brazil, Finland, France, Germany, Hungary, Iran, Israel, Italy, Netherlands, Pakistan, Russia, South Africa, Sweden, Switzerland, the UK and the USA), all of them doing so in their private capacities. The present report is the sole responsibility of its authors, who were asked by the meeting to prepare a report in consultation with the Steering Committee. It does not necessarily reflect a consensus of the workshop as a whole, or of the Study Group.

The workshop focused on the upcoming Fifth Review Conference of the 1972 Biological and Toxin Weapons Convention (BWC) and the key issues that will be addressed at that meeting, as well as on the continuing progress of the Ad Hoc Group (AHG) toward the negotiation of a legally binding instrument to strengthen and verify compliance with the BWC. There is guarded optimism that this Protocol will be completed before the Fifth Review Conference, scheduled for November-December 2001, despite the contentious issues yet to be resolved. The workshop took place immediately before the twenty-first session of the AHG, the last of the year, which met in Geneva from 20 November to 8 December.

After reports on the general status of the CBW treaties, and activities, initiatives, and new developments in the field, workshop participants devoted their discussion to the technological and political issues that deserve to be addressed by the Fifth Review Conference. These topics included scientific advances, the question of pests and vectors, the definition of "hostile purposes", the status of production facilities, national implementation measures, development of consultation procedures, the continuation of confidence-building measures (CBMs), international cooperation, the ongoing work of the AHG, and other issues such as regional security considerations. Much time was spent examining scientific and technological advances and the question of overlap between the BWC and the Protocol, in regard both to membership and to substance.

Reports on International CBW Activities and Initiatives

Following the custom of previous meetings of the Study Group, the workshop opened with updates on international activities relevant to the implementation of the CBW conventions—the BWC and the 1993 Chemical Weapons Convention (CWC).

CWC: Progress in Implementation

The first report noted the progress in implementation and toward universality of the CWC and the activities of its implementing body, the Organization for the Prohibition of Chemical Weapons (OPCW).

As regards universality of the CWC, the year 2000 saw nearly twice the number of new states join the Convention than in 1999. Since January, eleven states have ratified or

acceded to the CWC, the treaty has entered into force for five states within the last three months—Mozambique (14 September), Kiribati (7 October), Gabon (8 October), Jamaica (8 October), and Yemen (1 November).*

Certain regions in which there are states that have not signed or have signed but not ratified were highlighted, namely, the Middle East, Northeast Asia, and Africa. Israel has signed but not ratified while Syria, Lebanon, Egypt and Libya all continue to adhere to the policy of linkage between their membership in the CWC and Israel's ratification of the Nuclear Non-Proliferation Treaty (NPT). Communication between the OPCW Secretariat and North Korea continues to be difficult but with recent moves toward reconciliation on the Korean peninsula it is hoped that this situation will improve. In Africa, although a large majority of states have either ratified or signed, regional instability, differing priorities, and a lack of procedural mechanisms have been obstacles to achieving 100 per cent CWC universality on the continent.

As concerns implementation, it was reported that all states parties, excluding the five most recent members, have submitted their initial declarations. The submission by the United States of its industry declarations in April and May was also noted. However, it was also mentioned that not all states parties have complied with the obligations to submit annual reports and declarations to the OPCW.

Destruction of chemical weapons by the states parties is proceeding: destruction programs had begun in all four declared possessor states (the United States, Russia, India, and one other state party). Destruction of the US stockpile is running ahead of schedule, while in India and the other state party (which possess smaller stockpiles), destruction activities have kept in line with timelines set out in the CWC. To date, over 5,000 metric tons of agent and 1.3 million munitions have been destroyed and their destruction verified.

The problems with destruction so far have largely been encountered in Russia where a lack of financial resources and infrastructure has slowed down activities considerably.

The problems with destruction so far have largely been encountered in Russia where a lack of financial resources and infrastructure has slowed down activities considerably. The Conference of the States Parties, meeting in its fifth session in May, extended the first of the intermediate deadlines by which Russia must destroy specified percentages of its stockpile of chemical weapons under the terms of the CWC. However, without a significant increase in effort, Russia is in danger of not meeting even those extended timelines.

A total of 61 chemical weapons production facilities in 11 states parties have been declared to the OPCW. Twenty-five of these facilities have been destroyed, while one-third of them are planned for conversion; four have already been converted and seven are currently undergoing conversion. The workshop heard that the Secretariat has carried out 850 inspections at 140 sites in 40 states parties since entry into force. The majority of this on-site activity has occurred at destruction sites; but a large number of industry inspections have also been undertaken. Besides scheduled-chemical sites, 35 missions to plant sites using unscheduled "discrete organic chemicals" (DOC) have been undertaken.

Problems still faced in the implementation of the CWC, in addition to the delay in Russian destruction activities, have been categorized as either unresolved issues (stemming from the Prepcom days) or pending issues (that have arisen since entry into force). Included in this group are efforts by some states parties to restrict or limit the CWC's verification regime, particularly as it applies to industrial sites.

Discussion focused on the issue of "managed access", which states parties have used more often than was envisaged when the CWC was drafted to control the level of access granted to OPCW inspectors at military and/or industrial sites. "Managed access" was originally conceived in order to limit the intrusion on national secu-

* Since the workshop in mid-November, the United Arab Emirates deposited its instrument of ratification with the UN Secretary General in New York. The ratification took place on 28 November, and the Convention will enter into force for the United Arab Emirates on 28 December. With the inclusion of the UAE, all states of the Persian Gulf Cooperation Council will have become States Parties of the CWC.

rity posed by investigations of alleged use and challenge inspections. The workshop heard that some states parties are attempting to narrow the definition of a "facility" so that the OPCW inspectors can only inspect the "core" parts of a facility. Participants also discussed the restrictions on out-of-country sampling and analysis imposed by the United States. Some participants were worried by the precedent that this sets for other states parties and viewed such action as a de facto reservation to the Convention. The recent passage of legislation in India, on 10 May, was cited as an example of a state party placing similar limitations on the activities of the OPCW on its territory. However, others pointed out that the US restrictions still allowed samples to be taken off-site to independent laboratories within the United States where they could be analyzed either by or under the surveillance of OPCW staff.

It was also stressed to the workshop that the programs to provide international assistance and cooperation were both being implemented and under further development. Pledges of assistance from states parties, which are transparent, detailed, and compatible with the resources of other states and the Secretariat, are very much in demand. The provision of assistance, along with the passage of effective implementing legislation will be the next major challenges for the Secretariat. These two issues will be main topics on the agenda for the First CWC Review Conference, to be held in the Spring of 2003. It was also proposed that the Review Conference could assess the OPCW's role in the prevention of chemical terrorism. Activities could include the encouragement of legal cooperation and the international coordination of domestic anti-terrorist agencies.

BWC: Work of the Ad Hoc Group

A Special Conference of the States Parties to the BWC established the AHG in 1994. The Conference mandated that the AHG finish its work at the earliest possible date and report to a further Special Conference. The presentation to the workshop expressed guarded optimism that the AHG negotiations would be completed in 2001, claiming that the Protocol was in a state of "semi-set concrete". Trade-offs are expected in the coming months, but the scope for introducing completely new ideas into the text was seen as very limited. The last round of negotiations in July and August saw the removal of brackets from a large amount of Protocol text. The negotiations recently entered a new phase of work, involving numerous bilateral discussions and a division of unresolved issues into three categories: category 3 issues are those on which strong conceptual differences exist, while category 1 and 2 issues are less divisive.

Eight of the category 3 issues were listed: whether investigations will be launched using a red light or green light procedure; the necessity for randomly selected visits to all declared facilities; the setting of thresholds; modifications to Article I; control over the transfer of toxins and biological agents; establishment of a cooperation committee; the declaration of bio-defence capabilities; and clarification of the procedures to be taken with respect to undeclared facilities.

Subsequent discussion emphasized the importance of concise definitions and clear language in the text of the Protocol. However, some workshop participants were skeptical about the possibility of negotiations on the Protocol being completed in 2001.

UNMOVIC

The UN Special Commission on Iraq (UNSCOM), established in 1991 by Security Council Resolution 687 in order to verify Iraq's compliance with cease-fire obligations to dismantle and destroy its weapons of mass destruction (WMD) programs, evacuated its staff from Baghdad on 15 December 1998. A series of panel discussions, in early 1999, led to the passage of Resolution 1284 in December 1999. This resolution—from which China, France, and Russia abstained—established the UN Monitoring, Verification and Inspection Commission (UNMOVIC). UNMOVIC, under the leadership of Executive Chairman Dr. Hans Blix, was charged with continuing the work of UNSCOM. To date, the main work of UNMOVIC has been training, since they have yet to be allowed to enter Iraq. Two training courses have been undertaken with a third planned for the Spring of 2001. These courses have addressed the historical, cultural, legal, administrative, and political issues related to WMD. One of the numerous criticisms leveled against UNSCOM was its lack of understanding of Iraqi history and the country's societal and political structures, in addition to allegations of a lack of impartiality among the inspectors.

UNSCOM destroys Iraqi 500 kg CW bombs (UN photo #158594)

In its organizational structure, UNMOVIC has learnt from UNSCOM and the Security Council panels established in early 1999. Operations and planning have been separated out from analysis and assessment, and there is a separate unit dealing with information processing. In contrast to UNSCOM, the inspectors who have joined UNMOVIC are wholly employed by the UN and not contributed by individual states. It was estimated that if UNMOVIC received permission to enter Iraq, it could take action within six weeks, with minimal additional training.

Workshop participants speculated on whether Iraq is or is not in legal violation of the BWC, which it did not ratify voluntarily but was forced to do so as part of the Gulf War ceasefire agreement. Some participants also felt that the OPCW should not become involved in Iraq at present as the CWC is a voluntary agreement based on an assumption of compliance. It was also pointed out that, in theory, Resolution 1284 provides for inspections in states that are thought to be aiding Iraq in the continued development of its WMD programs.

At the workshop, it was stressed that far from the impotence ascribed to UNMOVIC by the international media, it has been assiduously preparing to carry out its mandate, and those involved believe that if Iraq allows the UNMOVIC inspectors into the country, much progress could be made in terms of monitoring to prevent reconstitution of Iraq's WMD programs and drawing the country back into the international community.

International CBW Criminalization: HSP Initiative

The workshop was provided with an update on the HSP initiative for the international criminalization of CBW. The HSP draft convention on this matter was published in the December 1998 issue of *The CBW Conventions Bulletin*. The draft text of the convention would make it a crime under international law for any individual, regardless of citizenship or official position, to order, direct, or knowingly to render substantial assistance in the development, production, acquisition, stockpiling, retention, transfer or use of biological or chemical weapons, to threaten the use of such weapons, or to create or retain facilities intended for the production of such weapons. Any person who knowingly commits any of the prohibited acts anywhere, worldwide, would face the risk of apprehension, prosecution, and punishment if found in a state party to the proposed convention.

The HSP draft convention is modeled on recent international conventions now in force that seek to establish universal jurisdiction for such crimes as aircraft hijacking, torture, hostage taking, theft of nuclear materials, and harming internationally protected persons. These conventions, like the HSP draft convention, do not establish international tribunals but instead provide for the specified offenses to be adjudicated in national courts on the territory where the alleged offender is found or to which such person may be extradited. In contrast, the International Criminal Court, expected to be established in The Hague, can accept a case only if the state which has jurisdiction over that case is unable or fails to carry out the investigation or prosecution. As regards chemical weapons, the ICC Statute prohibits, under the category of war crimes, the employment of "poison or poisoned weapons" and of "asphyxiating, poisonous or other gases, and all analo-

gous liquids, materials or devices".

So far, the drafters of the HSP convention have encountered no serious objection to it from the various government officials with which whom they have held discussions. However, no government has yet taken the lead in seeking to refer the draft convention to the Sixth (Legal) Committee of the UN General Assembly for negotiation, to be followed by signature and ratification by states.

Education, especially of future biologists and chemists, as to the potentially deleterious uses of biology and chemistry was deemed essential. Workshop participants emphasized the need to establish a norm in the profession against offensive CBW work. The suggestion was made that perhaps professionals should be required to take a pledge similar to the Hippocratic oath for medical doctors that prohibits engaging in the development or production of CBW.

The Fifth BWC Review Conference 2001

As its main agenda item, the workshop looked at the important issues for the upcoming Fifth Review Conference of the BWC. It first examined the opportunities and challenges to be faced in the coming year. This was followed by an analysis of recent advances in science and technology and discussion on the individual articles of the BWC. The workshop concluded with a look at the work of the AHG.

The Fifth Review Conference will be an opportunity for states parties to extend their understandings of the BWC, to review any relevant new scientific and technological developments, and to address issues arising out of the Protocol negotiations in the AHG.

It was suggested that the Fifth Review Conference could address the perceived "institutional deficit" of the BWC. The creation of interim institutions, such as a Committee of Oversight, assisted by a Scientific Advisory Panel and a Legal Advisory Panel as well as a small secretariat, would greatly enhance the implementation of the BWC and would facilitate the resolution of bilateral and multilateral disputes while providing representation for the BWC within the UN framework. They would also ensure that the BWC received "continuous care" rather than the ad hoc attention paid to it every five years through the review conferences. Eventually, such institutions could be merged with the OPBW, which is to be created by the Protocol.

Past review conferences have failed to establish such institutions and preoccupation with negotiation of the Protocol may prevent the Fifth Review Conference from remedying this shortcoming. However, it would be imprudent to attach the Protocol to a weak BWC regime. One of the largest concerns raised was the overlap between the BWC's CBMs and the declarations which will be required of states parties to the Protocol. An interim administrative body might help to facilitate measures to bring the two regimes into concert.

Advances in Science and Technology (Article I)

The workshop discussed advances in science and technology, particularly genetics, that may impact the BWC and necessitate a strengthening of its mandate. It was largely agreed that the final declaration of the Review Conference should extend the understandings of the Convention in order to facilitate current implementation and determine non-compliance as well as make future adaptation to new technologies possible.

The Fifth Review Conference is expected to reaffirm that the prohibitions contained in Article I of the BWC apply to all relevant scientific and technological developments. If necessary, the final declaration of the Conference should affirm that Article I also covers new terms such as genomics and applies to attacks on plants and animals as well as directly on human populations. It should also be affirmed that Article I applies to all vectors and means of delivery of biological agents, including insect pests.

One scientific development that is integral to the future implementation of the BWC is the increasing knowledge of bio-regulators—substances produced in the body naturally that when introduced unnaturally can cause illness and/or death and their receptor systems. One such bio-regulator, endothelin, is able powerfully to affect blood pressure. Much research has been done on endothelin since its discovery in the late 1980s. It was noted that there is a danger of such research being misused. Like all other new technologies, it is entirely possible that the current biotechnology revolution will also be exploited for hostile purposes.

Genetic manipulations, as recently exemplified by experiments with RNAi and other advances, increas-

ingly have the ability to alter the very nature of living species. It should be recognized that all such bio-active substances and agents are covered by the general purpose criteria of the BWC, the CWC, or both. Even as they advance scientific knowledge and its beneficial applications, scientists must be aware of the deleterious potential of biotechnology

The reasons for and likely groups behind an attack on a state's agricultural or livestock resources were outlined. National or sub-national groups may adopt such an approach as such agents may not be hazardous to the perpetrators, a lower moral barrier is crossed, there may be few technical obstacles to weaponization, and there is the possibility of mimicking naturally occurring events. Modern, industrialized agriculture is especially vulnerable to specific plant pathogens. It was argued that effective national legislation criminalizing attacks on plants and animals and affirmation by the Review Conference that such attacks are covered by the BWC are important to deterring them in the future.

It was pointed out by several workshop participants that such developments are covered by the general purpose criteria of the BWC and the CWC taken together. However, the Fifth Review Conference of the BWC should take special care to ensure that this is clearly reaffirmed.

"Hostile Purposes"

There was a discussion of what is meant by the term "hostile purposes", as it appears in Article I of the BWC. It was affirmed that the term applies not only to such purposes directed by a state against another state but also to hostile purposes as may be directed by a state to populations or groups on its own territory or under its control. As an example, the production of a biological weapon by a state for use in the attack of a village within the territory or under the control of that state would be a breach of the BWC. It was also noted that the bracketed language in the Protocol rolling text that sought to interpret the prohibitions of the BWC as being limited to

The term ["hostile purposes"] applies not only to such purposes directed by a state against another state but also to hostile purposes as may be directed by a state to populations or groups on its own territory or under its control.

hostile purposes directed by one state against another had been removed at a previous session of the AHG.

Deriving naturally from the discussion of science and technology and of Article I, was a discussion of the status of the use of bio-control agents by one country against crops in another. The currently planned use of a biological agent (a fungus) by the United States under the United Nations International Drug Control Programme to destroy coca in Colombia , if requested by the Colombian government, could be viewed as a legitimate effort to destroy illegal crops. Yet, depending on the circumstances, the biological agent may in addition become an anti-insurgency weapon. Preparations intended for such use within a state would then be in violation of Article IV of the BWC which obligates states parties to "prevent and prohibit" those activities detailed in Article I.

Concern was expressed that the CWC exemption of chemical agents for "law enforcement" purposes could undermine the prohibitions of the BWC in relation to novel biological agents, particularly as the CWC contains no definition of the meaning of "law enforcement" or of what chemicals may be used for it. This stands in contrast to "riot control agents", as may be used for "domestic riot control" and which are defined in the CWC. The view as expressed that the exemption for law enforcement can only apply when there is applicable law and only when there is appropriate jurisdiction to enforce it. This condition is met for the use of chemicals in legally administered capital punishment, as was envisaged by the negotiators of the CWC. Beyond that, however, the situation is unclear. For example, what law and what jurisdiction would apply, and what circumstances must be met, to allow national forces engaging in a United Nations peacekeeping mission to use riot control agent munitions?

Production Facilities (Article II)

A brief discussion was held on the provisions of the BWC regarding biological weapons production facilities. Article II of the BWC requires the destruction or diversion to peaceful purposes of "... all ... equipment

UNSCOM in Iraq, 1992 (UN photo 3158594)

and means of delivery...” that was “designed to use such agents or toxins for hostile purposes or in armed conflict.” Article IV requires states parties to take “measures to prohibit and prevent” the development and production of such agents. But the BWC says nothing about biological weapons production facilities and, until now, the status of production facilities under the BWC has not been addressed directly. This was highlighted as a discrepancy between the BWC and CWC. The latter contains much detail on the declaration, verification, destruction, and conversion of chemical weapons production facilities. There seemed to be a broad understanding that when considering the two articles noted above and the purposes and objectives of the BWC, a way should be found for the Fifth Review Conference to affirm that former BW production facilities are to be destroyed or converted to peaceful purposes.

National Implementation Measures (Article IV)

The key to effective implementation of the BWC is national legislation; however, unlike the CWC which requires enactment of penal legislation, the BWC simply requires state parties to take any necessary measures. There is language in the BWC Protocol to require penal legislation. The OPCW has been experimenting with innovative ways to facilitate this process, including integrating implementation of the CWC with the implementation of other regional and global treaties that regulate trade and economic growth. This approach makes it easier for smaller and less developed states to ratify global treaties such as the BWC. Penal legislation making the development or use of biological weapons a criminal act would also aid in the implementation of the BWC and would reinforce the preventive side of Article IV. The Fifth Review Conference should underscore the importance of such legislative initiatives.

Also essential for implementation are educational programs designed to increase awareness of the BWC—its prohibitions and guidelines—among citizens, governments, scientists, and non-scientists. Previous Review Conferences have emphasised this. It was noted that a Federation of American Scientists working group has suggested that wording be inserted under Article VIII Confidence-Building Measures of the Protocol that would require states parties to the Protocol to educate their citizens in areas related to the prohibition of biological weapons. This provision would help keep the public aware of the activities of their governments and would force scientists to consider the ethical consequences of their work. It was noted that beyond international treaties it is societal pressure that will prevent the future development of biological weapons.

Consultation Procedures (Article V)

The issue of consultative procedures under Article V of the BWC was taken up briefly by the workshop. It was pointed out that at the Fourth Review Conference in 1996 it had been stated that twice as many states had or were seeking biological weapons than when the BWC entered into force in 1975.Workshop participants noted how such allegations, when not followed up through the procedures provided for in the BWC, can undermine the Convention. Failure to use the consultative mechanism will lead to its corrosion, which would be unacceptable since consultations contribute much to legitimacy

and provide a forum for the airing of disputes. Some workshop participants supported the idea that the Fifth Review Conference should explore the overlap between Article V and the Protocol, asserting that consultations promote transparency. It was also proposed that the Conference should review the use of the consultation procedure in the case of the 1997 *Thrips Palmi* infestation in Cuba as this was the first occasion on which the mechanism was used.

Confidence-Building Measures

The provision requiring states parties to the BWC to submit CBMs—"measures to decrease secrecy regarding relevant biological facilities and activities in order to prevent or reduce the occurrence of ambiguities, doubts and suspicions"—was adopted by the Second Review Conference in 1986. Since then, only 82 states parties have submitted such information, with participation peaking in 1996, and decreasing steadily in the four (nearly five) years since. The issue has remained largely untouched since 1991, apart from a call for states parties to participate in the CBM regime, made at the Fourth Review Conference in 1996.Within the AHG, CBMs have not been addressed by the last 15 sessions, although language for nearly all the CBMs in force under the BWC have been included in an Annex to the Protocol. This situation begs the question of what the future status of CBMs will be once the Protocol enters into force, and whether those states which are parties to both regimes would be required to submit both CBMs and declarations.

Some parties argue that the CBMs are superseded by the legal obligations of the Protocol, yet this view assumes a 100 per cent correlation between the states parties to the BWC and to the Protocol. If CBMs are to be waived in favor of Protocol declarations, then those states that are not party to the Protocol would be deprived of the information contained in the CBMs. And, the CBMs may be critical to the future Preparatory Commission and OPBW in their planning for the implementation and verification of the Protocol. However, forcing some states to make duplicate declarations is also undesirable.

One proposal to resolve this paradox suggests that states parties to both the BWC and the Protocol submit both CBMs and declarations, and those states that are only party to the BWC would only have access to the information contained in the CBMs. The argument for this system is that the burden of sharing information in a dual system is not all that arduous and such activities promote transparency. It was also stated that the interim institutions—discussed earlier as important to the integration of the BWC and Protocol regimes—could also help process and organize the submission of both CBMs and declarations. It was stated that the CBMs represent an important forum for the exchange of information, transparency, and trust-building between states and should not yet be permitted to lapse. The view that seemed to emerge within the workshop was that CBMs should continue to function at least until 2011, when it is thought that the BWC and the Protocol will be functioning as one integrated regime, hopefully with the same states parties.

International Cooperation (Article X)

Under this agenda item, attention focused on the measures to implement Article X of the BWC in Article VII of the draft Protocol. The workshop heard that many of the principles and statements contained in previous Review Conference final declarations concerning Article X and relating to the promotional aspects of cooperation have been elaborated in the Article VI or VII obligations of the Protocol. Therefore, it is assumed that the language to implement Article X in the Protocol will be a main focus of the Fifth Review Conference. The final declaration of the Fifth Review Conference should acknowledge the value of Article VII of the Protocol in carrying out the international cooperation mandate of the BWC. It was also mentioned that the promotional aspects of Article X have to be balanced with its regulatory aspects. Many developing countries need both to justify their decision to join the BWC.

It was pointed out that the promotional aspects of Article X provide significant motivation for governments and industry to initially support and join the BWC, and that fulfillment of this obligation must be carried out in order for such support to continue. Furthermore, as not all countries are expected to immediately become states parties to both the BWC and the Protocol, reserving some benefits of international cooperation solely for states parties to the Protocol

(under Article VII) may act as an incentive for states to ratify the Protocol thus speeding its entry into force and eventual universality. It was pointed out that the Fifth Review Conference could be an opportunity for those states actively involved in the AHG to demonstrate the benefits of the Protocol to states not participating in the AHG.

Consideration of the Work of the Ad Hoc Group

The workshop next addressed the ongoing negotiations in the AHG and considered some issues that may facilitate the completion of the Protocol. One suggestion was that the Protocol should include language permitting the use of aerial imagery and open source information. While the information provided by these sources may be of little use in uncovering illicit development and production activities, it could prove valuable in the conduct of field investigations and to investigations of alleged use and could also help states parties demonstrate their compliance. Aerial imagery proved useful in UNSCOM's work in Iraq as an adjunct to other sources of information.

The workshop next heard that the Protocol could serve as a model for future international treaties involving private industry. Within the next 25 years, a number of treaties, for example those that deal with environmental pollution, workers' safety, and workers' rights, are likely to mandate the significant involvement of industry and industrial facilities. Such treaties could even encompass verification mechanisms similar to the regime of declarations and random visits now being discussed in the AHG. It was suggested that the concerns of industry regarding the loss of confidential business information could be allayed by "managed access" concepts similar to those employed in respect to the CWC, national implementing legislation, and a slow phasing-in of the OPBW's activities.

Future Work

The Study Group hopes to hold its fifteenth workshop in the Netherlands during the first half of 2001, possibly close to the start of the next session of the Conference of the States Parties to the CWC. One proposal was that the next workshop should focus on the progress in implementing the CWC to date and contribute to the review process, which culminates in 2003 with the First CWC Review Conference. The second workshop in 2001 will be held in the fall in Geneva and will focus on the then imminent Fifth BWC Review Conference. Workshop participants also recommended that the Study Group should address the moral dimension of the work both of Pugwash and of the CBW disarmament regimes, and that it should examine the proper role of the academic and non-governmental organization (NGO) communities in these regimes.

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Papers

Marie Isabelle Chevrier (USA): *The US Position in the BTWC Protocol Negotiation : The new Presidential administration*

Malcolm Dando (UK): *Genomics, Bioregulators, Cell Receptor Research and Potential Biological Weapons: Considerations regarding the scope of Article I of the Biological and Toxin Weapons Convention (BTWC)*

Iris Hunger (Germany): *Confidence-Building Measures under the Biological and Toxin Weapons Convention : Current status, future importance*

Lynn C. Klotz (USA): *Thoughts on the Model Role of the BWC Protocol in Future Treaties*

Jez Littlewood (UK): *Article X Issues at the Fifth Review Conference: The Promotional Aspects of Co-Operation*

Oliver Meier (Germany): *Aerial Imagery and the Verification Protocol for the Biological Weapons Convention*

Matthew Meselson (USA): *The Meaning of "Hostile Purposes" in the BWC*

Graham S. Pearson (UK): *The Fifth BTWC Review Conference: Opportunties and Challenges*

Graham S. Pearson (UK): *Production Facilities: A BTWC/CWC Discrepancy*

Barbara Hatch Rosenberg (USA): *On the Education of Scientists*

Nicholas A. Sims (UK): *Interim Supportive Institutions for the Biological Weapons Convention: The case for a representative body and advisory panels, pending institutional integration with the eventual Protocol Organisation (OPBW)*

Mark Wheelis (USA): *Agricultural Biowarfare & Bioterrorism: An analytical framework & recommendations for the Fifth BTWC Review Conference*

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Jean Pascal Zanders (Belgium): *The Proliferation of Biological Weapons: A Threat Assessment, , prepared for Disarmament Forum UNIDIR*, SIPRI, last revision: 26 July 2000 (http://www.sipri.se)

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Medical Research in Cuba: *Strengthening International Cooperation*

Havana, Cuba, 15–17 February 2001

Report

by Amina Aitsiselmi

"Public health and medicine are social interventions, and politics are public health in the most profound sense" —Virchow

The Pugwash workshop on *Medical Research in Cuba: Strengthening International Cooperation*, took place from 15-17 February 2001 in Havana, Cuba and was hosted by the Cuban Pugwash Group. More than 30 participants from seven countries attended the workshop. The meeting opened with welcoming remarks from Lic. Orlando Fundora Lopez, President of the Cuban Pugwash Group, and Prof. George Rathjens, Secretary General of the Pugwash Conferences.

Medical and Biotechnology Research in Cuba

The workshop began with an overview of Cuban achievements and the current state of Cuban biomedical research. Beginning in the early 1960s, biotechnology and medical research became a top priority of the Cuban government, with over one billion dollars invested in biotech R&D in the 1990s alone. Today, Cuba boasts a ratio of 1.8 scientists per 1000 inhabitants, a level comparable to the European Union (though with a far smaller GDP). Cuba also holds 400 patents in the biotech field.

In 1965, Cuba's national Center for Scientific Investigation was founded, leading the way for the opening of numerous other research facilities. Today, there are 38 biotech centers, grouped together in a science park to the west of Havana, which integrate research, development, production and marketing. A highly focused research strategy has enabled the country to eradicate numerous diseases and to control epidemics in remarkably short periods of time. For example, soon after the outbreak of a dengue epidemic in the early 1980s, Cuban scientists discovered that their own interferon, which had been perfected in under two months, was effective against internal bleeding resulting from dengue fever. Vector control measures are now in place and Cuba is currently free of the disease.

As a result of its overall strategy, Cuba's research effort has produced a variety of products ranging from vaccines and cancer therapy drugs to fetal monitoring equipment. Some of the many examples include:

- Monoclonal antibody and interferon, for the treatment of cancer and viral diseases;
- Anti-meningitis B and hepatitis B vaccine (both have been certified by the WHO);
- Recombinant streptokinase for the treatment of heart attacks;
- biomodulin-T;
- blood derivatives (albumin, anti meningococcal immonuglobulin);
- vaccines (rabies, small pox, tetanus, diphtheria; salmonella tiphi).

Cuba also has several products in the pipeline, including: combined vaccines, cholera vaccine, cancer vac-

cines; AIDS vaccine; new radioactive monoclonal antibodies; interleukin-2; and new interferon combinations, all currently undergoing clinical trials.

Workshop participants asked about quality control and safety standards, and were told that Cuba abides by World Health Organization (WHO) standards and that a WHO certification team visited Cuba's Center of Genetic Engineering and Biotechnology production facility in November 2000 to assess the Hepatitis B vaccine, which the WHO plans to purchase from Cuba in the future. At present, Cuba exports its products to over 20 countries, including the UK and Canada, and is therefore subject to the scrutiny of their regulatory authorities. Mention was also made as to lengthening drug timelines in the evolution from research to product development to marketing (8 years in the 1960s from the preclinical stages to the marketplace, 12 years or longer in the 1990s). There was also discussion about the effects of the WTO *TRIPS* agreement on biotech research in developing countries as well as the negative consequences of that agreement on access to drugs and healthcare.

Questions were raised as to how the Cuban experience in biotech could be replicated in other developing countries. It was noted that Cuba employed a positive 'strategic intention' strategy: it invested in a variety of projects, both short-term (low risk-low reward) and long-term (high risk-high reward). An example of the latter is the meningitis B vaccine which Cuba started developing in the 1980s to tackle its meningococcal epidemics. The result was both a resolution of domestic health problems as well as the development of products which can be marketed on a global level, generating a positive cash flow for the country. Export of the meningitis B vaccine (and now the Hepatitis B vaccine) provides income which is both reinvested in research and used to develop local vaccination programs.

Infectious Diseases and Vaccination Programs

Cuba has a rich experience in terms of handling infectious diseases, being the first country in the world to eradicate smallpox (1923) and polio (1962). Other diseases which were endemic but have all been eradicated include cholera, yellow fever, bubonic plague, malaria, diphtheria, measles, rubella, and mumps. Other diseases such as meningeal tuberculosis, whooping cough and tetanus have been reduced to levels of around one case per 10,000 inhabitants. Cuba's success in dealing with infectious diseases, despite being a developing country, is such that the country's leading causes of mortality are heart disease and cancer, respectively. Many of Cuba's health indicators match those of a developed country, and in a 2000 WHO report, Cuba's Public Health System ranked 39 out of 191 countries.

Cuba exports its products to over 20 countries, including the UK and Canada, and is therefore subject to the scrutiny of their regulatory authorities.

Cuba created its National Immunization Program in 1962. Today, it is one of very few countries in the world to vaccinate 100 percent of its population against 12 different diseases. The meningitis B vaccine, unique in the world, was developed at the Carlos Finlay Institute in the 1980s and is now administered to all infants over three months. This has contributed to a 93 percent reduction in morbidity related to meningococcal disease.

[Editor's note: As a result of the workshop, several participants from outside Cuba decided to nominate Cuba's National Immunization Program for the 2001 Gates Award for Global Health, being given by the Bill and Melinda Gates Foundation.]

Infectious diseases are responsible for more than 17 million deaths a year worldwide (as of 1997), half of these being children under 5 years of age. In low income countries, 45 percent of all deaths (63 percent for children) are due to infectious diseases, with the most deadly being Acute Respiratory Infection (3.5m), AIDS (2.3), diarrhea, TB, and malaria. A majority of these could be prevented with existing, cost-effective strategies, but one-third of the world's population lacks access to essential drugs. Moreover, the WHO has no guidelines at present to curb excessive use of antibiotics in countries where they are available to prevent the development of anti-microbial resistance.

Cuba's public health system has developed strategies to tackle infectious diseases against which there is no vaccine. Prior to 1960, malaria

was endemic among the two million Cubans living in Oriente and the eastern provinces. In 1962, the National Service for the Eradication of Malaria was established, and five years later, the last autochthonous case was reported. The campaign was based on vector control measures (DDT spraying, which Cuba banned in 1970, two years before a similar ban in the US), epidemiological control of each focus of transmission, and epidemiological surveillance of febrile patients in the whole country including the rural areas. There is now a surveillance system for imported cases.

Diarrheal disease and Acute Respiratory Infections are the most important infectious diseases in Cuba, even though the country has a very low rate of antibiotic resistance. There is also no multi-drug resistant TB. The unavailability of antibiotics due to the US embargo and subsequent drug rationing strategies may have a part in this, but no research has been done. Wide spectrum antibiotics are under clinical trials in Cuba.

Cuba has a very low rate of HIV transmission, and maintains a low incidence rate of around 7 per million (PAHO-1995). HIV patients are offered the opportunity to attend sanatoria where they can receive treatment and are educated about the disease and learn to live with it. Attendees continue to receive their salary during this period. Could education also contribute to the low prevalence (3200 AIDS cases)? In 1959, only 25% of Cuba's population was literate, and only two or three scientific institutes and one medical school existed. Now over 98% of the island's children regularly attend school and there are 22 medical faculties.

The role of education in cutting HIV transmission lines was brought into question when mention was made of Zambia, where the highest HIV/AIDS transmission rates are found among university graduates. Discussion also focused on the importance of national leadership, with Uganda mentioned as a positive example of how political leadership can affect public health. In Uganda, important state figures publicly admitted that the country had an HIV/AIDS problem, which helped galvanize political and public momentum to tackle the situation. This contrasts with the situation in South Africa, where the government only recently acknowledged the links between HIV and AIDS.

The US Embargo

In place since the early 1960s, the US embargo against Cuba is the only embargo in recent history that has explicitly included food and medicine, compared even with international embargoes against Iraq and North Korea. In so doing, US policy is in direct violation of Article 4 of the Geneva Convention, Article 12 of the UN Charter on Human Rights and various other international human rights accords.

With the fall of the USSR, Cuba's public health financing experienced a dramatic reduction, from over $250m a year in the late 1980s to $65m in 1993, only rising slowly to around $160m in late 1990s. The situation was aggravated by increased pressures on the public health system, including an aging population, increasing numbers of doctors and health practitioners, and increasing numbers of surgical procedures. The situation was further exacerbated by the US embargo (e.g., Cuba pays substantial shipping costs for imported materials because the US embargo requires that no freighters docking in Cuba may visit a US port within six months). As a consequence, imported pharmaceuticals soak up around 52% of Cuba's public health expenditure.

The country responded by taking a number of important measures to ration and distribute its drugs more effectively around the country. Cuba implemented a program of import substitution and domestic production of drugs, encompassing a total of 422 pharmaceuticals at a cost of $75m. Cuba also designed and developed a Natural and Traditional Medicine Program (NTMP), covering acupuncture, homeopathy, phytotherapy and hydrotherapy. The National Medicines Program was also forced to more tightly control prescriptions, banning drug dispensing from hospitals and restricting doctors' affiliations to only one pharmacy in order to prevent false prescriptions.

Although import substitution tactics have saved millions of dollars, Cuba nonetheless has to implement a VEN (Vital, Essential and Non-essential) system of drug classification and struggles to satisfy the population's need. In addition, such basic drugs as Ibuprofen, Vitamin E and Erythromycin are not available in the country.

Prior to the 1990s, Cuba was able to minimize the impact of the US blockade by purchasing drugs in both western and eastern Europe. Follow-

ing the collapse of the Soviet Union, East European supplies, as well as hard currency to purchase drugs in western Europe, dried up. Moreover, the 1990s witnessed a period of smaller European pharmaceutical companies being bought out by US companies, and thus coming under the terms of the embargo. This situation was further compounded by the signing of the "Cuban Democracy Act" of 1992 and its effect on food and medicines, including:

- a ban on subsidiary trade, where European companies that are subsidiaries of US companies may no longer sell to Cuba;
- a licensing provision permitting the sale of drugs for humanitarian reasons which was so arduous and protracted it had no practical benefit;
- the prohibition on foreign ships docking in the US if they have visited Cuba in the previous six months.

The passage of the Helms-Burton Act in 1996 further tightened restrictions in that various components of the embargo could only be changed by an act of Congress rather than by executive order. This legislation was especially damaging as it also targeted the biotechnology sector, which had proven such a success scientifically and financially for Cuba.

In 1995 the American Association for World Health undertook a comprehensive year long study of the impact of the embargo on the health of Cuban people. This document provided hard data for those seeking to exclude food and medicine from the embargo, including:

- a widespread shortage of nearly all pharmaceuticals (only 889 of the 1297 medications available in 1991 were now available, some intermittently);
- degradation of the island's water supply due to a lack of access to water treatment chemicals and spare parts, which resulted in a rise in mortality and morbidity;
- serious nutritional deficits, particularly among pregnant women, due to the ban on foodstuffs;
- constraints on the exchange of information due to travel restrictions, currency regulations, etc. Although information materials are theoretically exempt from the embargo, scientists and citizens of Cuba, the US and other countries suffer as a result (one of the Cuban participants at the Pugwash meeting noted that a condition for him to attend a professional meeting in the US was to drop his Cuban nationality).

One of the unintended benefits of the embargo for Cuba is that the country has developed a remarkable self-reliance in terms of both healthcare and biotechnology.

Are there political opportunities in the US for changing the embargo? While there has been some political momentum in recent years toward partial or full lifting of the embargo (among US food and drug companies, human rights groups, and even in Congress), the Bush administration and the Republican-controlled Congress give no indication of acting anytime soon.

One of the unintended benefits of the embargo for Cuba is that the country has developed a remarkable self-reliance in terms of both healthcare and biotechnology. Given severe resource constraints, Cuba has emphasized the fundamentals of medical practice (physical diagnosis and clinical judgment) and the implementation of a model public healthcare system. Thousands of medical students from the Caribbean, Latin America and elsewhere study in Cuba, including many from the US under the auspices of the organization MEDICC (Medical Education Cooperation with Cuba). Despite these programs, the fundamental violation of human rights imposed by the embargo remains unchanged.

Opportunities for International Cooperation:

Meningitis B

In the early nineties, Cuba's Carlos Finlay Institute finalized research on its anti-meningococcal B vaccine and started immunizing its population. The VA-Mengoc-BC vaccine was tested by a double-blind trial on 106,000 Cuban adolescents (10-16 years). The vaccine is now registered in 19 countries, with 45 million doses administered (85 percent in children under 5).

The anti-meningitis B vaccine, unique in the world, caught the attention of the pharmaceutical company, SmithKline Beecham (now Glaxo SmithKline), which subsequently reached an agreement with the Finlay Institute to market the vaccine globally. The Finlay Institute retains the vaccine patent and control over R&D,

production and quality assessment capacities in Cuba.

Given the size of the US market, there was obvious interest in being able to market the vaccine in the US, a suggestion which Cuba welcomed. Currently, there are some 3,000 cases of meningitis (300 fatalities) a year in the US, many of which could be prevented by immunizing children and teenagers, particularly in high risk areas.

Although the initial US government response was negative, SmithKline Beecham managed to galvanize enough scientific and medical support to demonstrate that the Finlay vaccine was the only option available on the market. After two years of negotiations, SmithKline Beecham received a license from the US Treasury Department allowing them to finalize the deal with Finlay and bring the vaccine to the US market, providing these vaccines were produced in SmithKline Beecham facilities. Other conditions were imposed by the US as well, including minimizing the hard currency that the Carlos Finlay Institute could received (i.e., part of the royalties must be paid in kind, through delivery of medicines and other materials to Cuba). Additional trials for the vaccine are now being completed in Europe and New Zealand.

Of course, the conditions imposed by the US on Cuba and SmithKline Beecham would cease if the embargo is lifted. Along with the financial benefits received by the Finlay Institute, there is also the political and symbolic importance of a developing country vaccine being used in the north. As one participant noted, the VA-Mengoc-BC vaccine is a good example of the need to "step beyond narrow international constraints to work for a higher purpose and the benefit of humanity". Other potential areas of joint research in which international collaboration would be particularly useful were noted as well, including: sickle cell disease, AIDS, clinical research methods, food and nutrition studies, and traditional medicine trials.

Sickle Cell Anemia

In the case of sickle cell anemia, Cuba has a strong research track record for two important reasons: its racially diverse population provides an interesting gene pool to investigate, and the primary care system provides excellent tracking of patients with the disease, even those not hospitalized. As a result, Cuban researchers have established that partial splenectomy is a better alternative to total splenectomy, reducing the need for hospitalization and transfusion, and recent double blind clinical trials have shown antisickling activity of the compound vanillin for the first time *in vivo*.

Established treatments of sickle cell disease include hydroxyurea, which was first used for sickle cell disease treatment in 1986-87. However, it took another ten years for extensive clinical studies to be completed. It was noted that international cooperation on such trials could have sped up the process, and that cooperation between countries with a strong interest in the disease (the US, Cuba and France, especially) could advance testing and clinical trials of new medicines. The US is, of course, a major force in organizing multinational trials, but Cuba is prohibited from participating because of the embargo, and the US Federal Drug Administration will not recognize Cuban institutes as partners for such trials. Here again, the embargo not only affects the target country, Cuba, but has wider repercussions on international research and global health.

Global Networks, Cooperation and Medical Ethics

This session opened with a theoretical overview on the meaning and utility of networks, which were defined as being complex interactive systems which are non-hierarchical, open-ended, dynamic, based on mutual benefit, and inherently chaotic (the butterfly effect). Networks were identified as part and parcel of the 21st century, being post-Newtonian and more in line with Heisenberg's uncertainty principle; i.e., part of a probabilistic rather than mechanistic universe. Increasingly, modern networks are technology-driven, transnational, trans-cultural and multidisciplinary.

The purposes of networks include exchanging technical and scientific information; the testing and sharing of experiences; and exploring new approaches and solutions to scientific and social problems. At the same time, networks pose challenges to traditional concepts of national control and sovereignty, intellectual property, standards of order, and political leadership. Networks operate through understanding the principle of "boundary conditions", including shared missions and values

and commitments to interchange and a willingness to change.

Effective networks use information and ideas which serve multiple needs, have straightforward access, facilitate feedback and revision, and encourage a wide range of participants. These are the goals the *Global Health Council* has been working towards in order to improve equity in global health. Major tools used for networking include diversified loose-knit organizations, interactive meetings, the internet, and outreach.

In Cuba, a networking strategy has been applied within the public health system via both telematic and internet communication, encompassing one national node, three regional nodes and ten provincial nodes. Similarly, the University Medical School of Cuba incorporates tele-education, tele-medicine, and off-site research in its programs. The Cuban *Infomed* network seeks to provide universal access on issues of health and education, stressing prevention rather than cure.

There are currently two *Infomed* website projects: 1) a virtual library; and 2) a virtual university, both aiming to improve access especially in more remote, rural areas (utilizing local computer laboratories). Cuba's *Infomed* could also help provide consultation services, surveillance of epidemics, and respond to different constituents (public, students, community health workers, academics and professionals).

It was noted that although equity is essential to health, developing countries are handicapped in access to communications technologies, the North-South digital divide being the most dramatic of all inequities in health or income. Tens of millions have access to the world wide web in America, whereas only thousands do in most African countries and usually at a slow intermittent rate. Telephones and personal computers are present in less than one percent of homes in low-income countries, and the increasing gap in wealth distribution holds out little promise of increasing access anytime soon.

The point was made about extending *Infomed* services for international access. This could be particularly useful in exchanging scientific information between different groups. *Infomed* plans to translate its information into English and Portuguese. Yet *Infomed* also shares the same problems of quality of information as other internet information services, and the ethical issues attached to such rapid dissemination of (at times unverified) information and technological developments are ones that face humanity as a whole.

The purposes of networks include exchanging technical and scientific information; the testing and sharing of experiences; and exploring new approaches and solutions to scientific and social problems.

The internet is revolutionizing information flows. The cost of sending journals every week for a year to Africa for example exceeds $70, whereas that of giving access to electronic editions is zero or close to it. What is more, those in poor countries can access electronic journals at exactly the same time as those in the developed world, and they can access what is relevant rather than the selection that was sent.

Successful information flow is always two-way; through the internet, servers such as PubMed, BioMed Central etc. make it easier for those from the developing world to bring their research to the world's attention, as well as to actively participate in debates on health and research. One of the main obstacles to full participation is that of sustainability, not solely in terms of financial of investment but also, as was identified for Cuba's *Infomed*, of having a critical mass of users. The way forward would be to exploit the full interactivity of internet services such as *Infomed*, enabling rapid feedback and change to continuously mould information flows into useful knowledge.

Concluding Remarks

A wide range of international efforts are underway to strengthen research capacity in developing countries, by the WHO, various NGOs, as well as foundations such as the Rockefeller Foundation. The most important lesson drawn from the Pugwash workshop in Cuba, however, was the contribution that developing countries can make to world health. Cuba is a specific and brilliant example of how scientific and medical developments can be made to address the country's problems and how these can be exported for the benefit of people elsewhere. Accordingly, it is particu-

larly unfortunate, as well as ethically wrong, that the US embargo hinders Cuba's full participation in international medical research and healthcare. Several participants noted the essential rationale of Pugwash in working to overcome political, institutional and cultural barriers for the common benefit of humanity.

The workshop concluded with various suggestions for follow-on activities, including: maintaining contacts as an important factor for long-term influence; drafting a policy report on the negative effects of the embargo, not just for Cuba but for international medical cooperation; posting the report on the Pugwash Forum of the Pugwash website to stimulate comments and elicit other examples of the negative effects of the embargo; disseminating such information to other NGOs and the media; and providing assistance to the American Association for World Health in the preparation of an updated report on the embargo's effects.

It was also recommended that Pugwash coordinate its work with the American Association for the Advancement of Science (which acts as a clearinghouse on scientific exchange with Cuba) and consider holding a seminar on Cuban medical research at the National Institutes of Health. Pugwash could also work with International Student/Young Pugwash in supporting the exchange of medical students with Cuba.

From a Caribbean perspective, a different but related issue raised was that of exploring the effects of the US embargo on Caribbean drug trafficking, given that Cuba is not allowed to contribute its resources and experience to such efforts. The suggestion was also made to explore the feasibility of a joint project involving the English-speaking countries of the Caribbean with US and UK participation.

Despite the twin constraints of a developing country economy and the US embargo, the Cuban medical research community and public healthcare system have much to offer both their immediate neighbors and the wider international community. To that end, international NGOs such as Pugwash have a special role to play in facilitating the free and open exchange of information and research with their Cuban counterparts.

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Papers

WORKING PAPERS

Amina Aitsiselmi (Algeria): War, Trade and Health: Cuba under the US Embargo

Peter G. Bourne (Grenada), Michele Frank, Gail Reed (USA): The US Embargo and Its Effects on Medical Cooperation

Lee A. Crandall (USA): Biotechnology and Information Technologies: Ethical Issues Associated with Rapidly Developing Technologies

Gustavo Kourí Flores (Cuba): The Cuban Historical Experience with Malaria, Poliomyelitis, Dengue and Meningoccocal Meningitis

Julián Pérez Peña (Cuba): Embargo Effects on New Medical Treatments Availability

Eugenio Selman-Hussein: Towards Medical Excellence

Eva Svarch, Porfirio Hernández, José Manuel Ballester (Cuba): Sickle Cell Disease

BACKGROUND PAPERS/ DOCUMENTS

Norma McFarlane-Anderson, Andrea Wierenga, Moniac Smiokle, Horace Fletcher, Carole Rattray, Sharmaine Mitchell: Cervical Cancer in Jamaican Women: Genetic and Dietary Factors

P. Mwaba, A. Ustianowski, M. Scarborough, S. Portsmouth, J. Pobee, A. Zumla, R.E. Mtonga: The Clinical Presentation, Natural History and Cumulative Death Rates of 230 Cases of Primary Cryptococcal Meningitis in Zambian AIDS Patients Treated under Local Conditions

S.W. Nam, M.L. Stracke, T. Clair, C. Campo, L. Liotta, E. Schiffmann: Some Molecular Features of Metastasis

Agustín Lage Dávila: Overview of Biotechnology and Medical Research in Cuba

Sickle Cell Disease in Cuba: Effect of the US Embargo

Paper

by Kenneth R. Bridges, M.D.
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The United States has maintained an economic embargo of Cuba for 40 years. The world's geopolitical landscape has changed dramatically during this time. President Nixon opened the door to mainland China in 1972. We now have a brisk and growing trade relationship with the world's sole remaining major communist economic and military power. The collapse of the Soviet Union and the disintegration of the Warsaw Pact transformed the economic and strategic face of Europe. Poland, Hungary and the Czech Republic have joined NATO as democratic states.

The Cuban economic embargo is a relic of a world that exists now only as a specter in nightmares of aging anachronistic Cold Warriors. An examination of the biomedical impact of the embargo is long overdue. Unlike political dogma, illness, injury and suffering know no national boundary. Sickle cell disease is a scourge both in the United States and Cuba. The embargo has injured people suffering from the disease in both nations.

An Overview of Sickle Cell Disease

Sickle cell disease results from a mutation in the b-globin gene that substitutes a valine residue for glutamic acid at position 6. This single alteration profoundly changes the biophysical properties of the hemoglobin molecule. Hemoglobin (inside red blood cells) picks up oxygen in the lungs and releases it to the peripheral tissues. Normal and sickle hemoglobin bind and release oxygen identically.

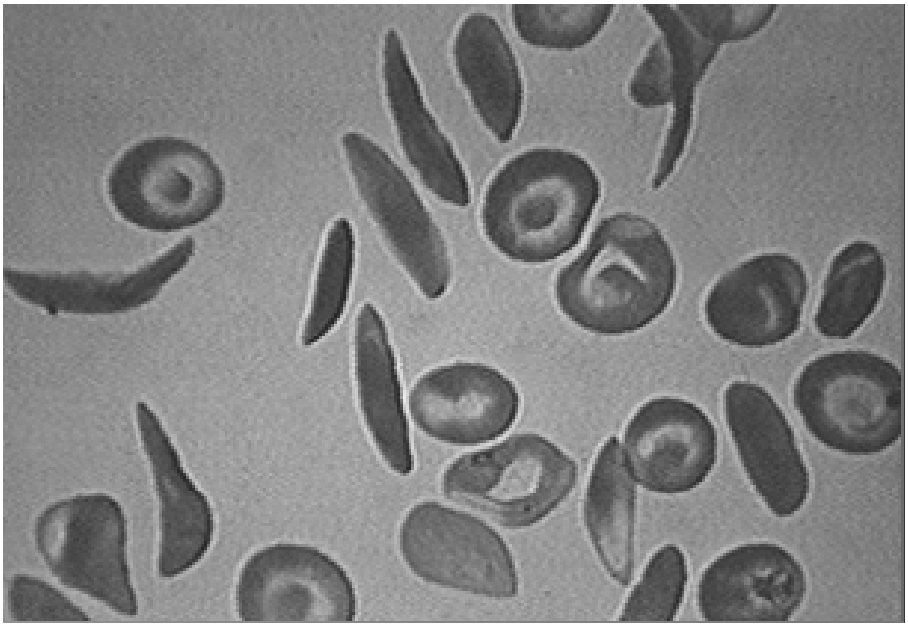
The key difference between the two molecules is their behavior after oxygen is released. Deoxygenated normal hemoglobin retains its solitary existence in the red cell. In contrast, deoxygenated sickle hemoglobin molecules adhere to form long chains or polymers. The molecules in the polymers dissociate when the red cells return to the lungs and pick up oxygen. The sickle hemoglobin polymers form stiff rods that stretch and distort the red cells. These distorted cells can obstruct blood flow through the small vessels in the tissues. The restricted oxygen delivery to the tissues damages cells, injures organs and produces pain.

Pain is the primary manifestation of sickle cell disease. The disorder varies tremendously in severity. Some people have only occasional pain episodes that require nothing stronger than over-the-counter pain relievers. Other people experience pain of such severity and frequency that only powerful, long-acting narcotic analgesics provide relief.

Poor tissue oxygenation damages organs. Sickle cell disease can injure every organ in the body. Strokes, bone degeneration, chronic leg ulcers and kidney failure are a few of the many problems that can follow in the wake of sickle cell disease. Sickle cell disease begins to produce problems in the first 6 to 12 months of life. The condition often waxes and wanes in severity over the course of a person's life. Fixed organ injury often manifests in adults due to accumulating cell damage.

World Distribution of Sickle Cell Disease

The sickle gene mutation arose in tropical areas of the old world as a defense against malaria. People with one sickle gene and one normal gene (sickle cell trait) suffer none of the ill effects seen with sickle cell disease (two sickle genes). People with sickle cell trait are more resistant to malaria, on average, than are people who have two normal hemoglobin genes. People with two sickle cell genes were likely to die of sickle cell disease. People with two normal genes were likely to fall victim of malaria. People with sickle cell trait



Sickle Cells

survived and passed their genes (both normal and sickle) on to the next generation. The incidence of sickle cell trait reaches levels of 30% to 40% in equitorial Africa and India. The sickle gene arose independently in these two regions of the world.

Sickle cell disease in the Americas largely reflects the African slave trade. People captured in Africa were transported to the New World, with the Carribean islands serving as the initial triage point. These islands retained some people to work in the burgeoning sugarcane industry. Others were transported to continental slave markets, including those in North America. A person suffering from sickle cell disease lives in Cuba or the United States solely by luck-of-the-draw of long-forgotten ancestors.

Advances in the Management of Sickle Cell Disease

Sickle cell disease first appeared in the medical literature in 1910 in a report by Herrick[1]. In 1956, Ingram and colleagues at the MRC in Cambridge, UK defined the mutation in the hemoglobin molecule responsible for sickle cell disease[2]. Despite detailed knowledge of the mutation that produces sickle hemoglobin, no cure exists. Significant advances in the management of sickle cell disease have been made over the past 15 years, nonetheless.

Early childhood mortality from overwhelming infection is a major risk for children with sickle cell disease. A study sponsored by the US National Institutes of Health showed unequivocally in 1986 that daily treatment with penicillin (called prophylaxis) dramatically lowers this risk[3]. The data from the study were so compelling that the study was curtailed early with the recommendation that all infants and young children be placed on penicillin prophylaxis.

A second major advance was the introduction of hydroxyurea to treat people with very severe sickle cell disease. A randomized, controlled multicenter study of hydroxyurea in sickle cell anemia was terminated earlier than planned when the drug prevented severe problems including pain crises and a particularly deadly complication called "acute chest syndrome".[4] Patients respond variably to hydroxyurea and some derive no benefit at all. Perhaps 25% of patients improve dramatically to hydroxyurea, some almost miraculously so. Hydroxyurea is now an essential part of the treatment armamentarium for sickle cell disease.

A number of other interventions have improved the clinical outlook and quality of life for patients with sickle cell disease. A number of additional therapies are currently being investigated. As a result, the next five to ten years hold great promise for patients with sickle cell disease and their families.

The Embargo and Sickle Cell Disease

Cuba has a newborn screening program to identify all infants with sickle cell disease. A program of prophylactic penicillin currently exists. The US economic embargo has produced shortages of drugs at times, including antibiotics. Fortunately, these shortages have not disrupted the prophylactic penicillin program. This program, along with other health measures, has substantially reduced the incidence of childhood mortality from sickle cell disease among Cuban children.

Patients with more clinically severe sickle cell disease are treated with hydroxyurea. A cohort of Latin

American countries recently instituted a multinational study of hydroxyurea in children with sickle cell disease. Cuban investigators are leading this effort because of their extensive experience in conducting clinical trials. The National Institutes of Health in the US recently conducted a trial of hydroxyurea in children (HUG Study) that demonstrated the short-term safety of this drug. This agency is poised to begin another study, this one examining hydroxyurea in infants six months of age and older.

Both penicillin and hydroxyurea are generic drugs, making them easier for Cuban physicians to acquire. Penicillin is relatively inexpensive. Hydroxyurea is not. The economic embargo strains the Cuban economy such that the availability of hydroxyurea is suboptimal.

For the first time, several drugs and interventions for patients with sickle cell disease are being investigated. These include clotrimazole, nitric oxide, Fluocor™ and non-ablative bone marrow transplantation. Not all these approaches will prove to be clinically useful in the treatment of sickle cell disease. Cuban patients suffering from sickle cell disease may not have access to interventions and drugs that are efficacious due to the economic embargo. The economic embargo promotes unwarranted suffering and even death due to the restrictions in access to medical care.

The economic embargo also injures people in the US afflicted with sickle cell disease. Approximately 70,000 Americans suffer from sickle cell disease. Most are not followed at comprehensive medical centers that perform clinical trials. Neither a registry nor a clinical trials network exists in the US. The National Institutes of Health funds ten Comprehensive Sickle Cell Centers. For a variety of reasons these centers have given clinical trials a low priority. Slow patient accrual has limited the pace of clinical trials in the US.

Cuba has a well-established patient care network. Excellent facilities for patient trials exist both in Havana and Santiago de Cuba. Cuba has a registry of patients with sickle cell disease, which is a valuable tool in clinical investigation. Lifting the economic embargo, at least as it applies to medical care, would allow American and Cuban physicians to work together on the problems of sickle cell disease. Thirteen percent of Cubans of African descent have sickle cell trait. The incidence is highest in the eastern provinces where 6-11% of all Cubans have sickle cell trait. Patients with sickle cell disease in these regions alone would significantly expand the number of people enrolled in multinational trials. Enrollment of patients in joint research protocols would speed the process of identifying useful interventions for sickle cell disease. Lifting the embargo would greatly benefit a most vulnerable group of Americans with a debilitating and often deadly disease.

Useful Websites:

Joint Center for Sickle Cell and Thalassemic Disorders
http://sickle.bwh.harvard.edu

Emory University
Sickle Cell Disease Center
http://www.emory.edu:80/PEDS/SICKLE

Footnotes

[1] Herrick, JB 1910. Peculiar elongated and sickle shaped red blood corpuscles in a case of severe anemia. *Arch. Int. Med.* 6: 517-527.

[2] Ingram, V.M. (1956) "A specific chemical difference between globins of normal and sickle-cell anœmia hœmoglobins." *Nature* 178, 792-794.

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Pugwash Workshop on Moving Towards the Abolition of Nuclear Weapons

New Delhi, India, 25–27 March 2001

Report

by Jeffrey Boutwell

The Pugwash workshop, *Moving Towards the Abolition of Nuclear Weapons*, was held from 25 to 27 March in New Delhi, and was attended by some 25 participants, including 13 from 7 countries outside India. The meeting was hosted by the India Pugwash Group and held at the India Habitat Center in New Delhi.

Given the deteriorating relations among the world's nuclear powers and recent setbacks to the progress made in the 1990s in nuclear weapons arms control, a central purpose of the Workshop was to identify particular issues on which Pugwash could influence policy and public opinion.

An Uncertain Future

The workshop began with a review of the changing attitude toward nuclear disarmament. The optimism of the 1990s concerning the prospects for controlling and ultimately eliminating nuclear weapons has degenerated into concern that the world may be on the verge of new tensions and dangers from the proliferation and possible use of nuclear and other weapons of mass destruction. Humanity may well be advancing into the future facing backwards, in ways that are potentially dangerous, constraining the way it confronts new challenges.

As the Cold War evolved into the post-Soviet interregnum that characterized the period from 1989 to 2001, so now the world appears to be entering a new phase. What is to follow? The 21st century will be based on a number of principles far different from those characterizing the 20th century: nuclear science is no longer a new science and is being surpassed by the revolution in molecular biology and genetics; biotechnology and climate change are joining nuclear weapons as instruments that pose fundamental threats to humanity; and the international system itself is undergoing radical transformations, marked by globalization, an increased emphasis on individual human rights relative to notions of state sovereignty, and an increased ability of individuals and small groups to cause great harm.

Within this framework, some of the many issues that will dominate policy agendas in the years ahead include: a growing Sino-American strategic rivalry; legacy issues of the Soviet nuclear complex; proliferation threats from both state and non-state groups; a retreat from multilateral institutions and increased propensities for unilateral action, especially by the US (including on national missile

defense); and prospects for a coming energy shortage in western countries that is already stimulating renewed interest in nuclear power.

All of the above combine to require new ways of thinking about concepts of international security in general and the military and political utility, legality, and morality of nuclear weapons in particular. Some of the hard questions that need to be addressed include:

- What are the ethical arguments for either retaining or abolishing nuclear weapons?
- What political processes can best marginalize and lead to the elimination of nuclear weapons?
- What are the likely political and military consequences of eliminating nuclear weapons?
- How can public opinion in the democracies for abolishing nuclear weapons be influenced?
- Can nuclear weapons be separated from issues of human rights/sovereignty?

The workshop discussion elicited a wide range of views on whether new challenges posed by biotechnology and global climate change would indeed rival the nuclear threat, or whether renewed interest in civilian nuclear power will greatly increase proliferation risks. Moreover, several participants felt that substantial public support for eliminating nuclear weapons had yet to be effectively mobilized. Participants also differed on whether the 1990s was a decade of 'lost opportunities' for markedly reducing nuclear forces and the salience of nuclear weapons in international politics. Whether one sees the glass as half empty or half full, the question must now be raised regarding the changes that would be required in the international system in order to move beyond the current inertia and revitalize the process of de-legitimizing nuclear weapons.

Delegitimizing Nuclear Weapons

In advancing its work, it is imperative for a group like Pugwash to take into account the views of those who are highly skeptical of the desirability and feasibility of eliminating nuclear weapons and to assess strategies and goals accordingly.

For example, how well do we understand the motivations of countries that keep or seek to acquire nuclear weapons? One participant stressed the need to better understand both security and non-military factors (domestic politics, prestige, bargaining power) of countries such as Iraq, Iran, and North Korea in seeking to obtain nuclear weapons, and of those who might seek to acquire them in the future. Or, is the question really one of power politics, of the weak seeking nuclear weapons so the strong cannot impose their will on them?

If, in the end, there will always be at least some states or actors sufficiently motivated to obtain nuclear weapons, what other means are available to advance the goal of a nuclear weapon-free world? Groups like Pugwash should perhaps focus on strengthening international norms and instruments that can contribute to reducing the utility of nuclear weapons and the continued high risk of nuclear 'next use.' Other suggestions included evaluating whether indeed missile defenses could facilitate deep cuts in strategic systems, if carried out cooperatively between not only Washington and Moscow, but involving second-tier nuclear powers as well. Mention was also made of strengthening negative security assurances as a means of reducing the motivations of nuclear aspirant states. There were also questions regarding the extent to which we understand the differences between the political and security considerations motivating states to acquire nuclear weapons or to give them up.

What other steps could be taken to devalue the role of nuclear weapons in political and strategic thinking? One response was that, as the US, Russia and NATO took the lead during the Cold War in arguing for the political and military utility of nuclear weapons, so now should documents from those countries (particularly as Cold War archives are opened) be analyzed to show how little utility nuclear weapons had politically, as well as the substantial risks such weapons actually posed to US, Russian and NATO security.

The aim of such efforts, of course, is to effect substantial changes in attitudes towards the value of nuclear weapons. In the US, this means demonstrating that not only are nuclear weapons a net liability to its security, but also that US security would be enhanced in a non-nuclear world. Making the same argument for Russia and other nuclear powers faced with greater security challenges, the problem is admittedly more challenging.

Despite the difficulties posed in changing such mindsets and the obstacles that remain in achieving the elimination of nuclear weapons, it

was argued that being clear about the goal of eliminating nuclear weapons helps clarify what the world needs to do in the short term to both achieve the goal and to reduce the risk of nuclear weapons ever being used.

Strategies for Eliminating Nuclear Weapons

Discussion ranged widely over various strategies that would be most effective in leading directly to the elimination of nuclear weapons. In addition to focusing on modalities such as nuclear weapon-free zones (NFWZ), No First Use (NFU), and comprehensive verification, other strategies mentioned included effective enforcement of international treaties and including the need for more effective sanctions in cases of non-compliance. Also noted was the need for the five main nuclear powers to live up to their NPT obligations for working seriously toward the complete elimination of nuclear weapons. Questions were also raised about the ethical aspects of relying on deterrence and mutual assured destruction, as well as the moral responsibility of scientists not to work on military projects.

On the question of NFU, for example, there is little question that declaratory NFU statements must be operationalized in nuclear weapons policies and procedures (through such steps as de-alerting, separating warheads from delivery systems, etc.). Yet NFU treaties are also important, as they make it difficult for governments to renounce steps previously taken. Similarly, a NWFZ covering Central and Eastern Europe could be an important step, especially in helping (in conjunction with decelerating further NATO enlargement) to prevent a return to the Cold War between Russia and the West.

Others were less sanguine about the utility of concepts such as NFU and NWFZ, or the viability of international treaties. It was noted that the international community does not even have high confidence in the disarmament of Iraq, despite incredibly intrusive verification measures. For this view, the emphasis should be less on formalities and more on changing the fundamental political and security conditions that will advance the goal of eliminating nuclear weapons.

The discussion that followed emphasized the complementarity of both strategies – of analyzing the political and security conditions necessary for a nuclear weapon-free world (NWFW) as well as the technical requirements (verification and enforcing compliance, operationalizing a No First Use policy, extending nuclear weapons-free zones) for building confidence in the stability of such a world.

Mention was also made of rigorously analyzing the end game: of demonstrating how a non-nuclear world, even with unresolved conflicts and uncertainties over breakout capabilities, would be more stable and secure than a world with nuclear capabilities. For example, many take it as a given that a NWFW would be a net security gain for the US (because of its conventional weapons superiority); yet the stronger one makes that case, the more uneasy others will become about giving up their nuclear weapons. This makes it important to focus, not only on the process of getting to a NWFW, but on how a NWFW would entail a net security gain for all countries. Also, by the time we get to a NWFW, how will it differ from the world we know today? Will the US be as dominant? Will other countries have mastered technologies that greatly reduce the political, economic and military superiority the US enjoys today? In making the case for a NWFW (in this case, to Americans), it is important to specify how such a world might be beneficial, even in a situation where the US, or any other country, may no longer be as dominant.

Whatever the priorities decided on, the nuclear situation today is far different than that which existed at the time of the Russell-Einstein Manifesto in 1955. Nuclear weapons are now embedded in the security fabric of democratic societies; the risk through deliberate use is decreasing, but that of accidental or unintended use may well be increasing.

Confronting the Major Issues

In the short term, it is important to focus on specific dangers and bring these to the attention of policymakers and the public. These include: the possibility that the risk of nuclear weapons use might be increasing; renewed nuclear competition and the development of new weapons; and horizontal proliferation. Through its work, Pugwash should identify specific solutions for minimizing these risks, such as de-alerting, deep cuts, restraints in deployments, strengthening the Comprehensive Test-Ban Treaty (CTBT), going slow on the National Missile Defense (NMD), and solving the problem of "loose nukes."

Strengthening Norms

Participants stressed the importance of norms in making the transition to a non-nuclear world. To begin with, increasing public debate on these issues is important; the idealistic aspect of a moral repugnance for nuclear weapons is something Pugwash should not lose. How, then, to bridge this idealism with the realist aspect of ensuring security? While a Cold War framework still dominates much of the debate (i.e., the primacy of the US, Russia and China), it is the regional aspects of nuclear weapons (Middle East, South Asia, East Asia) that are ultimately more important in today's world. In this regard, the CTBT as a global norm remains vital.

The need to go beyond a Cold War mindset was also pointed out, including the need for fresh analysis of the role of nuclear weapons for deterrence, defense, and compellence, and for demonstrating how nuclear weapons undermine security. On the issue of military usability, many felt strongly that Pugwash needs to stress the inutility of nuclear weapons use, whether against nuclear or non-nuclear states. Thus NFU is not just a declaratory policy, but one based on sound military policy.

The question of how security for all states can be assured without nuclear weapons should be high on the Pugwash agenda. For example, the US itself will not be able to contribute to the abolition of nuclear weapons until it helps solve some of the world's regional problems where nuclear weapons play a role. For a country like Israel, a secure and stable Middle East is a prerequisite to giving up nuclear weapons, yet (for some) Israel's nuclear capability complicates this process and even stimulates efforts by others in the region to acquire weapons of mass destruction.

Missile Defenses

In a discussion of missile defenses, questions were raised as to possible positive benefits of NMD for the sharing of technology and making deep cuts of strategic systems more feasible. If NMD is indeed inevitable, how can the focus shift from mid-flight interception (which China sees as a threat to its deterrent) to sea-based boost phase systems, focused specifically against rogue states? Others pointed out that sea-based systems would only be effective against a country like North Korea, not other potential rogue states.

Rather than uniformly opposing missile defense efforts, many felt that groups like Pugwash should find entry points where policies and strategies can be altered and the political damage limited (keeping in mind that while the political costs of NMD will be immediate, the benefits are distant; i.e., no deployable defenses until 2008 or after, and no strategic consequences for Russia and China for 10-20 years). Others noted that ballistic missile threats do exist, so missile defense needs to be placed in a larger context. Debates over missile defense should be technical and strategic, not political or ideological.

It was feared that missile defense issues could shape the arms control agenda for years, enhancing the credibility of the nuclear threat and undermining deterrence (give someone a shield, and it becomes easier to use the sword). Russia may well withdraw from existing arms control agreements (INF and CFE treaties) while China will be given a credible rationale for enlarging its strategic forces. Among nuclear aspirants, missile defenses could well *stimulate* proliferation as countries act unilaterally in response to US unilateralism and the decay of cooperative strategies. Above all, NMD undermines those in Russia who argue for cooperative security efforts with the US.

Non-Proliferation Efforts

Difficulties with strengthening the non-proliferation regime include: violations of the NPT by nuclear aspirant states; the failure of the nuclear weapons powers to convincingly move toward fulfilling their pledge on complete nuclear disarmament; a decline in the credibility of the IAEA; and the inability of the US to give positive security assurances. How does the international community deter a North Korea that is well situated strategically? How can sanctions be better targeted and strengthened? To what extent should distinctions be made between countries that sign treaties and violate them, and countries that do not sign them (as not being in their security interest)?

One proposal stressed the need for greater political cooperation among democratic states to counter proliferation (although this leaves out China and Pakistan) and for differentiating the nature of the proliferation threat (e.g., Japan going nuclear is not the same as North Korea). Another emphasized implementing a global convention prohibiting the use of nuclear weapons (like the Geneva

convention on chemical weapons) to further strengthen norms of non-use and military inutility.

To deal with ballistic missile proliferation, some advocated creating a multilateral INF regime. While some countries will criticize this as hypocritical (the US and Russia, having strategic systems, found it easier to give up INF systems) and others as useless (those countries of most concern will not join), similar criticisms were made of the NPT, yet it established norms over time and NPT participation has broadened. To be sure, INF limits were specific to US and Russia, so different limits would be necessary for countries of concern. There is also the concern of a global INF ban pushing countries to develop strategic missiles, and of expanding INF limits to cover sea-based missiles. Nonetheless, a joint US-Russian initiative to create a multilateral INF regime would be symbolically important and would have positive benefits in engaging China.

More attention needs to be paid to political strategies for dealing with rogue state threats, whether from North Korea or various Islamic countries (Iran, Iraq, Libya). It was thought that negative pressure will be counterproductive, and that international political and economic assistance would be more effective. In a similar vein, more emphasis is needed on political activities (dialogue and interaction) and on the relative strengths that countries other than the US can bring to bear on potential proliferators. For example, China should be very worried about a North Korean nuclear capability, as this would stimulate potential Japanese acquisition of nuclear weapons, which in turn would be even more worrisome to China. Thus, how can the US work with other countries such as China in joint efforts to solve the North Korean problem? A second example is that of greater cooperation with Russia in discussing future NATO expansion (especially as it relates to the Baltic states).

Summary

Continued work toward the goal of eliminating nuclear weapons will be needed on three levels:

- weakening the symbolic embedding of nuclear weapons in society (e.g., through the NMD debate);
- increasing perceptions and awareness of the disutility of nuclear weapons (e.g, through proposals for de-alerting and deep verification);
- de-legitimizing nuclear weapons (e.g., countering what will surely be continued reliance on nuclear weapons in the Bush administration's nuclear review, and among the other nuclear powers as well).

In all these efforts, the need exists to reverse the receding public consciousness regarding nuclear weapons. In a world where relations among the nuclear powers are deteriorating, and where the threat of terrorist acquisition and use of nuclear and other weapons of mass destruction could well materialize, there is a need to strengthen multilateral approaches to security and to pinpoint how motivations for both acquiring and retaining nuclear weapons can be constructively influenced.

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Papers

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Mohammed Kadry Said (Egypt): *Crisis of Idealism in the Middle East : The nuclear dilemma*

Gwyn Prins (UK): *Some Pointers towards Thinking about the Paradoxes of the Nuclear Issue at the Beginning of the 21st Century*

Joseph Rotblat (UK): *Pugwash and the Nuclear Issue*

Manpreet Sethi (India): *Steps to Devalue/Delegitimize Nuclear Weapons*

M. R. Srinivasan (India): *Eliminating the Causes of War*

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Pugwash Workshop on East Asian Security

Seoul, Korea, 3–6 April 2001

Report

by Jeffrey Boutwell

The Pugwash Workshop on *East Asian Security* was held at the Hotel Shilla in Seoul, South Korea from 3–6 April, 2001, and was attended by more than 30 participants from eleven countries. The meeting was organized by the Korean Pugwash Group, chaired by Dr. Mark Byung-Moon Suh, and was supported by Hon. Yong-Taek Chun, Chairman of the National Defense Committee, and Hon. Kun-Hee Lee, Chairman of the Samsung Group.

The workshop took place at a time of uncertainty and heightened tensions in the region. On Sunday, April 1, a US reconnaissance aircraft had to make an emergency landing on China's Hainan Island after a mid-air collision with a Chinese fighter jet, leading to a tense two-week diplomatic standoff between the US and the People's Republic of China prior to the release of the US Navy aircrew on April 12. Also complicating the picture were uncertainties over Bush administration policies regarding the situation on the Korean peninsula, national and theater missile defense, and arms sales to Taiwan.

Korean Unification

The major breakthrough in inter-Korean relations that occurred at the summit between President Kim Dae-jung and Chairman Kim Jong-il in Pyongyang in June 2000, symbolized by the Joint Declaration of June 15 that set out a framework for peaceful reunification of the two Koreas, has since been followed by delays and postponements in the implementation of several components of the Joint Declaration. Nonetheless, the Pyongyang summit represented a watershed in establishing formal contact and lines of communication between the two governments, which themselves will be vitally important as the two countries address the major outstanding issues between them.

These issues include: continued tension and military deployments along the inner-Korean border; the need to replace the 1953 armistice with a formal peace treaty; the destabilizing effects of military buildups by both North and South; and the wider ramifications of North Korea's nuclear weapons and missile programs. Important as well to the Korean people are closer economic cooperation, family visits and reunification across the border, and the return of Koreans detained in the 'other' Korea against their will (e.g., 'unconverted prisoners').

Regionally and globally, the thaw in Korean relations has produced both opportunities and challenges. The June 2000 summit, on the one hand, has led to an opening up of the North, with a number of European and other countries (possibly including Japan) establishing formal diplomatic ties with Pyongyang (helped by the urging of South Korea). On the other hand, challenges remain in the way that countries such as China, the US, Japan and Russia interact and coordinate their policies with the two Korean governments. Moreover, the pace of Korean rapprochement will remain subject to the influence of South Korean domestic politics (e.g., the next Presidential election in South Korea will be in December 2002,

leaving little more than a year before election politics will inhibit important diplomatic moves).

Questions were raised about the impact of changes in US Korean policy should the Bush administration take a harder line on North Korean nuclear weapons and missile programs. Many expected Bush to renew the Korean dialogue process once his foreign policy team is in place, but fears were expressed that the many disparate Korean issues will be interlinked, making resolution difficult. At a minimum, adequate verification of North Korean compliance with its commitments under the Agreed Framework will be a top priority for Bush.

The importance of domestic politics influencing events in both the US and South Korea was mentioned. First, President Bush's experience and priorities are in domestic affairs, and the President is mindful that his father was a one-term President because of conservative Republican defections (and the Republican party is divided on many foreign policy issues). Similarly, the South Korean government is going through a process of setting priorities concerning North Korea, especially in the aftermath of an awkward meeting in Washington between Kim Dae-jung and President Bush. Finally, there is the issue of North Korea using its direct channel to Washington to bypass Seoul and put inner-Korean relations on hold, which further complicates domestic sentiment in South Korea.

In evaluating how North Korea is following a division of labor on policy issues (missiles and nuclear weapons with US; economic, cultural, and humanitarian cooperation with South Korea), several participants felt that, ultimately, Pyongyang understands that the US and South Korea will closely coordinate policy and not permit a wedge to be driven between them.

Aftermath of North Korean Floods (UN photo #187446)

Discussion turned to how China, Russia and the EU can best support the Korean reunification process. China's position was said to be one of non-interference, of letting the Koreans settle their issues themselves. Beijing is, however, confused about the strategic intentions of the US in East Asia (not knowing how to evaluate Bush's skepticism of North Korea's intentions and whether the US government feels it needs a North Korean threat to justify its national missile defense efforts).

As for Russia, Moscow has signaled a desire to be involved in a solution of Korean peninsula problems, but has to overcome disillusionment in Pyongyang over the breakup of the Soviet Union. Moreover, the Russian business community is heavily oriented towards South Korea ($2.7 billion in trade versus $100 million with North Korea). Moscow has been letting both the US and EU know about the constructive role it could play, though much of this may be to help shore up Russia's great-power status.

The hiatus in President Bush's formulation of a clearer US policy on Korea has allowed the EU to partially fill the gap in terms of opening up diplomatic relations with Pyongyang and providing economic and humanitarian assistance. Countries like Sweden and Italy are out in front (France is lagging) in areas such as energy and the economy, with Sweden in particular having offered to provide inducements (satellite technology) to persuade North Korea to give up its long-range missiles. Overall, many EU governments see a more active North Korean policy as helping to strengthen Europe's engagement throughout East Asia.

While important in and of itself, such engagement also underscores Europe's need for Asian support (particularly from Japan and South Korea) on issues such as multilateral peacekeeping operations.

Mention was made of North Korean statements that, for the first time, seem to acknowledge the stabilizing effects of US forces stationed in South Korea. It was pointed out that Chairman Kim Jong-il conferred with his counterparts in Beijing on these issues before the June 2000 Korean summit (and that China itself sees US forces as preventing Japan from possibly filling a security vacuum on the Korean peninsula). More than one participant found it ironic that the Cold War deployment of US forces in Korea is now being welcomed by all parties as a post-Cold War stability measure.

Others were less sanguine about the pace of events, thinking that the Koreans should be more cautious in their expectations, and that North Korean tolerance of US forces in the south was expressed verbally and could change at any time. In this view, the integration of two non-adaptable social systems under one government will not be possible. Reunification will need a legal framework, and at present, the two Koreas do not even formally recognize each other. Far more will need to be accomplished in normalizing their relationship before political integration can be achieved. This process will require North Korean transparency and accountability, and there are outstanding questions over what inducements will be sufficient to get Pyongyang to go along.

A parallel was drawn with China and Taiwan, where low politics, such as interactions in trade ($25 billion a year), investment and people, are extensive, yet political relations remain fractious and tense. Can Korean political integration be sustained without similar extensive links in low politics?

South Korean perspectives included the thought that Seoul's position is evolutionary: confederation first, federation later. While Kim Jong-il seems sincere in his position on US military forces, North Korean public opinion has been so conditioned on getting US forces out of South Korea that Pyongyang's formal stance will take some time to alter. It was also noted that South Korean public opinion is divided on the issue of US forces.

Whatever the pace of Korean political rapprochement, security issues will remain paramount, both on the Korean peninsula and more widely throughout East Asia. The key element conditioning these issues will be whether the US and China engage in strategic competition throughout the region.

Nuclear Proliferation and the Agreed Framework

The status in the US of the 1994 Agreed Framework seems to be in question, with second thoughts about supplying North Korea with nuclear power plants being expressed, not just by some in the Bush administration, but others as well (including Robert Gallucci). North Korea remains in violation of the NPT, not having allowed full IAEA inspections. Given that such inspections may well take 3-4 years to implement, and that the deadline for them is now about the same, Pyongyang's compliance with the IAEA safeguards is the determining factor in pacing the schedule of the Agreed Framework.

While it was predicted that the Bush administration will stick to the letter of the agreement, US law requires export licenses and statements of agreement for the

Inside the negotiation hut at Panmunjom.

export of US nuclear power equipment to North Korea. Moreover, the two 1000 mw power plants are fundamentally incompatible with North Korea's electric grid (in part because they will constitute far more than 10 percent of the entire system). Also, the two plants will require a stable and reliable electric system to ensure continuous power for cooling the reactors when they shut down for maintenance. Finally, concerns were expressed that the two plants would produce twice as much plutonium as the original power plants that Pyongyang was contemplating, and that some of this plutonium (200-300 kgs at the first refueling) would be near weapons-grade.

In response to the suggestion that organizations like Pugwash might have a role to play in reorienting the Agreed Framework to thermal power plants, it was asked what kind of new package would be acceptable and feasible? The issue is not just bilateral between Pyongyang and Washington, but involves the interests of South Korea as the prime contractor and the multilateral efforts of KEDO (which some thought should refocus its attention on energy issues, in particular on the need to restructure and modernize North Korea's electric grid). Many thought that Washington's pulling the plug on the project would be a political and perhaps security disaster.

Sentiment was widespread that while the Agreed Framework met its short-term objective of freezing North Korea's nuclear weapons program, less thought had been given to its long-term implementation. Even though some of the highlighted problems may not have been known earlier (reactor-electric grid safety issues), the underlying feasibility of the project was certainly questionable. While supportive of sticking with the Agreed Framework, several participants were doubtful that the project would ever be completed.

While the ball is currently in Pyongyang's court in terms of complying with IAEA safeguards, waiting for a violation to occur and then canceling the agreement doesn't take into account the long lead times involved.

While the Agreed Framework meets its short-term objective of freezing North Korea's nuclear weapons program, less thought has been given to its long-term implementation.

IAEA compliance should also be a factor in providing North Korea with short-term energy aid (such as the currently requested supply of 500 megawatts from South Korea and potential help in upgrading the North Korean electric grid). One example of the problems being encountered is that North Korea denied a request from Seoul for a survey of the North Korean electric grid to ensure safe delivery of the 500 megawatts of power. While the easiest way for Pyongyang to fully utilize the power generated by the two 1000 mg plants would be to integrate the two electric grids, there are sensitive safety and security issues involved.

As for whether US domestic law will ultimately prevent the use of US components in the nuclear power plants, full-scope safeguards will make parts-substitution very difficult and some redesign of the plants will be necessary. Furthermore, as evidenced by the recent pullout of General Electric from the project, there may be substantial liability and insurance issues to be negotiated.

Discussion broadened with proposals for a formal denuclearization of the Korean peninsula and a broader nuclear weapons-free zone (NWFZ) in northeast Asia involving Japan and perhaps even some Russian and Chinese territory. It was argued that a formalization of the current non-nuclear status of the peninsula would have an important psychological effect, backed up by obligations under international law. It was noted that both North Korea and South Korea have declared their intentions not to have nuclear weapons, but North Korea needs to clarify its status. Many in the south are suspicious of Pyongyang's intentions, of manipulating negotiations to obtain economic aid. Also, North Korean behavior under the NPT raises questions both of North Korean compliance and enforcement/sanctions by others to maintain the integrity of the NPT.

In this regard, some noted, US policy is especially important, in both implementing the Agreed Framework and supporting South Korea's sunshine policy, and clear signals are needed on both from the Bush administration. Also, the US should not dramatize the verification issue, but talk about it quietly with Pyongyang. While acknowledging that North Korea might have developed one or

two nuclear warheads, this view held that Pyongyang would only use them if it felt extremely threatened. In a wider context, Japan has the capability to go nuclear also, and non-proliferation efforts need to be multi-faceted without singling out North Korea.

China-Taiwan-US

An overview of issues regarding Taiwan described the security situation as sensitive and very similar to that in the 1950s, with all the countries of northeast Asia involved. Domestic politics in Taiwan, and especially the democratization trends since the late 1980s that give rise to a separate Taiwanese identity, are making the situation more difficult. New PRC military technologies across the Taiwan Strait (missiles, naval assets, information warfare) are making Taiwan nervous. Although the island can never hope to match PRC military capabilities, additional military deployments by Taipei are felt to be needed in order for Taiwan to negotiate an ultimately peaceful solution with Beijing. President Lee seems to be trying to elevate the China-Taiwan issue to a level similar to that between the two Koreas.

For the US, Taiwan is one of the most important security issues, making conflict prevention a top priority. Domestic events in both the PRC and Taiwan are making this more difficult, and the preferences of the Taiwanese people seem to be driving events more than before. Although the Clinton administration was proactive in encouraging dialogue between the two sides, the US ultimately has little concrete leverage. Moreover, US policy is hampered by conflicting signals from the executive branch and Congress, and there is little appreciation among the US public of Taiwan's international status. While Taiwan is interested in theater missile defenses from the US, its ultimate security will depend most on its assistance from the US and on its diplomatic finesse in gaining international support for its position. From a US perspective, Beijing would be better off making more positive appeals to woo the Taiwanese people, yet nationalism in the PRC is making Beijing more impatient and less conciliatory. Thus, on both sides, a combination of nationalism, impatience and military modernization is complicating the problem.

Japan has the capability to go nuclear, and non-proliferation efforts need to be multi-faceted without singling out North Korea.

One view held that PRC-Taiwanese relations are of an entirely different nature from those of the PRC and US. Concerns were expressed over promoting the notion of Taiwanese independence. In terms of Sino-American relations and how these are affected by Taiwan, the PRC is seeking a cooperative relationship with Washington in various areas, including economics and trade, stability in the Asia/Pacific region, and curbing the proliferation of weapons of mass destruction. Such cooperation could even extend to the Taiwan issue, especially in terms of crisis management.

Domestically in China, there is increased public frustration over the failure to reach a positive solution for Taiwan. While Washington talks of peaceful solutions, it continues the sale of modern weapons to Taiwan. Accordingly, PRC deployment of missiles across the Taiwan Straits will likely increase. The role of China's military is to ensure the integrity of its territory, not to engage in military coercion. International concern for the situation is understandable (and Beijing appreciates the international support it has received for its Taiwan position), but not international involvement in China's domestic affairs. Above all, Taiwan is a vital, core interest, and the PRC will defend it even at the cost of international political and economic implications. Conversely, Taiwan is not a core US interest. War with Taiwan is not the issue, but with the US (parallels being drawn with US involvement in Vietnam).

In this increasingly sensitive situation, all sides have a duty to prevent self-fulfilling prophecies. Should Taiwan seek independence, there would be war. In response, it was asserted that Taiwan will not declare independence, and is willing to talk and negotiate even without preconditions (such as a PRC promise not to use force). For China, the precondition is Taiwan accepting the goal of a one state solution.

A comparison of Asian and European security issues noted a more common trait in the latter for international involvement to resolve conflicts. This has been less so for India-Pakistan, the Taiwan Straits, and the

George Rathjens and Maj. General Pan Zhenqiang.

Korean peninsula. Many Europeans are getting nervous about conflict in East Asia and its global implications. There is also puzzlement about resurgent nationalisms in the region, when globalizing trends are transcending nationalist sentiment.

Discussion focused on the need for constructive US-PRC relations, and how these are made more difficult by domestic politics and nationalist statements made for domestic consumption. It was noted that many in China, however, feel that time is working against them. Since the early 1990s, especially, there has been an increase in demonstrable Taiwanese moves towards independence, with much tacit support from both the US and Japan. If Taiwan forswore independence, China would reduce its military pressure and be willing to discuss processes for peaceful integration (e,g., one country, two systems).

Taiwan is clear about having no ambitions to acquire weapons of mass destruction. By the same token, many in Taipei and elsewhere have urged Beijing to rethink a policy based on military coercion, as this is counterproductive, stimulating unwanted reactions in both the US and Taiwan. By contrast, Taiwanese leaders are encouraged when they hear PRC statements that dialogue and political solution are possible as long as independence is not the goal.

It was noted that few confidence-building measures (CBMs) exist between the US and China, similar to those negotiated with the USSR during the Cold War (especially relevant is the Incidents at Sea agreement). While some US-China discussions have taken place to minimize accidents at sea (but not in the air, as made painfully evident by the March 31 mid-air collision), there is a complete absence of any agreements involving Taiwanese vessels and aircraft. More than ever, steps to build confidence (similar to the Chinese withdrawal of forces in the 1980s from the coast opposite Taiwan) are much needed and should be explored.

Missile Defenses and Asian Security

An overview of US plans for national missile defense noted that efforts to defend against a nuclear attack have been underway since WWII, and that the current US program is either the 5th, 6th, or 7th such attempt, depending on how they are counted. Pending the outcome of the Bush administration's review and revision of the Clinton NMD plan, the US is likely to opt for early deployment (2006-2008) of an NMD system (possibly in North Dakota rather than Alaska) in conjunction with vigorous research, development and testing of land, sea and space-based missile defense components. In addition, the Bush administration would appear to want to get rid of NMD and TMD distinctions (as outlined in the 1997 US-Russia demarcation agreements). Whatever system the administration does propose, deployment is not inevitable (given both technical hurdles and the need for Congressional approval). Despite these uncertainties, it is possible, perhaps even probable, that the administration will withdraw from the ABM Treaty within two to three years, the first such withdrawal from a major arms control treaty since 1945.

What is the likely Russian reaction to such outcomes? Most probably, Russia will retain MIRVed warheads on their land-based missiles (the SS-28 Topol M especially), which would undercut one of the major arms control achievements of the first President Bush in the early 1990s. To that end, the demise of the ABM Treaty would unravel its original premise of constraining defensive systems in order to facilitate cuts in offensive systems. In the end, while Russia might accept moderate changes to the ABM Treaty, China likely will not.

Regarding missile defenses and Asia, formal arms control up to now (SALT, START, INF) has been Euro-focused, and largely bilateral between the US and Russia. In Asia, one is dealing with a multi-country scenario. Although not a party to the ABM Treaty, China has not pursued missile defenses. Its ICBMs now have a free ride as long as the US remains bound by the current ABM Treaty with Russia. Also, US-Russian arms control efforts have focused on long-range offensive systems and NMD,

Seoul workshop participants at Panmunjom

not theater missiles and TMD, which are of more importance in Asia.

For many participants, China seems justified in thinking that US NMD efforts, ultimately, are aimed at them. In this regard, some felt the disappearance of any threat from North Korea would not influence Bush administration support for NMD, but it could weaken Congressional support.

The possibe provision of TMD systems (PAC-3 and Aegis) to Taiwan is of direct concern to Beijing. On the other hand, theater missile defense is of little military use for South Korea, threatened as it is primarily by long-range artillery. Japan is more interested in the technology than the deployment of TMD, while India and Pakistan would likely be affected by China's reaction and possible response to NMD.

The primary conclusion to emerge from all this is that early discussions on NMD and TMD are needed among all parties, but especially with China. During the Clinton administration, there were some US-Chinese discussions on missile defense (with Russia intervening heavily to get Chinese support in opposing NMD plans), China expressing the most concern about TMD for Taiwan.

In the discussion, one view held that the US obsession with NMD was predicated on wanting to avoid a mutually assured destruction relationship with China, as the US had with the Soviet Union during the Cold War. The US seems to want to change the rules of the game on the ABM Treaty and missile defense, similar to how it has in the past with non-proliferation issues (reprocessing). Another participant held that the US perception of threat will be driven by events in Iran and North Korea; missile tests there would drive even Democrats to support NMD.

In Russia, many feel that the September 1997 NMD-TMD demarcation agreement was a failure, giving the US too much leeway in pursuing theater defenses (to the extent of the US not having to violate the ABM Treaty). The line between national and theater missile defense also becomes blurred for many parties in Asia; providing TMD to Taiwan essentially gives the island a national missile defense (especially from Beijing's perspective). Is the US taking seriously Russian proposals for cooperation on TMD? From Moscow's vantage point, a combination of globalizing processes that are changing international security dynamics and requirements, as well as increased US unilateralism, are posing special challenges to countries like Russia.

In response, the demarcation agreement is not likely to get Senate approval. Indeed, some Senators erroneously think the agreement puts more restrictions on the US than exist now, while others believe the ABM Treaty 'expired' with the collapse of Soviet Union (neither of which is true) and that approving the demar-

cation agreement amendments would at the same time 'revive' an ABM Treaty that they do not want in the first place. As for the relationship of NMD with TMD, utilizing data from the SBIRS-low satellite system with theater missile defenses could provide some national defense capability. Regarding joint cooperation on missile defenses, many in the US feel there is not much to react to with the Putin proposal.

To the question of whether a final Bush decision on NMD will be largely unaffected by performance criteria (the next test is scheduled for summer 2001), it was noted that, despite a strong unilateralist strain in the Bush administration, some of the key supporters of NMD (e.g., Senator Kyl and Representative Weldon) are not unaffected by performance criteria; they want something that works.

Missile Defense and Nuclear Stability

The point was raised that missile defense efforts should be analyzed in the wider context of how best to reduce nuclear weapons and the nuclear threat. While the ABM Treaty was well-suited for a particular period of the nuclear age, perhaps its tenets should be re-thought. The US-Russia relationship is fundamentally different now, so a rethinking of the ABM Treaty may be in order.

For example, why are missile defenses necessarily destabilizing, especially when offensive forces are being reduced and defenses could protect against small numbers of nuclear weapons launched accidentally or through miscalculation? At the height of the Cold War, a 99% effectiveness criteria for missile defenses might have been appropriate, but not necessarily now, when such defenses might either dissuade attacks or a country's decision to acquire a small nuclear force.

While some agreed that bipolar strategic stability is no longer relevant, there was less certainty as to what is evolving to replace it. Questions about nuclear stability really rest on how different force configurations (e.g., land-based MIRVs, sea-based missiles, NMD, TMD) will affect political decisions in crises. In this regard, NMD efforts are less worrisome from a military or resource allocation perspective as they are in accelerating changes in the rules of the game that will undermine great power relations and make cooperation more difficult, especially over sensitive issues and in times of crisis.

Others pointed to the destabilizing nature of defenses, where technical malfunctions, erroneous assessments of launch, etc., can increase the risk of conflict. Stability should consist of maintaining existing ceilings on missiles and preventing a new arms race. Russia's response to the US withdrawal from the ABM Treaty could be one of following a unilateral nuclear policy and not being tied to bilateral constraints with the US. Unlike the bipolarity of the Cold War, nuclear stability is coming to rest on four bilateral equations: US-Russia, US-China, Russia-China, and India-Pakistan, with two important conventional equations (Taiwan-China and North Korea – South Korea) and uncertainties over possible conflict in the Middle East.

Some stressed that NMD has to be seen in the larger context of US efforts to reconfigure force structures and rearrange the rules of the game in the 21st century. While this process will take many years, it was noted that countries like China need to recognize future trends and formulate responses now. While major nuclear exchanges are no longer credible,

Susan Shirk, Hon. Chun Yong-Taek, Mark Suh and Sir Joseph Rotblat

Victor Gilinsky dons traditional Korean mask, with Michael Kau

new doctrines may emerge. In this respect, modifications to the ABM Treaty that allow limited defense deployments are not the problem; it is the open-ended nature of NMD. Nuclear weapons are not a priority item for China's military, and it will not engage in an arms race with US or develop its own NMD. Rather, China will respond in proportion to the perceived threat (e.g., developing penetration aids for its strategic nuclear forces, improving its anti-satellite capability) while focusing on conventional force modernization. Politically, Beijing might also seek a strategic partnership (not a formal alliance) with Russia. Yet, China remains interested in discussions with the US to promote transparency about US plans, especially as NMD relates to Chinese offensive forces and how a withdrawal from ABM Treaty would affect the web of other arms control agreements (MTCR and verification measures for BTWC are two particular areas of interest).

Similar discussions are going on in Russia regarding how best to protect the country's security, given uncertainties over missile defense and other US policy options. Possible Russian responses to a unilateral US withdrawal from the ABM Treaty include deploying three warheads on the Topol-M; withdrawing from the START, INF, and CFE treaties; and deploying INF systems on its western borders (and possibly in Kaliningrad). Yet Russia is putting itself in the risky position of having to implement these actions if the US does withdraw from the ABM Treaty.

Some noted that Russian policy on TMD is inconsistent; it develops TMD and is ready to sell its S-300 and S-400 systems (and work with Europeans on TMD), yet Moscow joins with China and North Korea in opposing US TMD plans in East Asia. Russia would like a formal military pact with China, yet China is not interested in formal agreements. What other options exist to neutralize the missile proliferation threat? There are several, but none totally satisfactory: globalize the INF treaty, the Russian global protection system, MTCR, and recreate financial inducements for countries to forego ballistic missile development.

Dynamics of Asian Security

There are a number of special issues regarding Asian security, including: the lack of a broad-based security organization in the region; a more salient proliferation problem (North Korea); the emergence of India and Pakistan as nuclear powers; the future role of China; and greater interest than in Europe in theater missile defenses. In a worst case scenario, North Korean and Chinese missile programs could accelerate as NMD/TMD moves forward, and both could renew missile exports as an additional response to NMD.

In Japan, there is neither decision nor consensus on missile defenses. Tokyo has just begun its participation in the Navy Theater-Wide study and there are differences of opinion within the military, the Diet, government agencies, and business, with little overall public awareness of the issue. Navy Theater-Wide deployments are years in the future, giving plenty of time for decision. On the other hand, Japan traditionally has had a difficult time saying no to the US. The most active supporters of missile defenses are those who see China as a threat and influential segments of the industry/technology community.

As for South Korea, it was reiterated that TMD can do little to defend South Korea, given the main threat posed by North Korean artillery. Moreover, the presence of US troops already provides a deterrent, and South Korean support for TMD would undermine its sunshine policy and efforts at reunification. Nonetheless, as in Japan, questions remain concerning Seoul's policy independence from the US.

A different view held that North Korea's offensive conventional capabilities have been greatly exaggerated; Pyongyang is using that perception primarily for political and psychological leverage. Moreover, doubts were expressed that North Korea can develop a credible missile threat beyond 300-400 km. South Korea's main

goal should be to help North Korea survive and not totally collapse.

In terms of meeting the proliferation threat, the main US goal should be working with Russia to reduce and safeguard fissile material, yet this will be difficult if the Bush administration is shoving NMD down Russia's throat. US unilateral actions could also jeopardize the NPT regime. While an ASAT Treaty could be beneficial, the US is unlikely to be interested. In general, the Bush administration will have little interest in new negotiations/agreements, wanting as free a hand as possible to take actions it sees fit (whether NMD or unilateral reductions in offensive forces).

In the broader context of Asian security, there is a need for the following: to strengthen multilateral institutions (especially ASEAN and ARF) and their capabilities for collective conflict resolution; to promote transparency and confidence building measures on weapons acquisition, deployment of forces, missile tests, etc.; to employ a trilateral dialogue between China, Russia, and the US on nuclear issues; and to strengthen UN mediating and peacekeeping capabilities.

Many thought that future Pugwash work could focus on analyzing the European experience of confidence building measures and collective security organizations as these might be feasible for Asia. Especially troubling in Asia is the lack of transparency in conventional force acquisition, deployments, and doctrines. There is also a need to manage the increased use of nuclear energy in Asia (e.g., proposals for creating an Asiatom).

While there have been some positive developments along these lines (ASEAN), trying to create something like the OSCE will be difficult. On the other hand, the ARF could develop into a viable forum for discussing Korean security and other issues. It was agreed that transparency on nuclear issues is important (China is evaluating the concept of Asiatom). For others, what is missing is military-to-military contacts. Constructive US-China relations (and military-to-military contacts) are fundamental, as is bringing North Korea into East Asian forums. Despite the importance of regional forums, however, the Taiwan issue will ultimately have to be decided bilaterally.

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Papers

WORKING PAPERS

Jong-Chun Baek (South Korea): In Search of a Peace Regime for the Korean Peninsula

Yuri E. Fedorov (Russia): Missile Proliferation and Theatre Ballistic Defenses in Northeast Asia's Security Landscape

Victor Gilinsky (USA): Fixing the 1994 US-DPRK Agreed Framework

Camille Grand (France): Europe, East Asia, Missile Proliferation and Missile Defenses

Michael Ying-Mao Kau (Taiwan): Building a Collective Security Regime in the Asia-Pacific: Trends, Patterns, and Prospects

Hans Maretzki (Germany): Unsolved Problems of Normalization and Detente between Both Koreas

Chung-In Moon (South Korea): The Korean Summit and Inter-Korean Relations: Assessment and Prospects

Alexander Nikitin (Russia): Military Competition in East Asia: Current Trends and Prospects for Constraint

John Rhinelander (USA): Missile Defense and East Asia

Yuri Ryzhov (Russia): The Changing World and Missile Defense

Yong Soon Yim (South Korea): The Summit and Beyond: Remaining Challenges

BACKGROUND PAPERS/ DOCUMENTS

Monte R. Bullard (USA): "Undiscussed Linkages: Implications of Taiwan Straits Security Activity on Global Arms Control and Nonproliferation"

Chen Jifeng (China): TMD and Its Impact on Security in the Asia-Pacific Region

Chun Yong-Taek (South Korea): "Missile Proliferation on the Korean Peninsula and Consequences of the Theater Missile Defense (TMD) Program", paper presented at the Forum on *The Missile Threat and Plans for Ballistic Missile Defense: Technology, Strategic Stability and Impact on Global Security*, 18-19 January 2001, Rome, Italy

Camille Grand (France): "Ballistic Missile Threats, Missile Defenses, Deterrence, and Strategic Stability", Occasional Paper, Monterey Institute for Strategic Studies

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William J. Perry (USA): Review of US Policy Toward North Korea: Findings and Recommendations", Unclassified Report to the President and the Secretary of State, Washington, DC, October 12, 1999

Mark Byung-Moon Suh (South Korea/Germany): "Progress and Prospect of Nuclear-Weapon-Free Zones in East Asia", paper prepared for the Pugwash Workshop on *Eliminating Nuclear Weapons*, 1-3 March 1998, New Delhi, India

Tatsujiro Suzuki (Japan): A Proposal for Asian Non-proliferation Research Cener (ANREC)

Marc Th.Vogelaar (Netherlands): The Role of the EU in the Rehabilitation of the Power Sector in the DPRK

Matin Zuberi (India): "The Proposed Indian Nuclear Doctrine", *Journal of Indian Ocean Studies*, Vol. 6, No. 3, July 1999

Matin Zuberi (India): "Soviet and American Technological Assistance and the Pace of Chinese Nuclear Tests", *Strategic Analysis*, October 2000, Vol. XXIV, No. 7, New Delhi: The Institute for Defence Studies and Analyses

Recommendations to President Bush of the Independent Task Force on Korea, sponsored by the Council on Foreign Relations, March 22, 2001

The Nuclear Threat

Franco Dupré wrote this short essay—probably for a Pugwash Conference which he was planning to attend—perhaps twenty years ago. But this text was never published, presumably because of the excessive self-criticism Franco applied throughout his life to his own writings (a remarkable physics textbook for biology students, on which he labored for decades, will only be published postumously). When Franco suddenly died (see his obituary in the April 1999 Pugwash Newsletter) I tried to retrieve this little jewel, which I remembered but of which I did not then manage to find a copy. Now Annemarie—Franco's wife—found this text among Franco's papers, and with her permission we print it here—not least, for its "prophetic" ring, in the context of current efforts to revive the idea of anti-ballistic missile defense.
—Francesco Calogero, Chair, Pugwash Council

Why Do Hedgehogs Die?

By Franco Dupré

A silent massacre has been going on for years on Italian highways: hedgehogs are being run over by cars far more frequently than are other animals.

What is it that predestines them to such an end?

The hedgehog (Erynaceus) is a small, quiet insect hunter which has almost no enemies, thanks to a very effective defense technique: whenever it feels in danger it rolls up into a ball of spines, untasty to any predator—a behavior pattern which has always been very efficient in saving these animals from danger.

But not today: when "attacked" by a car, rolling up is of no help; the only chance of survival would be to run away as other animals do. Before a totally new situation, the well-established reaction, designed to save, becomes deadly. Can the fate of the hedgehog be taken as a didactical analogy, an aid to getting a feeling and an understanding of the complete novelty of the situation created by nuclear weapons?

Populations actually feel its novelty, but only in the form of fear, a paralyzing, numbing fear; they are not capable of rationally understanding its basic diversity, nor are most governments and military. Fear triggers all kinds of instinctive responses, those of mistrust, of aggression, of hate, of looking for hiding places or for superiority.

Our actions and judgements are governed by a cultural background, in turn based on a behavioral heredity which goes back thousands of centuries, which makes us fear any attack from an ambush, which makes us seek shields to protect our fragile body; we despise and hunt spies because they uncover our hiding places. We try to have more and better weapons than others.

But today, in the era of the absolute weapon, we are forced to learn that there is no effective hiding, that building up defense cannot be interpreted other than as a problem of aggression, and that more and better arms bring us only closer to a holocaust.

We are forced to learn that, because of the enormous overkilling capacity stored in both arsenals, that nuclear submarines hiding in ambush are the best guarantees for stability, that satellites spying from the sky offer us a chance to reduce reciprocal mistrust, and that inspections sniffing into our own country are needed to build up confidence.

These facts are now slowly being understood by some, but this anti-instinctive, purely rational understanding is still too weak to be able to keep under control our spontaneous reactions, which break through violently as soon as fear arises: again, we roll up like hedgehogs into the old cultural patterns of war.

But in a world which is shrinking because modern large-scale events do not halt at borders, which confronts us with dangers which our instincts and culture are not prepared to cope with, our only chance is to learn to control these reactions rationally, to make the ever-existing war culturally impossible, to change our behavioral patterns, recognize that it is deadly for mankind to "roll up" into defense and aggression in front of nuclear weapons.

This learning program poses a great didactical challenge, and an urgent challenge for survival, in the hope that mankind might avoid meeting the same end as hedgehogs.

Pugwash and the Nuclear Issue

by Joseph Rotblat
Emeritus Professor of Physics, University of London
1995 Nobel Peace Laureate

"Against a great evil, a small remedy does not produce a small result, it produces no result at all."
—John Stuart Mill

It is now more than a year since the Secretary-General initiated a review of the Pugwash nuclear agenda. It took place in several forums: in La Jolla and London (January and March 2000), by correspondence and in person among the "Gang-of-Five" (George Rathjens, Michael Atiyah, Francesco Calogero, Ana María Cetto, and myself), and at Pugwash Council sessions during the 50th Pugwash Conference in Cambridge, UK (August 2000). To these should be added several plenary sessions at the 50th Conference in which Pugwashites at large had the opportunity to express their views.

In an article in the *Pugwash Newsletter* (June 2000), the Secretary General draws attention to substantial differences of opinion on these issues: "… there is now much support for the view that abolition of nuclear weapons is a remote and, perhaps, receding and misleading or unrealistic, goal; and that, accordingly, the primary focus as regards nuclear weapons should be on measures that might, in the short and medium term, be effective in reducing the likelihood of their use…"

I took part in all but one of the above-mentioned forums. In addition, I had numerous conversations with Pugwashites in Cambridge. I did not detect much support for the views expressed in this quotation. On the contrary, it is my impression that the great majority of Pugwashites want the abolition (or prohibition)* of nuclear weapons to continue to be the main focus for Pugwash.

** Side note on terminology*. Various terms have been used in describing the ways towards a nuclear-weapon-free world (NWFW). In this paper I use the term elimination because this is the word used in official documents, e.g. the Preamble to the NPT, or in the statement from the 2000 NPT Review Conference. I am aware of the difference between elimination and prohibition, but in the context of this paper the difference is semantic rather than substantive. Any attempt to present the difference as a major problem would be misleading.

In this paper, I want to present my opinion that our policy should be based on the premise that the elimination of nuclear weapons remains our principal goal and that priority should be given to discussing measures which lead directly to that goal. In view of the suggestion that Pugwash should abandon, even if only temporarily, that goal, I believe that we should begin by revisiting some fundamental aspects of Pugwash.

Some basic notions about Pugwash

The main task for Pugwash is to provide a forum for learned debate, but this was never intended to be a purely academic exercise, solely for the purpose of acquiring knowledge. Michael Atiyah put it in a nutshell in his Schrödinger Lecture when he said: "Knowledge brings responsibility." Pugwash has a strong moralistic element. There is a motivation for our actions. We aim at specific goals.

This was so from the beginning. The Russell-Einstein Manifesto implores: "Remember Your Humanity." At the First Pugwash Conference we discussed the social responsibility of scientists on a level with the political aspects. Later this became enshrined in the "bylaws" of our (unwritten) constitution, which we have debated and adopted at successive quinquennial conferences. The document "Principles, Structure and Activities of Pugwash" states:

> *The Pugwash Movement is an expression of the awareness of the social and moral duty of scientists to help to prevent and overcome the actual and potential harmful effects of scientific and technical innovations, and to promote the use of science and technology for the purpose of peace.*

At these quinquennial conferences we also adopt a document entitled "Goals of Pugwash", which sets out the objective of Pugwash activities for the forthcoming five years (and thus are mandatory on the Council). The goals adopted at the last Quinquennium (Lillehammer, 1997) specifically include the elimination of nuclear arsenals. I believe that the time has come to reaffirm this goal, not only because of our belief that this is necessary for the security of the world but also because of equity requirements and ethical considerations.

There are many organizations, institutes and commissions which study the nuclear issue in its various aspects. We are different from most of them through our expressed concern with ethical values, yet we are disinclined to highlight this distinguishing feature. Indeed, we seem to shy away from mentioning this aspect probably because we are afraid of the criticism this might evoke; we are afraid of being labelled as naïve, amateurs and not a serious group. The so-called realists, many of whom are hawks, and some are simply cynics, view ethical arguments with contempt. Remember the question reportedly put by Stalin: "How many divisions does the Pope have?"

Another probable reason is related to the general problem of specialization. Those who study a specific topic in its minutiae, and become experts engrossed in it, do not like to be diverted by other concerns.

I do not think that we should be influenced by such considerations. Of course we should be pragmatic, but not at the cost of abandoning basic values. We should try to put some idealism into realism; we should study topics in depth but be motivated by worthy ideals. We should not lose sight of the wood for the trees.

The fact that Pugwash has a good reputation in the world – evidenced by the award of the Nobel Prize – should encourage us not to be affected by negative reactions. Far from being ashamed of raising ethical issues we should be proud of it. It is the cynics who should be made to feel ashamed, and we can do this by exposing the hypocrisy of their policies.

Hiroshima (UN photo #149442)

Moral and legal aspects

I make the above points in direct reference to our policy on the nuclear issue. Our ultimate aim is to create conditions for lasting peace in the world. Such a world would have to be based on moral principles, on equity and justice, on respect for the law, both as individuals and as a society. The integrity of international treaties is of particular importance to Pugwash.

From the very beginning nuclear weapons were abhorrent to people everywhere and attempts were made to eliminate them by international agreements (e.g., the Acheson-Lilienthal Report). The potential use of these weapons was generally described as a crime against humanity. It was in response to such feelings that the NPT came into being in 1970, and now counts among its members 98 per cent of the nations of the world. I am sure that even in the four countries that have not signed the NPT the people have the same sentiments about nuclear weapons.

The NPT has been criticized as being discriminatory, which indeed it is. But the underlying concept was laudable: to get rid of *all* nuclear arsenals and thus end the discrimination. There was an apparent difficulty relating to the ambiguous wording of the all-important Article VI, in which the pursuit of nuclear disarmament is called for in the same sentence (though separated by a comma) as a treaty on general and complete disarmament. The hawks in the nuclear-weapon states deliberately interpreted this as meaning that nuclear disarmament can proceed only together with – and as part of – general and complete disarmament. Until the latter has been achieved, the nuclear

weapon states are legally entitled to retain their nuclear arsenals, they claimed. This ambiguity has now been removed.

In the General Assembly of the United Nations there has always been strong pressure on the nuclear-weapon states to proceed with nuclear disarmament. This pressure has been steadily increasing since the indefinite extension of the NPT in 1995. A new group of seven nations, the New Agenda Coalition, was very vocal in this respect, and its efforts seem to have been successful. The NPT Review Conference in April/May 2000, in New York, came out with a long and comprehensive statement, signed by all five official nuclear-weapon states. It makes the issue quite clear. The section related to Article VI of the NPT includes *inter alia*: "An unequivocal undertaking by the nuclear-weapon states to accomplish the total elimination of their nuclear arsenals leading to nuclear disarmament to which all states parties are committed under Article VI." The previous description of nuclear disarmament as being an "ultimate goal" has also been dropped.The objective of "…general and complete disarmament under effective international control" is still mentioned in the statement, but in a separate paragraph, much further down in the document. The link between the two objectives is unambiguously broken. There is no longer any excuse not to fulfil the objectives of the NPT.

This is where the hypocrisy comes in. The solemn declaration is belied by the actual policies pursued by the nuclear-weapon states (or at least by four of them). The pursuit of the policy of extended deterrence, whereby nuclear weapons would be used – if necessary – against attacks with chemical, biological, or even conventional weapons, implies the indefinite retention (or retention at least until general and complete disarmament) of nuclear weapons. This is the actual policy of the USA; it is enshrined in the 1997 Presidential Decision Directive (PDD-60 document) which sets out the US nuclear posture, and clearly implies the first use of nuclear weapons.

If, at this stage, Pugwash were to give up the elimination of nuclear weapons as the primary focus, this would imply our connivance with the United States and the others in the violation of an international treaty. I do not think that this would be acceptable. On the contrary, we must strongly oppose such an attitude; we must use every opportunity to expose the hypocrisy of the nuclear-weapon states in proclaiming one policy and pursuing just the opposite. We should keep hammering home the fundamental thesis, that compliance with international commitments is an essential requirement of a civilized state. We should keep on reminding people that world peace cannot be achieved without respect for international law. We should encourage other NGOs working towards nuclear disarmament to make the call for the adherence to international treaties an important part of their campaigns.

I suggest that we make this issue the subject of a Pugwash Workshop. We need to study the various aspects of international treaties; their role in national and international policies; the ways and means of dealing with their violation. Some of the study would be concerned with legal issues but this should not put us off, (we are, for example, dealing with legal issues in the Pugwash study group on Intervention, Sovereignty and International Security).

The ethical dimensions of deterrence

In reviewing the nuclear issues with which Pugwash should concern itself, as a group with moral responsibilities, we should – in my opinion – take up explicitly the ethical aspect of deterrence.

The concept of nuclear deterrence is historically and substantively at the heart of the whole nuclear issue. I used it way back in 1939 as the rationale for starting the work on the atom bomb (but soon realized its fallacy); it was the rationale for nearly all the scientists in the pre-Manhattan years. Deterrence – in its various forms – was the reason for the build-up of huge arsenals during the Cold War period, and it is being used now to justify the retention of nuclear weapons.

The problem of deterrence has of course been frequently debated in Pugwash, as well as in numerous other forums. But the arguments have usually been on the political, strategic or military aspects; little attention has been paid to the ethical aspect. The reason for this is the one mentioned earlier: ethical issues have no place on the agenda of the cynics. But for Pugwash the ethical dimension of deterrence should be of prime importance. If the use of nuclear weapons is a crime against humanity, how can the threat of their use ever be justified?

In discussing the problem of deterrence I am primarily concerned with the doctrine of extended deterrence,

although the ethical element applies of course to all aspects of deterrence. The argument that nuclear weapons are needed to prevent any aggression is the chief reason for policies of indefinite retention of nuclear weapons. I believe that if this argument were shown, and accepted, to be invalid it would open the way to the total elimination of nuclear weapons.

The extended deterrence argument lacks credibility, largely arising from the general abhorrence of nuclear weapons. The existence of these weapons has not prevented the several hundred wars that have taken place since 1945. Nor has the possession of them prevented the USA and the Soviet Union from being defeated (in Vietnam and Afghanistan). No doubt, there were political and military reasons for the non-use in these cases, but the opprobrium associated with such use must have played a significant role. The taboo against the use of nuclear weapons is still strong and this weakens the threat of deterrence. On the other hand, if the taboo is too strong the deterrence argument would cease to be valid. The whole thing is based on a deliberate ambiguity. We have made our security hang on uncertainty: on whether or not a would-be aggressor will take the threat seriously.

UN Security Council debates Cuban Missile Crisis (UN photo #049)

The deterrent would be effective only if it is made absolutely clear that the threat will be converted into action; otherwise it would have no value and the bluff would be called. This means that George W. Bush, or Tony Blair, have to show convincingly that they *will* push the button and unleash the most destructive and omnipotent weapon in a dispute which could otherwise be solved with much less destruction. The threat may work for a time but eventually an aggressor will gamble on the uncertainty. In the meantime, the security of the world is based on a balance of terror, and as Francesco Calogero pointed out a long time ago: "The fact that the survival of human civilization is predicated on such a policy may, in the long run, result in the disintegration of the ethical basis of civilized society."

Although the ethical aspect of nuclear deterrence is as old as nuclear weapons themselves, there are valid reasons for raising it now as an item for our agenda. There is growing awareness in the world community about individual and collective responsibility for one's deeds. With the establishment of the International Criminal Court, people may be put on trial for offences against international law even if these are legal under national laws.

This raises the much wider issue of the personal responsibilities of scientists working on military projects. If the use of a given type of weapon is illegal under international law, should not research on such weapons also be illegal, and should not the scientists also be culpable? And if there is doubt even about the legal side, should not the ethical aspect become even more compelling?

In this connection we should be reminded of the call issued in 1995, on the occasion of the 50th anniversary of Hiroshima, by Hans Bethe, the most senior scientist in this field:

> *I call on all scientists in all countries to cease and desist from work creating, developing, improving and manufacturing further nuclear weapons – and, for that matter – other weapons of potential mass destruction such as chemical and biological weapons.*

It seems to me that there are enough items for investigation in connection with the ethical issues of nuclear weapons, to justify at least one workshop.

Steps towards a NWFW

Apart from the two suggested topics for Pugwash study, centred on the social responsibility of scientists, I want to recommend other projects on measures that would lead to the achievement of a NWFW.

A nuclear-weapon-free world will not be achieved in one go; it will require a series of steps. Some of these steps may be the same as suggested by the "realists". There is, however, a significant difference: the latter view each step as an endpoint in itself, while we see them as part of a comprehensive programme of disarmament. Among the many steps that can be taken, we should give priority to those which lead us directly to the objective.

No-first-use treaty

As I have stated several times already, I consider the doctrine of extended deterrence – which means the potential first use of nuclear weapons – to be the major obstacle to the achievement of a nuclear-weapon-free world. This is a fundamental issue. If we concede that nuclear weapons are needed to deter even non-nuclear attacks, then these weapons will have to stay for as long as disputes are settled by military confrontations. And if they are needed for that purpose by the United States, then they are needed even more by weak states. Hence, the proliferation of nuclear weapons is bound to happen, with the eventual near certainty that these weapons will be used in combat.

The doctrine of extended deterrence has been discussed and potent arguments against it were presented in several studies in the 1990s, notably in the Report of the Canberra Commission. The matter was also discussed in two relevant reports from the US National Academy of Sciences (CISAC) published in 1991 and 1997. In the first of these the following is stated in the Executive Summary:

> *We conclude that the principal objective of the U.S. nuclear policy should be to strengthen the emerging political consensus that nuclear weapons should serve no purpose beyond the deterrence of, and possible response to, nuclear attack by others.*

The 1997 Report goes a step further when it recommends that

> *To this end, the United States should announce that the only purpose of U.S. nuclear weapons is to deter nuclear attacks on the United States and its allies, adopting no first use for nuclear weapons as official declaratory policy.*

The great importance of a no-first-use policy is that it would pave the way to an agreement on the total elimination of nuclear weapons.

The no-first-use policy is usually presented in the form of unilateral declarations, or pledges, by the individual nuclear-weapon states. While this could be achieved quicker than the alternative (a treaty), it would not be satisfactory, in my opinion. There is nothing – legally – to stop a unilateral declaration from being unilaterally revoked. This has in fact happened: the Soviet no-first-use pledge, in existence since 1982, was withdrawn by Russia in 1993. In the USA, a new President may decide that he does not like the policies of his predecessor and scratch a pledge. This cannot be done easily with international treaties, signed and ratified.

International treaties can also be terminated by states parties giving suitable notice of withdrawal, but this usually creates quite a commotion (witness the current situation of the ABM Treaty), and does not occur often. Treaties may of course be violated by cheating but this too is an infrequent event. In general, there is a tendency to adhere to the terms of a treaty. Certainly, in the light of what I said earlier, we in Pugwash should promote international treaties and seek ways to ensure that they are conformed with, both in letter and in spirit.

In line with this, I believe that a no-first-use policy should be enshrined in a No-First-Use Treaty to be signed and ratified by all official and non-official nuclear-weapon states.

As far as I am aware, not much research has been done (certainly not in Pugwash) on the terms of such a treaty and its possibly far-reaching consequences for military doctrine and nuclear force postures. For example, the treaty would probably have to include a formal agreement to abolish tactical nuclear weapons, in place of the 1991/2 unilateral declarations by Bush (senior) and Gorbachev/Yeltsin, since these are weapons most likely to be used to counter a non-nuclear attack. De-alerting of nuclear warheads, necessary to reduce the probability of

an accidental or unauthorized launch, would be an essential part of a No-First-Use Treaty.

These, and other types of measures to make first use less likely, as well as possible obstacles to a NFU treaty, need to be discussed in detail, and should be the subject of a Pugwash project.

Verification of nuclear disarmament

The Pugwash study on the desirability and feasibility of a nuclear weapon-free world (published in the trilogy of Pugwash monographs on this subject) makes out a consistent case for a programme of nuclear disarmament leading to the abolition of nuclear weapons. In the last of these books (*A Nuclear Weapon-Free World – Steps Along the Way*), John Holdren makes a penetrating analysis of the pros and cons of going to zero, coming to the conclusion that "…prohibition is *clearly* desirable under appropriate conditions..." It is to these conditions, discussed in the last part of Holdren's paper, that we must apply ourselves.

The argument used by those who would like to retain nuclear weapons indefinitely is that even if a NWFW were desirable it would not be feasible, because there are no means to guarantee that a treaty to eliminate nuclear weapons would not be violated, either by some nuclear-weapon state hiding away a small nuclear arsenal (the bombs in the basement argument), or by some rogue state acquiring such weapons clandestinely at a time in the future (the breakout argument).

In a paper by Tom Milne and myself in the second book (*Nuclear Weapons – the Road to Zero*), it is argued that the probability of such events occurring, once a treaty to eliminate nuclear weapons has been agreed to, is very small, although not zero. 100 per cent security can never be achieved. Our main proposition is that a world without nuclear weapons would be safer than a world with them (quite apart from being a better world for moral reasons as outlined above). All the same, we have to substantiate this proposition by showing that it is possible to realize a safeguard regime, with a verification system – both technological and societal – robust enough to reduce the probability of breakout to a vanishingly small value.

Although the topic has been studied by Pugwash sporadically, a new systematic study is warranted, to take into account the changes that have occurred as a result of the development of new technologies and the greater opportunities provided by the advances in information technology, such as the Internet.

Methods of technical surveillance are improving all the time. Although the advanced technology may also be used by those who contemplate illegal schemes, the overall balance probably makes feasible enhanced verification (the relative advantage should be part of the study). Similarly, reliance on societal verification is becoming stronger with the much greater openness and better facilities for transmitting information through the Internet. In general, the current tendency to greater openness makes verification easier. The various agreements between the USA and Russia to improve strategic stability, e.g. the decision to set up a Joint Data Exchange Centre, should also be helpful in this respect. A workshop devoted to these issues seems to me to be highly desirable.

Nuclear weapon-free zones (NWFZ)

The second method of achieving a nuclear weapon-free world – by gradually reducing the area of the globe where nuclear weapons are allowed – is making steady progress. More than half of the surface of the earth is now officially a nuclear weapons-free zone, although in terms of the world population more than half live in the eight countries with nuclear weapons (plus NATO), this number having gone up considerably since 1998.

There is an urgent need for instituting NWFZs in at least three more areas, in Central/Eastern Europe, in Northeast Asia, and in the Middle East. Efforts to establish these seem to have evaporated recently and there is a need to revive them, in view of the heightened tension in Eastern Europe following the expansion of NATO, the concern about the nuclear policy of North Korea (described again as a "rogue" state by the administration of George W. Bush, and the chief excuse for national missile defense), and the extremely volatile and dangerous situation in Israel/Palestine. All three potential NWFZs present special problems since they would border directly on official nuclear weapon states, or include an unofficial nuclear weapon state.

The controversial issue of transit and deployment of nuclear weapons in the waters of all the nuclear weapon-free zones also requires more study, as does the formal recognition of the status of NWFZs with appropriate verification systems.

Missile Defense and East Asia

by John Rhinelander
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March 2001

The first comment that a veteran of the SALT process can make with respect to missile defense and East Asia is that an *action-reaction* cycle is about to begin. In the 1960s it was between the US and Soviet Union. That essentially bilateral competition is still not resolved. Now in East Asia a much more complex cycle is poised. China is only the most directly influenced by the US ballistic missile defense (BMD) initiatives recently made public by the Bush administration. The SALT/START experience appears largely irrelevant, except perhaps the INF Treaty and its path-breaking onsite inspection (OSI) provisions and other confidence- building measures (CBMs) as they might apply to a missile agreement with North Korea.

Change is underway in East Asia in a very complex scene. There are two major players in the area — China, which is a nuclear-weapon state, and non-nuclear-weapon Japan with the second largest economy in the world notwithstanding its present stagnation - plus, of course, the US and Russia. Overarching, there is the US-Russia-China triangle that includes three of the five acknowledged nuclear-weapon states. The US is pursuing a national missile defense (NMD), as well as theatre missile defenses (TMDs) for allies and US forces deployed abroad, that will directly impact East Asia when the details are announced. China is modernizing its strategic offensive nuclear missiles, but its scope and pace are unknown. Russia will continue to downsize its nuclear offensive systems because of economic weakness, but will remain a potent nuclear-weapon force. US missile defense programs will directly impact relations with both China and Russia.

Military Briefing of the DMZ and Panmunjom

There are four sets of bilateral relationships that are either unstable or could become so under certain trains of events involving BMDs. In each case, one or more of the three nuclear-weapon states are factors. First, there are two Koreas, not at peace nearly fifty years after the Korean War ended. Their common border, misnamed the de-militarized zone (DMZ), is one of the most heavily armed in the world. The US has a security treaty relationship with South Korea, but is concerned with North Korea's nuclear and missile programs. Russia and China have withdrawn their prior extensive support of North Korea, which is economically bankrupt but pivotable with respect to both peace on the Korean peninsula and relations among the three great powers.

Second, there is the one China of two parts - the mainland and Taiwan. Mainland China, an expanding economic giant, is facing enormous internal challenges, both economic and political. The US is Taiwan's most important supporter notwithstanding terminating its treaty relationship in 1979. Both a US NMD program, but particularly potential TMD assistance to Taiwan linked to US military forces, raise acute issues with mainland China.

Third, there is the age-old rivalry between Japan and China. The US provides extended nuclear deterrence to non-nuclear Japan, its most important security ally in Asia. The US is urging a more significant military role on Japan, including participating in TMD programs as well as support for US NMD. China is wary of both. In any event, Japan's stagnated economy is teetering between recession and sharp deflation with potential regional and worldwide impact.

Finally, there is the India-Pakistan rivalry. While technically not part of East Asia, actions by others, and in particular China reacting in part to the US, may worsen the already unstable relationship between these two nuclear-weapon-capable states. Missile defense is not yet part of

that scene. It could be, assuming willing buyers and sellers, as their nuclear offensive missile threats to each other develop. Given the constant irritant and low-level warfare over Kashmir and other disputes, the Indian subcontinent is likely to remain the highest risk of nuclear war.

The Anti-Ballistic Missile (ABM) Treaty of 1972 was negotiated by the US and Soviet Union as part of the first step in the SALT context to control the inter-action between offensive and defensive strategic (that is, long-range) weapons. On the defensive side, a nationwide defense was prohibited. Surface-to-air missiles (SAMs) and theatre missile defenses (TMDs) were generally excepted from the Treaty.[1] The regional context of SALT, then later START, was the Atlantic and Europe, not the Pacific and Asia. This was reinforced by later agreements, particularly the Intermediate Nuclear Forces (INF) Treaty signed in 1987 and the Treaty on Conventional Forces in Europe (CFE Treaty) signed in 1990. Unless ground-based and with a range greater than 500 kilometers, short-range or tactical nuclear missiles are not limited by any US-Soviet (Russian) agreement.

To date, East Asia has not been involved in any similar arms-limitation agreements. Asian states are parties to multilateral conventions, such as the nuclear Non-Proliferation Treaty of 1968 (NPT), the more recent Comprehensive Test Ban Treaty of 1996 (CTBT), as well as the Biological Weapons Convention and the Chemical Weapons Convention.

The basic asymmetries

The SALT/START/European agreements were focused on two different, but largely symmetrical rivalries. The first was the US-Soviet strategic nuclear standoff of the late 1960s, 1970s and 1980s. The threats were long range, primarily over the North Pole, and the *action-reaction* cycle involved both long-range *offensive* (ICBMs, SLBMs and heavy bombers) and countering *defensive* (ABM and SAM) systems. Historically, the US and the Soviet Union (including Russia) have never fought a war against each other. Nevertheless, each had and still has the capability to annihilate the other. They almost came to nuclear war during the Cuban missile crisis of 1962.

The second rivalry was represented by the two alliances, NATO and the Warsaw Pact. Each was led by a super power, and the alliances were massively armed with conventional and nuclear weapons across the length of their entire common border. The INF Treaty of 1987 abolished the entire class of US and Soviet land-based missiles with ranges of 500 to 5,500 kilometers. Shorter-range land-based tactical offensive weapons, whether armed with conventional or nuclear warheads, were never the subject of US-Soviet or intra-European agreements, but the 1991 parallel unilateral reductions achieved by former President Bush and Mikhail Gorbachev were a major achievement. The CFE Treaty, initially negotiated on a pact-to-pact basis, limited the five categories of weapons that could be used in a surprise attack, including tactical aircrafts that by their nature are dual capable (nuclear and conventional, bombs and air-to-ground missiles). While the Warsaw Pact has dissolved, a revised CFE Treaty remains in force.

Among the many asymmetries involved in East Asia are that China has never sought to develop a ballistic missile defense, but it benefits from the ABM Treaty in which the US and the Soviet Union agreed in 1972 to ban nationwide defenses of their territories. China thus is a beneficiary although not a treaty partner. Currently, Russia has its single, ineffective ABM site around Moscow and the US has had no operable ABM site since 1976. Similarly, China is not a party to the INF Treaty, but it benefits from the destruction of the entire class of ground-based US and Soviet (now Russian) nuclear missiles with a 500 to 5,500 kilometer range.

Conversely, neither SAM nor TMD systems were central concerns to the US or the Soviet Union in 1972 when the ABM Treaty was signed, provided they were not capable of intercepting long-range ICBMs or SLBMs. From China's perspective, SAMs or TMDs on the territories of both Taiwan and Japan could perform a strategic (i.e., defense of homeland) role against medium or intermediate range aircraft and missiles. Therefore, SAMs and TMDs have a central and strategic importance in an East Asian setting.

Terminology

The terms national missile defense (NMD) and theatre missile defense (TMD) are inherently ambiguous. They must be defined, or redefined, when discussing East Asia.

By common understanding NMD, which in current parlance has replaced nationwide ABM, refers to defenses

Arrow Theater Defense Missile (BMDO)

against long-range offensive ballistic missiles, ICBMs and SLBMs, which are invariably armed with nuclear warheads. The US and Soviet Union (now Russia) are the only two countries that have pursued and deployed NMD/ABM systems in defense of parts of their homeland. If a city or other soft target is to be defended, then the NMD/ABM system must be perfect because the destructive power of nuclear-armed ICBMs and SLBMs, particularly those armed with multiple independently-targetable re-entry vehicles (MIRVs) is so great.[2] No country has developed effective technology for this task to date, and the prospect remains remote.

The term TMD, as used by the US but not others, is relatively unambiguous. It refers to defenses against lesser-range offensive ballistic missiles which, because of the geopolitical position of the US, does not include defense of its homeland (unless linked to an ABM/NMD system itself). Therefore, TMDs defend either US allies or US forces abroad.

Theatre missile defense of US allies, whether in Europe, the Middle East or Asia, usually refers to defense of their homeland against intermediate- or shorter range ballistic missiles. The threat could be nuclear, chemical, biological or conventional. From the perspective of the country being defended, this is a strategic defense. In this article, the term TMD-Homeland (or TMD-H) will be used when the role of the TMD is clearly strategic. Whether a TMD-H needs to be perfect depends on the type of incoming threat. If the threat is conventional, then the TMD need not be even near perfect. The defense of Israel cities in the Gulf War by US Patriot missiles provided needed reassurances to the Israeli population against the conventionally-armed SCUDs, and the threat of chemically armed SCUDs, even though the defense was in fact later shown to be militarily ineffective.

Defense of US troops in the field, as well as associated air bases and transport ships in harbors, against short-range ballistic missiles that are generally but not necessarily armed with conventional warheads is a recognized military mission but not yet within the capability of the US or any other country. This will be referred to as TMD-Military (or TMD-M). A recent example is the Patriot system used in the Gulf War to defend US troops. TMD-M generally need not be anywhere near perfect to accomplish its mission (an analogy being the RAF during the Battle of Britain). Nevertheless, the failure of a Patriot battery in Saudi Arabia led to the largest US casualties in the Gulf War in an era when the US appears to be moving toward an intolerance of any casualties.

While the conceptual difference between TMD-H and TMD-M is clear, the same technology is used for these two fundamentally different purposes and raise different concerns.

The United States

President George W. Bush will probably make detailed decisions on his NMD, TMD and anti-satellite (ASAT) programs by this summer or fall.[3] It will then be up to Congress to decide each year whether or not to fund the President's budgetary requests. Over the past 40 years, Congress has frequently disagreed with the Executive, sometimes pushing NMD on a reluctant Executive (as was the case with Presidents Johnson and Clinton) while other times reducing or denying the funds requested (as with Nixon and Reagan). The present 50/50 split between Republicans and Democrats in the Senate has no historical parallel and will probably change within a year.

Bush is likely to propose: (1) deployment of a ground-based NMD system with 100 to 200 non-nuclear interceptors, perhaps first located in North Dakota rather than Alaska, which might become operational between 2006

and 2008 at the earliest[4]; (2) vigorous research, development and testing programs on sea-based (particularly boost phase) and air-based interceptors, and space-based sensors, whether used for TMD or NMD; (3) deployment of TMD-M systems (currently Pac-2) outside the US with US forces, and willingness to provide these and improved versions (whether TMD-M or TMD-H) to US allies when they become available. What Bush might propose for ASATs, other than increased R&D, is not clear.

At some point Bush might decide to give six-months' notice of withdrawal from the ABM Treaty based on "supreme interests" of the US if Russia does not accept, within a "reasonable" time, treaty amendments that the Bush administration will propose.

Whether or not Bush will decide to shift the location of the ground-based interceptors from Alaska—the location that Clinton chose but which garners little support now—to North Dakota where a site would be more compliant with the ABM Treaty, is presently unknown.[5] It is surely one of the many options under consideration, as is whether or not to deploy an X-band ABM radar on Shemya Island, as Clinton proposed, or simply upgrade the Clear (Alaska) early warning radar instead. Presumably, both North Korea and China would favor such changes, assuming the US decides to deploy an initial NMD somewhere, but neither would say so publicly. China, in particular, would still vigorously oppose any US NMD deployment that appeared capable of negating China's present minimal deterrence of 20 or so single-warhead ICBMs.

Whether Bush will decide to give a six-month's notice of withdrawal from the ABM Treaty if Russia balks at Treaty amendments, it is clearly possible and will be urged on him by many in his Administration and Republican conservatives in Congress, notwithstanding the political flak this step would entail worldwide. A decision to do so would probably be coupled with significant, and unilateral if necessary, reductions in US strategic offensive weapons on ICBMs, SLBMs and heavy bombers. The offensive reductions would presumably garner broad international support in East Asia and elsewhere. This support, though, would undoubtedly be undercut by the US following North Korea's example in 1993 and becoming only the second state to give notice of withdrawal from a post-World War II arms control treaty.[6] Tension would be especially high during the six-month period.

The strong support the US is certain to show for TMD deployments outside the US, both in defense of allies and US forces deployed abroad, would raise concerns particularly in China. US sales of Pac-3s or their successors to Japan would be viewed by China as homeland defense (TMD-H), but Japan's current and independent concern with North Korean missiles could become stronger if North Korea does not formally cease its missile developments.[7] US sale of Pac-3 or (in the future) Aegis destroyers to Taiwan, or US sea-based patrols in the Taiwan Straits coordinated with Taiwan, would probably be of greater concern to China than even a NMD system deployed in the continental United States. Both together would raise maximum concerns. How the Bush administration intends to deal with these China issues is unclear.[8]

Russia across Eurasia

Russia's interest in missile defense is global, not regional. Since the primary rationale for the US NMD is the missile program of "rogue states" such as North Korea, and since Russia fears that a US NMD, even initially limited to counter North Korea, might serve as a "base" for a highly effective system capable of countering a reduced number of Russian ICBMs and SLBMs, Russia's interest is parallel to (but motivated differently from) that of the US in seeking a permanent halt to North Korea's nuclear program and ban on its exports, development and even manufacturing of missiles with a range greater than 300 kilometers. Vladimir Putin has already visited North Korea this year with these goals in mind as well as policies that could enhance Russian export of energy to South Korea. While Bush announced he is not ready to recommence missile negotiations with North Korea "anytime soon," he may do so by mid-year or this fall, after more of his appointees are in office and his BMD programs are announced. By then, North Korea may not be willing to talk.

While Russian (as well as Chinese) policies coincide with the US in seeking bans on North Korean nuclear and missile programs, the Bush administration is unlikely to change its drive for an "effective NMD," even if satisfactory, comprehensive and verifiable agreements are reached with North Korea. Other threats would be cited, such as Iran. However, the willingness of Congress to fund an early NMD deployment, as well as multi-faceted and aggressive NMD and ASAT research, development and

Aegis system (BMDO)

test programs, could wither away with the demise of the North Korean threat in light of competing budget priorities.[9]

One China in two parts - mainland and Taiwan

When the ABM Treaty came into effect in 1972, most Asians had never heard of it or SALT, and those who did could not discern any substantial impact on their interests.[10] Notwithstanding Secretary of Defense McNamara's 1967 speech justifying the deployment of the US Sentinel ABM system by the nascent threat from China, the Soviet Union, and not China, was the prime focus of US concerns in the 1970s and thereafter. Furthermore, China has never indicated an interest in developing and deploying ABM/NMD/TMD on its own. It appears unlikely to do so in the foreseeable future.

The Clinton administration sought to convince China that it should have no concerns with the proposed Alaska-based, phase-one US NMD deployment. China was not persuaded. It focused on capability not intent, just as the US has always done with the Soviet (Russian) ABM deployment site around Moscow and the possible "upgrade" of Soviet SAMs to link with its ABM system. From China's perspective, the Clinton NMD was aligned against and intended to counter its existing ICBMs, not those of North Korea, which are non-existent. Phases two and three of the Clinton scheme would have compounded China's concerns.

The US sold some Pac-2 TMDs to Taiwan in the 1990s and Taiwan has developed its own Sky Bow. Neither is viewed as effective for urban defense, which is their purported role, against hundreds of conventionally-armed missiles. Pac-3, the successor to Pac-2, is still in development and testing, as are other land-based and sea-based TMDs. Any sale to Taiwan of improved TMD capability would be of great concern to China. Nevertheless, there is considerable support for this in US Republican circles. China would undoubtedly assume the TMDs would be for Taiwan's homeland defense (TMD-H) and could encourage Taiwan independence, particularly if coupled with a US NMD.[11]

Any deployment of improved TMDs in Japan by US forces or the Japanese defense forces for homeland defense would also raise concerns in China. The US and Japan have recently established a new US-Japan Commission on Arms-Control, Disarmament, Non-Proliferation and Verification. Inter-operability and strategic implications of Taiwanese TMD may be one agenda item.[12] Unfortunately, the US-China dialogues on these issues to date appear as stilted as those between the US and Soviet Union in the early 1960s.

The two Koreas

The US has two concerns about North Korea. The first is its nuclear program that was the subject of the 1994 Agreed Framework. The Bush administration has publicly stated its support for these efforts, but may do nothing to speed up the slow pace. The second is the North Korean ballistic missile programs, involving both possible deployment in North Korea and exports to other "rogue states" such as Iran and Libya, as well as Pakistan. The missiles have not yet become the subject of agreement, notwithstanding the progress made under Clinton. His hope that agreement could be reached before he left office to justify a trip to Korea to sign a historic document was frustrated by several reasons, including North Korea's failure to accept rigorous verification measures.[13] Russia, China and Japan are all generally supportive of US initiatives in these two areas, although not necessarily of the details or tactics. In the end though, while their firmness could be helpful, both efforts could collapse.

There is little role for TMD on the territory of South Korea. While TMD-M such as the present Pac-2s with US forces might have a marginal role in defense of air bases or port facilities in the southern part of the peninsula, TMD

serves no role in the Seoul area. The cost exchange ratio is adverse. North Korean artillery and missiles would overwhelm whatever TMD was deployed in the area and Seoul could be destroyed by conventional weapons in any war. The Clinton administration intended eventually to deploy an X-band radar in South Korea for US NMD, but it could not help provide an effective defense for Seoul. South Korea's present position with respect to the US NMD program is unclear.

South Korea, of course, is central to all issues effecting the peninsula, even on those where the US is the prime negotiator with the North. The ultimate success of South Korea's Sunshine Policy depends on the North Korean nuclear and missile issues being resolved.

Japan and China

Japanese defense forces have deployed some Pac-2s. Their purpose is not readily apparent, but presumably are to defend high value military targets (TMD-M), and not urban areas, against conventional warheads. Japan's primary present concern appears to be North Korean missiles, but it is concerned that China is targeting it with nuclear weapons.

As its primary security ally in Asia, the US is urging Japan to take a more vigorous role supporting ballistic missile defense generally. For the moment, Japan appears most interested in its industry participating in BMD technology development.

India and Pakistan

The most predictable impact of ballistic missile defense on India and Pakistan would result from China increasing significantly its offensive ballistic missile capability, both in numbers and readiness, in response to a US deployment of NMD that China perceived directed at it. Under the circumstances, India might feel threatened by an increased Chinese threat, and therefore increase its missile capability against China. Pakistan, in turn, might then increase its nuclear forces. The situation on the Indian subcontinent, already inherently unstable, could worsen by this *action-reaction* cycle.

At present missile defense does not seem to be an issue on the subcontinent. India now has some SA-10 batteries from Russia. They are generally comparable to Pac-2s in that the SA-10 was designed as a SAM and improved to have some TMD capability. India does not have the SA-12B, a more capable Russian TMD system. If India were to deploy SAMs extensively and acquire an upgraded TMD, this could be destabilizing since Pakistan has nowhere to go to acquire SAMs/TMDs even if it wanted to purchase them.

Conclusion

Any firm conclusions about missile defense and East Asia are lacking, given the absence of a coherent framework for analyzing the issues, the current ineffectiveness of NMD and TMD systems, and the unknown timing and content of the Bush administration's proposals. But several tentative thoughts are worth offering.

Most pressing is the need for the Bush Administration to consider, as none of its predecessors has done, the impact of NMD and TMD upsetting stability in the region.

There is no historical record of bilateral or regional negotiations in East Asia.[14] The state most actively threatening to upset the status quo by introducing BMD issues is the US, which is not even located in East Asia. Most pressing is the need for the Bush Administration to consider, as none of its predecessors have done, the impact of NMD and TMD upsetting stability in the region.

When discussions or negotiations begin, whether bilateral or multilateral, the US, Russia and China will sometimes be aligned together, but other times adversarially, in the four sub-regional areas. In the two Koreas, their prime interests will be aligned in dealing with North Korea and each should view the situation as the highest urgency. In the case of China and Taiwan, the US and China could become diametrically opposed. The impact of missile defense on the relationship between China and Japan appears less clear and urgent. In the India-Pakistan situation, China's reaction to US NMD could be the most important variant since it will influence India's response.

Russia is a treaty partner with the US to the ABM Treaty, while China is not. Russia would probably accept modest Treaty amendments and a limited deployment of NMD. China is likely to oppose a range of US decisions, including military sales to Taiwan and any NMD deployment. What each would do if the US were to ignore totally

their views is uncertain. Russia could withdraw from or refuse to implement one or more treaties if the US withdraws from the ABM Treaty. The NPT could begin to unravel.

The risk of war or increased instability could increase in three circumstances. First, North Korea, if isolated again and if the US and South Korea were to take military measures as in 1994, could strike out across the DMZ although it would be the eventual loser. More likely would be a continuation of exports of missiles. Second, China, if Taiwan declares independence behind an upgraded TMD shield, could take military action of some sorts against Taiwan, although the specifics are unclear. Other types of actions would be certain. Third, an increase in deployed nuclear weapons by India, in response to China, would surely increase crisis instability in South Asia.

The two most urgent steps are comprehensive discussions, leading to negotiations, between the US and China and the renewal of negotiations between the US and North Korea. With respect to North Korea, some have interpreted the Bush Administration's rejection of negotiations "anytime soon" as a radical change in policy from its predecessor. Others, including this author, are more optimistic and view it as a pause while the Administration staffs up, and carefully fashions its policy.[15] The readiness of the US to begin negotiations sooner rather than later appears singularly important. US-China relations are at a fork in the road, and the window of opportunity with North Korea could shut, as it has so frequently in past years.

Footnotes

[1] The author's analysis of BMD/NMD and the ABM Treaty are expressed in Foreword to Jeffrey Boutwell (ed.) *Nuclear Stability and Missile Defense*, Pugwash Occasional Papers, vol. 2 no. 2, March 2001, written after the October 2000 Pugwash Workshop in Sigtuna, Sweden.

[2] This is a fundamental point, made by George Rathjens in his Epilogue to the recent *Pugwash Occasional Paper, supra* note 1.

[3] The timing appears more uncertain all the time. It is probable that details will not be announced before the Senate votes on the President's number one priority, tax reduction, which is unlikely to occur before June at the earliest.

[4] Even if the interceptors were initially based in North Dakota, there will be at least one large radar in Alaska. There is currently one there in Clear, Alaska, for early warning. This radar could be upgraded, together with those in Thule and Fylingdales, to perform ABM radar tracking functions, as Clinton proposed.

[5] A prime Treaty issue raised even by a switch from Alaska to North Dakota would remain the ban on a nationwide ABM system in Article I.

[6] The North Korean three-month notice under the NPT, then suspension of it the day before it became effective, is chronicled in Don Oberdorfer, *The Two Koreas* (Basic Books, 1997), pp. 279-86.

[7] See generally Michael J. Green and Katsuhisa Furukawa, "New Ambitions, Old Obstacles: Japan and Its Search for an Arms Control Strategy," *Arms Control Today* ("ACT") (July/August 2000), pp. 17-24. All articles published in ACT since 1997 are available at http://www.armscontrol.org

[8] For a general discussion of BMD and China, see Charles Ferguson, "Sparking a Buildup: U.S. Missile Defense and China's Nuclear Arsenal," *ACT* (March 2000), pp. 13-18; Banning Garrett, "Facing the China Factor," *ACT* (October 2000), pp. 14-16. In April, President Bush will have to make a decision on Taiwan's annual request for military sales. Republicans in Congress, as usual, are the strongest supporters of arms sales to Taiwan as evidenced by a staff report from the Senate Foreign Relations Committee. See Bill Gertz, "Senate report urges arms for Taiwan," *Washington Times*, Mar. 12, 2001, p. A1; Robert Kagan, "China's Game of Chicken," *Washington Post*, Mar. 12, 2001, p. A17. China's Deputy Premier Qian Qichen is scheduled to meet with President Bush on March 22. The President's decision is likely to be made in mid-April. If he denies anything on Taiwan's current list, some Republicans in Congress will urge they be provided notwithstanding.

[9] See generally the author's Foreword in the recent Pugwash Occasional Paper, *supra* note 1.

[10] See Morton H. Halperin, "The Perspective from China and Japan," in Mason Willrich and John B. Rhinelander (eds.), *SALT–The Moscow Agreements and Beyond* (Free Press 1974), pp. 209-222.

[11] See generally Trevor Corson, "Backing Beijing Into a Corner," *New York Times*, Mar. 12, 2001, p. A19.

[12] See "New Ambitions, Old Obstacles," *supra* note 7, at 23-24.

[13] See Wendy R. Sherman, "Talking to the North Koreans," *New York Times*, Mar. 7, 2001, p. A23, for a summary of the negotiations at the end of the Clinton administration and recommendation that President Bush renew them. See generally Willis Witter, "Bush demands N. Korea pacts verified," *Washington Times*, Mar. 8, 2001, p. A1; Leon V. Sigal, "Negotiating an End of North Korea's Missile Making," *ACT* (June 2000), pp. 3-7, and "Averting a Train Wreck With North Korea," *ACT* (Nov/Dec 1998), pp. 11-15.

[14] The US did intervene to block Taiwan's and South Korea's moves toward nuclear-weapon capability and to limit the range of South Korean ballistic missiles.

[15] See generally Thomas L. Friedman, "Macho on North Korea," *New York Times*, Mar. 9, 2001, p. A 21.

The Impact of U.S. NMD on Chinese Nuclear Modernization

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Chinese nuclear deterrence

The Chinese decision to build its own nuclear weapons was a response to the nuclear threats posed by the United States (U.S.)[1] In the 1950s, China perceived constant nuclear threats from the U.S. and felt that the threat could be negated by nuclear deterrence. China chose to develop its own nuclear force rather than accepting the Soviet nuclear umbrella because it did not want to lose its sovereignty and independence in a military alliance with the former Soviet Union. In January 1955, the Chinese leaders made a decision to develop atomic bombs to defeat the U.S. nuclear blackmail and nuclear monopoly.[2] The next year, China began to organize research on atomic bombs and the missiles that would carry them[3]. After the Soviet Union tried to constrain China from further developing Chinese nuclear weapons, China became more determined to develop an independent nuclear force.[4]

The purpose of Chinese nuclear development is to defend its vital national security by countering possible nuclear blackmail. China worries that the superpowers would feel free to offend China's vital security interests without apprehension if China did not have nuclear weapons. It expects that its nuclear arsenal would discourage the use of nuclear weapons or the threat of using nuclear weapons against China. The Chinese leaders believed that (1) a modest nuclear force would be able to neutralize nuclear blackmail made by the superpowers and deter their nuclear attacks; and (2) nuclear weapons are not militarily usable and therefore the Chinese nuclear weapons are not for war-fighting.[5] Based on Mao Zedong's nuclear strategic thought, China made a no-first-use commitment immediately after its first nuclear test. In this commitment, China pledged not to be the first to use nuclear weapons. Since then, the no-first-use commitment has become an important part of Chinese nuclear strategy.

To explore the impact of U.S. National Missile Defense on the Chinese nuclear deterrent, we need to quantitatively understand how the Chinese nuclear deterrent works now. The difficulty here is that the Chinese government has never explicitly explained how to translate Chinese nuclear strategy into quantitative requirements for its nuclear force. So we have to make some educated guesses in our analysis on the Chinese nuclear deterrent. In addition, all the discussions on Chinese nuclear deterrence in this paper will be only in the China-U.S. context.

Chinese nuclear development may be divided into three stages. In the first stage, China had only a symbolic or existential nuclear deterrence until it acquired the capability of launching Inter-Continental Ballistic Missiles (ICBMs) in 1980.[6] After that, Chinese nuclear deterrence entered into the second stage in which deterrence is based on the quantitative ambiguity of its nuclear force. In general, the creditability of the nuclear deterrent of a country depends on its rivals' perception about its nuclear retaliatory capability. It is widely believed that China has about twenty liquid-fuel silo-based ICBMs that can reach the U.S.[7] The two dozen land-based ICBMs that have been detected and located by the U.S. intelligence agencies would have very little chance of surviving a U.S. preemptive nuclear strike. However, because China has neither confirmed nor denied any outside estimates about the size of its long-range nuclear force, it is difficult for the U.S. to rule out some errors in its estimate. If the U.S. considers launching a preemptive nuclear strike against China, the Americans would understand that they may not know the exact number of Chinese ICBMs. They may have some confidence that they could destroy all two dozen detected Chinese ICBMs in a preemptive strike, but they would have to worry about a Chinese nuclear retaliation with a few undetected ICBMs. Such a worry would discourage and deter the U.S. from attempting a nuclear strike against China.

The total number of the Chinese ICBMs do not directly contribute to Chinese nuclear deterrence since multiplying this number does not increase the strength of deterrence. The error or uncertainty of the American esti-

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mate about the size of the Chinese long-range nuclear force forms the perceived Chinese retaliatory capability in the U.S. and the scope of this uncertainty or error is directly relevant to the credibility of Chinese deterrence.

To deter a first nuclear strike from the U.S., the Chinese nuclear retaliation must be able to cause an intolerable amount of damage to the U.S. There are different estimations about the minimum number of nuclear warheads needed for causing intolerable damage based on different criteria.[8] The criterion used in this paper is drawn from the history of recent U.S. conventional wars. The U.S. ended two wars without winning them in the last half century: the Korean and Vietnam conflicts. There were several reasons for the U.S. withdrawal from these two wars. One important and common reason is that each war had caused tens of thousands of American casualties. So, I assume that the U.S. would choose other options rather than launching a nuclear strike against China in a crisis if the U.S. understands that the strike would initiate a Chinese nuclear retaliation and that the retaliation can cause more American casualties than the above figures: tens of thousands. A nuclear bomb with a yield of about one megaton TNT equivalent exploded over a big city would certainly cause many more casualties than tens of thousands. So a Chinese retaliatory strike with a few nuclear warheads should be able to deter a first nuclear attack from the U.S.

The above discussion shows that the nature of Chinese minimum nuclear deterrence is quite different from that of the other nuclear states. In its current stage, Chinese minimum nuclear deterrence comes from the quantitative ambiguity of its nuclear force. As long as this uncertainty is larger than a few ICBMs, the deterrence is stable. Now, Chinese nuclear development is going to enter a third stage, in which China will have credible and visible minimum nuclear deterrence. The Chinese long-range nuclear force could not be saturated by a U.S. preemptive strike, i.e., at least a few Chinese ICBMs or Submarine-Launched Ballistic Missiles (SLBMs) would be able to survive a U.S. preemptive strike and could be used in a retaliatory strike no matter how well the U.S. measures the total number of Chinese nuclear weapons. China has two options to acquire a credible nuclear deterrence: to increase the quantity or to raise the survivability of its nuclear force. Table 1 gives the number of nuclear weapons China needs to maintain a credible minimum nuclear deterrence in different Chinese deployment modes and at different levels of the U.S. nuclear arsenal. This paper gives one estimate

Table 1, Nuclear Weapons Needed by China for Creditable Minimum Nuclear Deterrence under Various Assumptions

	Numbers of Chinese weapons and hypothetical deployment			
Warheads in the U.S. at different level	Silo-based	One-dimensionally mobile	Two-dimensionally mobile	Submarine-based
START II: Operational and hedge ICBM: 1400 SLBM: 2130	1200	167	22	30
START II: Operational only ICBM: 500 SLBM: 1680	800	112	18	30
Total: 1000 ICBM: 230 SLBM: 770	430	57	14	30

Data from, Li Bin, "China's Nuclear Disarmament Policy", in Harold A. Feiveson ed., *The Nuclear Turning Point, A Blueprint for Deep Cuts and De-alerting of Nuclear Weapons*, Brookings Institution Press, Washington, D.C., 1999, pp.325-332. In the table, "one-dimensional mobile" means that the weapons are restricted to moving along a highway or railway, with no opportunity to scatter in other directions; "two-dimensional mobile" means that the weapon can travel off roads. One third of the submarines are assumed at sea all the time and to be 100% survivable.

based on the criteria explained above and assumptions listed below. Other estimates might give quantitatively different numbers, but the general pattern would be the same and would not change the argument made in this paper.

Table 1 shows that to acquire a credible nuclear deterrence, China needs a big expansion of its long-range nuclear arsenal if it does not raise its survivability beyond placing the missiles in hardened silos. If China successfully develops mobile ICBMs or SLBMs, it needs very little, if any, increase in its long-range nuclear force. It is reported that the size of the Chinese long-range nuclear force has been stable over time in the last two decades and that China is working on mobile ICBMs.[9] This suggests that China has chosen the second option, that is to build credible minimum deterrence by increasing the survivability rather than the number of its long-range nuclear weapons. If there is no missile defense, this will be the direction of Chinese nuclear modernization. Nuclear development in this direction is very predictable and stable. This approach to nuclear modernization will increase Chinese security without increasing the perception of threats in other countries. The National Missile Defense (NMD), if the U.S. decides to deploy it, would force China to consider incorporating approaches that would help defeat the defense, and this would make the direction of the Chinese nuclear modernization diverge over a big range of possibilities.

Impact of NMD on Chinese nuclear deterrence

The effort of current U.S. missile defense development is focusing on Ballistic Missile Defense (BMD). There are five basic types of BMD: (1) pre-launch attack, meaning attacking the missiles before their launch; (2) boost-phase interception, meaning attacking the missiles while they are being accelerated by their rocket boosters; (3) exoatmospheric interception, meaning attacking the missiles or their warheads during midcourse in the upper atmosphere or above it; (4)endo-atmospheric interception, meaning attacking the missiles or their warheads during the reentry phase in the lower, denser atmosphere; (5) civil defense, meaning reducing the effects of the missile attacks by strengthening constructions on the ground or hiding personnel and facilities at safe locations. The U.S. BMD effort covers the first four approaches, which may have different impacts on Chinese nuclear deterrence.

In its history, the U.S. tried several times to acquire a capability to counter ICBM attacks. The U.S. first developed nuclear-armed anti-ballistic missiles (ABMs) in the 1960s but abandoned them later. In the 1980s, the U.S. attempted to develop layered missile defenses with directed energy and kinetic energy weapons under the Strategic Defensive Initiative (SDI), which was believed later to be too ambitious. Because SDI technology was far from ready and East-West relations improved in the late 1980s and the early 1990s, the SDI program shrank. In the Bush Administration, it was changed to a more limited program referred to as Global Protection Against Limited Strikes (GPALS). In the first Clinton Administration, the SDI program officially died and then it was revived in the current BMD programs.

The current U.S. BMD effort can be divided into two major parts. The first is the project to develop Theater Missile Defense (TMD), for which the declared goal is to defend U.S. military bases abroad or its allies against attacks by missiles with ranges less than 3,500 kilometers. The second is the project to develop a National Missile Defense (NMD), for which the declared goal is to defend the U.S. territory against ICBM attacks. To defend the entire United States, the U.S. would have to use exoatmospheric or boost-phase interception. Exoatmospheric defense is the emphasis of the current U.S. NMD project as designed by the Clinton Administration, while boost phase defense has also been proposed for discussion.[10] The current TMD project includes lower-tier, upper-tier and boost phase systems. The lower-tier systems, e.g., the Patriot antimissiles, are endo-atmospheric defense systems that can defend only small areas. The upper-tier systems, especially the Navy Theater Wide (NTW) system, could defend a big area in principle, so they could be used to supplement the U.S. NMD if needed.

Before President Clinton decided to leave the decision on NMD deployment for the next president, the Ballistic Missile Defense Organization (BMDO) had designed an NMD architecture, calling for initial deployment of interceptors in Alaska. Many Republicans are pushing for a more robust NMD system, while others oppose the idea of NMD based on mid-course interception. At the same time, US-North Korean relations are improving and the perceived DPRK missile threat is declining. All these factors may fundamentally change the structure of NMD. This paper will only consider the Clinton Administration's

NMD architecture and analyze its impact on China's nuclear deterrence. This analysis will also be valid if the main technology and structure of the NMD system remains similar in the next administration.

According to the Clinton Administration's NMD system design, the U.S. would deploy ground-based launchers and interceptors at two locations. The interceptors would be equipped with Exoatmospheric Kill Vehicles (EKVs) that kill incoming warheads by hitting them at high speed (hit-to-kill). The NMD system is designed to work as follows: the early-warning satellites of the NMD systems detect the launch of a missile by seeing the hot and bright plume from its engine. Once the missile is detected, the control center tells different sensors to track the missile or the warhead and decoys it releases and discriminate them. These sensors include some early-warning radars that would be upgraded to have a tracking capability accurate enough to guide interceptors, some X-band tracking and discrimination radars, and satellite-based infrared tracking sensors. The trajectory information obtained by these sensors would be used to launch and guide interceptors toward the target warhead. After the EKV is released, the infrared sensors on the EKV would guide it to approach the target. To increase the kill probability, several interceptors may be launched towards each target warhead.

According to the current plan, the U.S. would deploy NMD in several phases. In the first development phase, sometimes referred to as capability 1 (C1), the U.S. would deploy one hundred interceptors in Alaska, upgrade existing early warning radars, and deploy a new X-band tracking radar. The goal of this phase is said to be to defend against an attack by a few tens of missiles with simple or no countermeasures. It is noticeable that the C1 system was originally designed to have twenty interceptors and to deal with a few ICBMs. Its proposed size and capability was subsequently enlarged to its current level. In the later phases, the U.S. would deploy more radars, low-orbit and high-orbit missile-tracking satellites, more interceptors and would add a new launch site. The stated goals of these phases are to defend against a few tens of missiles with complex countermeasures.

The number of missiles the C1 system is intended to defend against is comparable to the reported size of the whole Chinese long range nuclear force and is obviously larger than the number of the Chinese retaliatory ICBMs.

Chinese Vice-Premier Qian Qichen and Kofi Annan (UN photo #esd490)

As discussed in the last section, only a few Chinese ICBMs would survive a first U.S. strike and constitute a retaliatory capability if China does not expand the size of its long range nuclear force. So even a very thin NMD system with very few interceptors would pose a serious threat to the Chinese retaliatory capability. No matter how the U.S. government clarifies its intentions in deploying NMD, many Americans still believe that a NMD designed for "rogue states" would have an inherent capability to defend against Chinese ICBMs.[11] Chinese nuclear deterrence depends directly on American perceptions about Chinese nuclear retaliatory capability. The deployment of NMD would change these perceptions and therefore significantly undermine the Chinese deterrent. Without the backup of NMD, the Americans would always worry about a Chinese retaliation with the few Chinese nuclear weapons that might survive a U.S. first nuclear strike against China. The deployment of a NMD system would provide the American public with an illusion that the several surviving retaliatory Chinese ICBMs would be intercepted by the NMD system – since it is both designed and said to be able to defeat attacks by small numbers of missiles. If the Americans tended to believe that a first nuclear strike plus a NMD system would be able to disarm the Chinese nuclear retaliatory capability, the U.S. could become incautious in risking nuclear exchanges with China in a crisis. It would therefore disturb the strategic stability between China and the U.S and increase the danger of war between the Chinese and American peoples.

China has realized these dangers and its arms control representative, Ambassador Sha Zukang stated that "it is

evident that the U.S. NMD will seriously undermine the effectiveness of China's limited nuclear capability from the first day of its (NMD) deployment. This can not but cause grave concerns to China."[12]

The structure of the NMD system designed for the Clinton Administration is obviously East Asia-oriented, especially in its first deployment phase, C1. In the C1 phase, the only new missile tracking radar will be deployed on Shemya, an outpost well located to watch missiles from East Asia, including Russian Siberia, Korea, and China. The only NMD launch site in the C1 and C2 phases would be in Central Alaska, which is much closer to East Asia than to the Middle East or the European part of Russia. This geographical structure provides more time and less required defense range for the interceptors in defending against missiles from East Asia than from other places in the world. This may help the U.S. take a strategy of "shoot-look-shoot" in defending against missiles from East Asia. This strategy could raise the kill probability of the NMD system and allow it to operate in a more efficient way. The East-Asia-emphasized structure of the NMD system could leave Americans with a strong impression that missiles from East Asia would have little chance of penetrating the U.S. defense.

The above analyses show that the U.S. NMD system proposed by the Clinton Administration, based on its number of interceptors and geographical structure, would have an inherent potential capability to threaten the Chinese retaliatory nuclear force. This would reduce American perceptions of China's nuclear retaliatory capability and undermine Chinese nuclear deterrence. Besides the problem of the designed capability of NMD, the intention behind NMD in the U.S. is also worrying. As the relations between North and South Korea are improving, the voices in the U.S. calling for aiming the NMD at China are getting stronger. This will cause serious concerns in China and the Chinese will have to explore possible responses in their nuclear development if the U.S. decides to deploy NMD.

Requirements for Chinese responses

China is now using its diplomatic resources to influence the U.S. on the NMD matter. The hope is that the U.S. will take China's security concerns into account when it considers NMD deployment. But there is a danger that the U.S. will ignore China's concerns when making its deployment decision. If this happens, China will certainly seek possible approaches that help maintain the effectiveness of its nuclear deterrent. As Ambassador Sha Zukang stated, "China has not and will not participate in an arms race with anybody. But neither will we sit on our hands and allow our legitimate security interests to be compromised by any one."[13] When China considers the approaches to protect the effectiveness of its nuclear deterrence, it is necessary to apply some requirements to these approaches. Our research indicates that four such requirements are fundamental.

(1) The approaches China takes should be FEASIBLE in helping defeat the U.S NMD. This is a requirement that takes precedence over all others. Judging the feasibility of proposed approaches is sometimes difficult because of the following four reasons: (a) The BMDO has declared that the NMD system would be able to defeat simple and complicated countermeasures as its development proceeds. It is not clear how the NMD would do this based on all the proposed technology; (b) although the technology of the NMD plan proposed by the Clinton Administration is clear, the plan itself is still uncertain. For example, the Republicans are pushing for stronger missile defenses; (c) China needs to worry about any scientific surprises in NMD development; (d) different organizations in the Chinese defense industry may have different assessments of the feasibility of different approaches. Due to the uncertainty about the feasibility of various approaches, the Chinese government may want to pursue more than one set of approaches in case one does not work.

(2) Some of the approaches should be VISIBLE to the U.S. It is necessary but not sufficient that the Chinese approaches can defeat the U.S. NMD. The reason is that Chinese deterrence depends on the American perception of Chinese retaliatory capability rather than its real capability. Thus, some of the Chinese approaches should be visible to the Americans so that they will know that their NMD system will not be able to counter the Chinese retaliatory capability.

(3) The approaches should be AFFORDABLE and not constitute a financial burden on China. China is now concentrating on economic development. It does not want a sharp expansion of military expenditure that would disturb its economic progress. The Chinese government's policy takes economic development as its priority and the pol-

icy has strong support from the Chinese people.

(4) The approaches should be MODERATE and not increase perceptions of a "China threat" in other countries. China is now in the process of fully participating in the international community and it needs a peaceful environment for its economic development. In order to continue this peaceful profile, China would prefer approaches that avoid negative consequences in arms control or that would lead to new tensions.

In addition to the above four key requirements, there are some additional factors that could also influence decision-making in selecting possible approaches. These factors are not as critical as the four above, but sometimes they can be important when the potential approaches are assessed in different Chinese organizations. These factors are the following:

(5) The decision makers will prefer approaches that are COMPATIBLE with each other. All approaches applied to the missile defense problem must be compatible with each other. On the other hand, decision makers sometimes prefer competition in the early part of the development process, so incompatible approaches may not be excluded in early Chinese plans.

(6) Some PRECAUTIONARY approaches are needed. The U.S. BMDO declares that NMD will defeat simple and complicated countermeasures in different development phases. It is not clear how the current NMD technology will do this. So the Chinese will have to worry about some possible scientific surprises. On the other hand, some people in the U.S. are pushing for stronger missile defenses or even a revival of part of the SDI program. The Chinese may want to have some technical preparation for approaches that can also deal with a stronger missile defense.

(7) Approaches based on CHALLENGING technology could obtain more support. China worries that one of the intentions behind the U.S. NMD is to acquire preemption in military technology in the new century. Chinese scientists would hope that their work could narrow the technical gap between China and the U.S., although some approaches may not be the best option to respond to the U.S. NMD.

The above list is not an exhaustive one. There may be some other factors which could at some time play a role in determining Chinese responses. For example, if an approach has traditional bases in the Chinese defense industry or dual-use industry, it would have more of a chance to be recognized and recommended by the scientists in those industries. Therefore, it would have a better chance to be chosen by the government. However, these factors may not be as important as the seven described above.

The U.S. development of missile defenses is forcing China to consider taking approaches to protect its nuclear deterrent. This poses some new requirements and challenges for Chinese nuclear development. As discussed in the first section, if there is no missile defense, China needs to worry only about survivability, reliability and safety in its further nuclear development. The appearance of missile defenses would disturb the process and introduce many uncertainties. The next section will comment on different Chinese approaches based on the above listed seven factors.

Comments on possible Chinese responses

Many approaches that could help defeat NMD have been discussed.[14] These approaches may be divided into four groups. The first group aims to overwhelm the defense. This could be done by (A) building more ICBMs; (B) MIRVing the Chinese ICBMs to multiply the number of warheads; (C) releasing decoys from the missiles; or (D) dispersing chaff to fool the sensors of the defense. The second group aims to lower the observability of the warheads by applying stealth technology. This group includes: (E) radar stealth, meaning that the radar reflection from the warhead is reduced; and (F) infrared stealth, meaning that the infrared radiation emitted by the warheads is reduced. The third group creates a rivalry between the warheads and the interceptors during the flight, for example, (G) by making the warheads maneuver. The fourth group raises the survivability of the Chinese ICBMs by (H) deploying mobile ICBMs and/or SLBMs; (I) building a missile defense; or (J) putting the Chinese nuclear weapons on hair-trigger alert.

There are two very different scenarios in which more ICBMs would be built to overwhelm the defense. In the first scenario, China builds more silo-based ICBMs; and in the second scenario, China builds more survivable ICBMs or SLBMs. These two scenarios give very different results.

As discussed in the first section, the current Chinese

nuclear deterrent is based on quantitative uncertainty in the minds of its rivals. The NMD would strengthen U.S. confidence in its ability to counter Chinese retaliatory capability. If China wants to overwhelm the defense by developing more warheads, the size of its retaliatory force should be larger than the sum of the number of warheads intercepted by the defense and the number of warheads that can produce "intolerable damage". Here we assume that two interceptors are used to kill one warhead, so that a C1 system with 100 interceptors is able to kill 50 warheads. Table 2 gives the number of warheads China needs to overwhelm a C1 or C2 system.

All the numbers in Table 2 are larger by 50 than those given in the same positions of Table 1. However, if there is no missile defense, China could maintain its nuclear deterrence by keeping some quantitative ambiguity about its nuclear force before it deploys survivable nuclear weapons. If there is a missile defense, the effect of the quantitative uncertainty would be eliminated by the defense. China would then have to seek a credible deterrent. The conclusion is that it is not economic or efficient for China to enlarge its silo-based nuclear force in response to a U.S. NMD deployment. It would be a more reasonable option for China to overwhelm the defense with fully mobile ICBMs or very survivable SLBMs when these technologies are ready. A key problem here is the timing: If China wants to overwhelm the defense with an enlarged nuclear force, China needs to raise the survivability of its nuclear force before the U.S. finishes the deployment of NMD. If Chinese technology cannot be ready in time, or if China chooses to deploy combined modes of its long-range nuclear force, the number of nuclear warheads China needs to overwhelm the defense varies from one hundred to several thousands. This would create a big uncertainty about the future of Chinese nuclear forces.

Enlarging Chinese nuclear forces to overwhelm the defense may have some significant costs for China: (1) it may not be good for China's peaceful profile; (2) it may involve a big financial burden if China chooses to enlarge the silo-based nuclear force; (3) China may need to produce additional fissile materials for the new warheads, especially if China chooses to add silo-based ICBMs. This factor would make China reluctant to join a Fissile Materials Cut-off Treaty (FMCT) if it wants to keep open the option of such a buildup. Although the costs could be large, the buildup option cannot be ruled out. The reason for this is that the buildup option is so mathematically simple to understand and so certain to work. So, in the Chinese debate this idea would easily win some support from non-technical people. Another advantage is that the buildup would be visible to the outside and would therefore help discourage any first strike against China.

An efficient way to enlarge a nuclear force is to deploy Multiple Independently-targeting Re-entry Vehicles

Table 2, Nuclear Weapons Needed by China to Maintain Credible Minimum Nuclear Deterrence in Case of C1

	Numbers of Chinese weapons and hypothetical deployment			
Warheads in the U.S. at different level	Silo-based	One-dimensionally mobile	Two-dimensionally mobile	Submarine-based
START II: Operational and hedge ICBM: 1400 SLBM: 2130	1250	217	72	80
START II: Operational only ICBM: 500 SLBM: 1680	850	162	68	80
Total: 1000 ICBM: 230 SLBM: 770	480	107	64	80

(MIRVs) if the technology is available. In U.S. efforts to persuade Russia to revise the ABM treaty, one inducement has been to allow Russia to keep its MIRVs. This could encourage China to think about this option. However, for China, MIRVing the silo-based ICBMs is not a good idea because its nuclear force is much smaller than Russia's. MIRVing the survivable ICBMs could be better. But this depends on whether the technology is mature.

Some Chinese articles mention multiple-warheads as countermeasures[15], but they do not always refer to real warheads. Thus, multiple warheads in these articles could also mean one real warhead plus many decoys. As discussed in a report made by a group of American scientists (UCS/MIT)[16], the proposed NMD sensors cannot differentiate the real warhead from anti-simulation decoys during the midcourse of the flight. This technology is not too complicated for China. This means that the deployment of decoys is a much more efficient and simple way than MIRVs for China to defeat the NMD system.

If some metal chaff strands are dispersed around the warheads, they can fool the radars of the defense. This technology should not be difficult for China.

Stealth technology can be used to make the warheads less observable during their flights. For example, the radar reflection of a warhead can be reduced by putting the warhead in a reentry vehicle with a pointed cone-sphere shape or painting the reentry vehicle with radar absorbing materials. This countermeasure is based on not too complicated technology and can reduce the effectiveness of the defense. Another stealth technology, which is discussed in UCS/MIT report, is to reduce the infrared radiation of the warhead by cooling the skin of the warhead. This countermeasure is also based on not-too-complicated technology and can completely defeat the defense.

The only countermeasure mentioned by the Chinese defense industry is the use of a maneuvering warhead.[17] To defeat the interceptor, the maneuver capability of the warhead should be comparable to that of the interceptor. So, the warhead needs to detect the approaching interceptor and start its maneuver at an appropriate time; otherwise, the warhead needs to carry a lot of fuel so that it can maneuver continuously. Either option is a challenge to the designers of the warhead. The first option needs very capable sensors on the warhead that can search for approaching interceptors from all possible directions while the latter needs to reduce considerably the weight of the nuclear device so that the re-entry vehicle can carry additional fuel and an engine. To match the maneuver capability of the interceptor, the warhead may need a new design to tolerate off-axis accelerations during maneuvers. This may require new nuclear tests and therefore create difficulties for China to ratify the Comprehensive Test Ban Treaty (CTBT). The result of the competition between the warhead and interceptor is dependent on the competition of technologies of the defensive and offensive sides, and thus difficult to assess.

Raising the survivability of the Chinese nuclear weapons cannot directly defeat the U.S. NMD system; however, it can make some other approaches much more effective and efficient. For example, China would need many fewer nuclear warheads to overwhelm the defense if China can deploy survivable ICBMs rather than silo-based ICBMs. If there is no missile defense, it is the main goal of Chinese nuclear modernization to build a survivable mobile and/or sea-based nuclear force. This goal is still important for China even if the factor of a missile defense is added.

So-called 'point' missile defenses protecting missile silos may also help raise the survivability of Chinese ICBMs. However, the technology is very challenging and the cost is very high.

Another approach to increasing nuclear weapon survivability is to put Chinese nuclear weapons on hair-trigger alert. This would mean that China would need to launch its nuclear weapons after it detects a nuclear attack but before the incoming nuclear weapons arrive. This strategy is called "launch on warning" and was cited as a destabilizing factor by American negotiators to their Russian counterparts in their consultations on the ABM Treaty[18]. This approach requires advanced and reliable early-warning systems, which China may not currently possess.

The above discussions show that there is not one simple choice for China in responding to U.S. NMD deployment. All approaches discussed above and maybe some others would be considered by Chinese decision-makers. An assessment of the priorities of different options for China would be very difficult because the very strict and different requirements listed in the last section may produce different judgements. The competition among these

approaches would lead to a big range of uncertainties in China's nuclear modernization.

Possible Arms Control Responses

China is making diplomatic efforts to dissuade the U.S. from deploying NMD in both bilateral and multilateral forums. In bilateral exchanges, China has expressed its concerns over NMD through official visits and "track two" meetings that include both governmental and non-governmental officials. These bilateral dialogues have helped the two countries understand each other's positions and concerns and are laying the base for possible resolution of the dispute over the NMD issue.

China has also spoken out against NMD at two major multilateral meetings. The first was at the First Committee of the United Nations (UN), where China endorsed the Russian proposal to sustain the ABM treaty, a proposal that won the overwhelming support of the UN members. The second forum is the Conference on Disarmament (CD), where China is trying to initiate a negotiation on the prohibition of weapons targeting outer space. In addition to the UN and CD, China also outlines its concerns over NMD (or TMD that could supplement NMD) at several regional forums[19]. Chinese diplomats have talked more and more with the Western news media, thereby providing more transparency on China's positions to the American people.

If this diplomatic effort fails, however, China would make some responses in the area of arms control in addition to its responses in nuclear development.

NMD deployment would harm Chinese confidence in arms control. Before China gradually opened its door to the world in the early 1980s, it was skeptical of the utility and effectiveness of international efforts in global arms control and it did not believe that the superpowers would be faithful to their commitments when they feel that they have the power to break them. As it has been involved more and more in international arms control regimes and negotiations, China has learned the importance of participation in international cooperation on arms control and has become very active in this area. U.S. attempts to modify or withdraw from the ABM treaty are reviving old doubts in China about whether the U.S. will be faithful to its arms control commitments and about the sustainability of international arms control cooperation. The Chinese would worry that participating in arms control would reduce, not strengthen, China's self-defense capabilities. In conclusion, China could become less cooperative with the U.S. in the area of arms control and non-proliferation if the U.S. finally revises or abandons the ABM treaty.

As discussed in the last section, some approaches may add difficulties for Chinese participation in arms control. For example, China may need some additional fissile materials to saturate the defense by building more nuclear weapons, especially silo-based ICBMs. It will be difficult for China to accept a Fissile Material Cut-off Treaty, one that puts a ceiling on the size of the Chinese nuclear force and makes China lose an option for countering the NMD, even though China may not take such an option immediately. Another concern would add to the difficulty of ratifying the Comprehensive Test Ban Treaty. In China, there have been voices arguing that China lost too much in signing the CTBT[20]. If some Chinese feel that a few more nuclear tests are required to develop countermeasures like the maneuvering warhead discussed above, the voices opposing the CTBT would certainly become stronger in China.

In the non-proliferation area, China would become less interested in legally accepting the MTCR, including its annexes, as China's export control law if the U.S. does not respond to China's concern over NMD. The U.S. would become less influential in dissuading China to cut its cooperation with some countries if China believes that such cooperation is consistent with existing international law. In the area of nuclear disarmament, NMD will become a new and serious obstacle that blocks China from considering joining global nuclear reduction efforts.

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Sharing Missile Launch Data

By John Steinbruner

When Presidents Clinton and Yeltsin signed an agreement at their September 1998 Summit to share information on the launch of ballistic missiles through a Joint Data Exchange Center (JDEC), the announcement was not received as a major accomplishment. There had been a minimum amount of bureaucratic preparation within the two governments and little negotiation. Essential details were yet to be worked out.

Nonetheless, the agreement was significant. It addressed a serious underlying problem: although neither nation proclaims the other a strategic foe, both Russia and the United States continuously maintain thousands of nuclear weapons in an operational state, poised to initiate a massive attack within minutes. These force configurations are justified as powerful deterrent threats deployed to assure that no such attack ever occurs. But as an unavoidable corollary of that logic, both countries, for their own safety, must be absolutely certain that the forces of the other side are not susceptible to false alarm. The two nations are forced to trust each other on that latter point.

However, their capacity to sustain that trust differs substantially. The United States operates a comprehensive warning system able to provide reliable assurance that any large-scale attack emanating from Russian forces would be quickly detected and then confirmed fifteen minutes before impact. Russia's warning system is incomplete and does not provide either continuous or comprehensive surveillance of attack corridors with even a single method of detection. The United States can assure Russia that it would not falsely perceive an enemy launch and would not therefore retaliate by mistake; Russia cannot offer comparable assurance. That fact is a problem for the United States and creates a strong incentive to strengthen the Russian warning system — the implicit purpose of the 1998 agreement.

If both sides accept JDEC's operations as a reliable source of reassurance, it truly will be a seminal development with broad implications for global security relationships. If the center breeds suspicion rather than reassurance, however, the consequences could be directly dangerous. In guiding the development of JDEC and

assessing its ultimate significance, it is important to consider both the good and the harm it can potentially do.

If the parties to the arrangement were to share all warning sensor data as it is generated, were to apply exactly the same interpretative algorithms at precisely the same time, and were completely confident of the integrity of the system, then the possibility of deliberate deception or inadvertent confusion would be minimized and reassurance would be as robust as possible. However, restrictions on data, interpretative filters, and time delays imposed on the exchange would tend to induce suspicion and increase the risk of perverse effects. The JDEC agreement announced last June does not provide for the comprehensive exchange that would set the highest imaginable standards of reassurance. It is not evident whether the more limited exchange projected will exceed the uncertain threshold necessary to assure that the result does more good than harm.

Strengthening the Agreement

The JDEC agreement could be strengthened by some or all of the following measures:

- enhancing the Russian surveillance system;
- gradually increasing the specificity of information exchanged for the entire surveillance area;
- initiating comprehensive exchanges in limited areas — perhaps one used by a third nation of mutual concern to the U.S. and Russia — and then extending those to the full surveillance area;
- introducing additional participants, thereby giving the initial bilateral effort multilateral standing that might eventually become globally inclusive.

At first glance, it seems unlikely that these more extensive arrangements would be attempted anytime soon. There are many other issues with greater immediate resonance preempting political attention in both countries, especially in Russia. Nonetheless the looming collision over the proposed deployment by the United States of a National Missile Defense (NMD) might prove to be a catalyst for expanded collaboration on missile warning.

National Missile Defense

A strong connection between JDEC and NMD is forged by the core fact that defensive technology has almost no serious chance against an unrestrained ballistic missile assault. The very difficult problems of in-flight interception are likely to be solved only if both the numbers and the overall operating characteristics of the attacking warheads are far more limited than the forces possessed by even a modest opponent. The necessary limitations can in principle be achieved by prior agreement, but in that case it is prudent to presume that the defensive deployment would have to be subjected to prior agreement as well.

Alternatively, the necessary limitations might be achieved by preemptive attack. Since current United States forces have a large and increasing advantage in offensive capability, any potential opponent is forced to consider this latter possibility. To the extent that the United States refuses to subject its projected NMD deployment to internationally agreed limitations, it conveys the impression that it is actually pursuing a strategy of preemption. That is a very threatening prospect—most immediately to China, which has only a minimal deterrent force not held in continuous alert status, but over the longer term also to Russia, which cannot maintain a deterrent force commensurate with that of the United States.

As the U.S. pursues its efforts to deploy an NMD system, the consequences for Russia and China will have to be convincingly mitigated. Otherwise their reaction is likely to overwhelm the project. Since an expanded JDEC would offer protection against pre-emptive attack, it could end up playing a significant role in this situation.

John Steinbruner (University of Maryland) is co-chair of the Committee on International Security Studies at the American Academy of Arts and Sciences, where he directs a project that is studying the proposed Joint Data Exchange Center.

Idealism vs Realism: Pugwash's catch-22

by Ejaz Haider, News Editor,
The Friday Times *(Lahore, Pakistan)*
April 27–May 3, 2001

Ejaz Haider looks at the complexities involved in the issue of nuclear disarmament—brought to the fore, yet again—not only the problems of nuclear disarmament but also the dilemma faced by Pugwash itself.

A quick run-through would perhaps help set the premise. The NNPT (Nuclear Nonproliferation Treaty) was never pegged to (complete) nuclear disarmament. This, despite the pious intentions of article VI, since amended further to purge it of any ambiguity. The treaty was, and remains, the corner stone of nonproliferation efforts, legitimising the possession of nuclear weapons by five powers while denying the capability altogether to every other state (at least until such hypothetical moment in history when the five nuclear weapon states decide to go non-nuclear). The Five-Vs-the-Rest formula is therefore at the core of nonproliferation. The other plank relates to the nuclear arms control measures. Arms control moved bilaterally between the United States and the Soviet Union from arms limitation to arms reduction during the Cold War and has continued between the US and the Russian Federation. There have also been unilateral measures taken by the five nuclear weapons states to cut down on the numbers of weapons and reduce the operational salience of such weapons or, retain the capability at lower levels. However, at no point have any of the NWSs shown any inclination to move towards the abolition of nuclear weapons. The situation is complex. Indeed, far from achieving the ideal of complete disarmament, as the 2000 NPT Review Conference envisages, even the (discriminatory) nonproliferation regime is today under threat of unraveling. South Asia is overtly nuclear; missile proliferation is a reality and the US is very likely to push ahead with some form of missile defence. While it may achieve this by cutting down on offensive nuclear weapons and bolstering its defensive capability (passing that off as an arms reduction measure itself), it will definitely result in China—and Russia—putting more premium on nuclear weapons and modernising their offensive nuclear weapons. Not only would such a development put paid to arms reduction but it would also unravel the nonproliferation agenda. Together, these developments would take the world further away from conditions congenial for complete disarmament, if such conditions could ever exist, a questionable proposition in itself. A further problem is presented by the regional nuclear weapons states, their ambitions, their security dilemmas, etc. In most cases, their threat perceptions relate to ongoing regional conflicts. India may harp on the ideal of disarmament before it would agree to abolition of its own capability, but the operational reality of its capability relates to Pakistan, a perceived threat from China and the perceived nexus between China and Pakistan. Pakistan, for its part, sees India as its biggest security threat. Israel looks at its nuclear capability in view of its fear of obliteration. None of these countries, and they are by no means the only ones in the game, are likely in the foreseeable future to roll back their respective nuclear capabilities. In fact, if anything, the regional scenario would probably require, as one moves further into the new century, a different paradigm, one with greater emphasis on managing nuclear weapons sans overt deployments, rather than abolishing them. In fact, the non-deployment scenario itself presupposes that the goalposts will remain the same and the US missile defence will not result in changing the nature and hue of the game. Not surprisingly, Pugwash faces the fallout of these developments. At the very top of the movement there is tension between the idealist and the realist approaches. It comes through clearly in two background papers by Sir Joseph Rotblat (idealist) and Prof. George Rathjens (realist). Rathjens, the secretary general of the Pugwash Conferences on Science and World Affairs, puts across four propositions: Why do states go nuclear and stay nuclear? Can states be de-motivated in regard to possessing nuclear weapons? If so, would that require extending security guarantees, and by whom? Rathjen's proposition here seems to imply the existence of some nuclear weapons possessed by a cer-

tain state which could conceivably extend security guarantees to other state(s) to dissuade them from going nuclear or rolling back their programmes. This implication comes through in his second proposition. If the US gives up its nuclear weapons, would that not reduce its credibility as a guarantor of the security of, say Japan or South Korea, forcing these countries to develop their own nuclear capabilities? Even if it were accepted that a nuclear weapons-free world is possible, how would we, in the short term, deal with any holdout states? Would we need to use multi-national forces to attack and destroy the capabilities of such states? If so, by whose authorisation and under whose command? The proposition again presumes the existence—at least until such time that the holdout states are purged—of nuclear forces even if within a multi-national framework. But could the holdouts not argue that they are holding out precisely because some states, individually or as conglomerates, still possess operational nuclear forces? After all, the perceived or real strategic compulsions of one state cannot be considered holier than those of another. Also, what is the guarantee that after the holdout state(s) has been purged of its capability that the hypothetical multi-national force—or some elements within that conglomeration—will voluntarily give up its nuclear weapons?While Pugwash plays down the difference between the idealist and the realist viewpoints as one relating more to approach than substance, it should be clear from the propositions listed above and the possibilities and questions implicit in them, that the two approaches may in fact be mutually exclusive. Rotblat debunks the theory of deterrence. He looks at the ethical dimension of the issue, talks of a comprehensive no-first-use treaty, a verification mechanism for nuclear disarmament and strengthening and extending nuclear weapons-free zones. He also rejects the bomb-in-the-basement and the breakout arguments even as he concedes that no verification mechanism can be fail-safe. His approach is essentially informed by ethics. Unfortunately, states' possession of nuclear weapons is pegged to factors other than ethics. The movement's strength lay in the past in doing the doable; or getting things done. That is why it, and Sir Joseph Rotblat himself, earned the Nobel Peace prize in 1995. But it is precisely at this point that Pugwash's dilemma begins. It could do what it brilliantly did until the agenda was pegged to nonproliferation and arms control; until the US and other nuclear powers wanted it to provide them a forum where they could not only reach out to each other but also take steps to get other states to agree to nonproliferation. Now it has to contend with the nuclear weapon states. How does it go about convincing them to completely disarm? Suddenly, there are no buyers for the idealist approach. But neither does the problem end here. The realist approach itself is likely to end up providing an underpinning to the nuclear weapon states' security agenda by emphasising management rather than abolition of nuclear weapons, precisely the outcome that Pugwash wants to avoid. It faces a catch-22.

Canada must oppose U.S. missile defence plan

With threat of Armageddon lessened, we should be relying more on diplomacy

by John Polanyi , The Toronto Star Thursday, May 3, 2001

With the announcement by President George W. Bush that the United States plans to move forward with a multi-layered National Missile Defence (NMD), Canadians are approaching a historic decision. Will we hold fast to our traditional commitment to disarmament as the best route to a stable world, or will we take the path of realpolitik, acknowledging that the U.S. is in a position to alter our priorities? The answer to this question should not be in doubt since NMD means dismantling the 1972 Anti-Ballistic Missile (ABM) treaty that Prime Minister Jean Chrétien characterized accurately, this past December in Ottawa, as being "the cornerstone of strategic stability."

In the 1972 ABM treaty, the two superpowers far-sightedly renounced national missile defence on the grounds that it was delusory and destabilizing. They acknowledged through the treaty that they were naked to attack, and consequently regarded restraint in the deployment of arms as the best hope for peace. Since defensive shields constituted armaments just as surely as did offensive swords, the parties to the agreement were renouncing the former as a prerequisite to restricting the latter. The argument, as the Prime Minister implied, remains valid. There is no evidence that the forward march of

technology has rendered it invalid.

The current U.S. proposal takes the opposite view. It requires that the 1972 ABM treaty be scrapped, that national missile defences be built and, incredibly, that disarmament nonetheless proceed. Those who question this scenario are assured that we are now in "a new era"; and are urged to put Cold War thinking behind them. These barbs are well aimed. Nothing frightens liberals more than the suggestion that they may be conservative. Accordingly, following a discussion of NMD with Bush on Feb. 5, Chrétien was moved to say "perhaps we're in a different era."

And so, in a sense, we are. But what has changed is not the fundamental truth that restraint begets restraint, but the increased opportunity to show restraint. With the collapse of the Soviet Union in 1989, and the subsequent tidal wave of democracy that swept around the globe, the opportunity for strengthening the ABM treaty by, for example, banning all interference with satellites, has never been greater. With the threat of Armageddon lessened, we should be widening the regime of arms control. We should be relying more on diplomacy and less on arms.

Instead, we are offered by the U.S. an elaborate, costly, and technologically unproven plan for countering a nuclear surprise attack. The warning against Cold War thinking seems apposite, but it is being directed at the wrong party. The proposed reduction in U.S. strategic missiles to a level that may be closer to the 1,500 (on either side) favoured by Russia, represents a welcome gesture of restraint on the part of the United States. The fact that it is coupled with the announcement of a major U.S. defence initiative should not, however, lead us to suppose that these measures support one another. Unlike the U.S., potential adversaries will not respond to U.S. defences by diminishing armaments.

Russia is contemplating various strategies in response to the U.S. NMD, including abrogation of arms control treaties, increase in its number of multiple-warhead missiles, and maintenance of its ICBMs on hair-trigger alert. It is unlikely that it will take all of these steps, since it is the least threatened by a limited NMD. China, which has reason to feel disarmed because of its small nuclear force, can be counted on to accelerate its pace of nuclear armament. Its neighbour India will in all likelihood follow suit, triggering further armament of Pakistan.

The pace of these developments cannot be forecasted. What can be confidently predicted is that the existence of U.S. defences will lead to further nuclear armament abroad, rather than the hoped for disarmament.

One is led to wonder whether the present U.S. administration is concerned with disarmament. Compared with its own level of weaponry, the arms of its potential adversaries may seem to represent a tolerable threat, susceptible to being ameliorated by high-tech defences.

This is a false view today, destined to be more false tomorrow. For in this "new era", there are many ways of delivering weapons of mass destruction, any of which can precipitate a disaster beyond what we have known.

Vulnerability, it should be observed, has never been greater than in today's world of high tech, in which satellites can readily be blinded and computers fatally confused. The "Love Letter" virus launched by a casual hacker in the Philippines constituted an attack that did roughly $10 billion damage to the U.S.

High tech vulnerability will not be eliminated by increased high tech. Instead, NMD armaments will compound the world's security problems. We must take the opposite tack of disarmament if we are to address the problem of global security.

Canada should remain true to its priorities at this time, as it did when pressured to embrace Star Wars by then president Ronald Reagan two decades ago. Then we were one of the very few countries that declined to participate. This time we can expect the support of some major European allies whose citizens harbour deep misgivings in regard to NMD.

If we compromise, we betray not only our principles but our friends, most prominently our U.S. neighbours who will before long abandon this short-sighted policy, as they abandoned Star Wars and all previous defences against nuclear weapons going back to the Bomarc nuclear-armed anti-aircraft missiles. Canada, thinking itself a good ally, embraced Bomarc, and then, in the ensuing domestic turmoil, rejected it. That was 40 years ago. Time enough in which to learn that it is better to take the right path from the outset.

We can, of course, delay. But we should be in no doubt as to what we must ultimately do. We declined Star Wars and should do the same for National Missile Defence.

Nobel laureate John Polanyi is a professor of chemistry at the University of Toronto. He has had a long involvement in the international debate on missile defence.

BOOK REVIEW

Scientific Cooperation, State Conflict The Roles of Scientists in Mitigating International Discord

Allison L. C. de Cerreno and Alexander Keynan, editors
Annals of the New York Academy of Sciences, vol. 866, 281 pages.

This book is a distillation of the experience of some scientists in their efforts to bring about political changes. It is of particular interest for organizations like Pugwash which deal with subjects such as arms control and elimination, the prevention and resolution of armed conflicts and other major threats to humanity. Readers will greatly benefit from the plentitude of experience that has emerged from the successes as well as the failures of these efforts.

Alex Keynan's introductory overview of the political impact of scientific cooperation on nations in conflict and his summary of related issues illuminate the aims and achievements as described in chapters devoted to particular case studies. A foreward and preface by the editors clarify the substantive chapters.

Responses to the text of the chapters are made by outstanding authorities (A. Keynan, Jean-Jacques Salomon, Fareed Zakaria, Susan Raymond, Wolfgang P. Panofsky, Klaus L. Gottstein, Mahmoud M. Mahfouz and others).

Pugwashites will recognize that most of the subjects covered in this volume have been and remain active concerns in the Pugwash program. An excellent example is the work by Pugwash on chemical and biological weapons (CBW) since 1959 (the first Pugwash meeting on CBW) to the present consisting of over 50 meetings solely devoted to the subject. Julian Perry Robinson of the University of Sussex is the author of this chapter who, along with Matthew Meselson of Harvard University, began their participation in this series in the 1960s and continue today as stalwarts in this effort.

This volume is indispensible as an historical account, with present relevance, of the efforts of scientists as they seek to improve society and avoid major damage to our planet. It deserves a wide audience.

Partial List of Chapters and their Authors

- Scientific Cooperation as a Bridge Across the Cold War Divide: The case of the International Institute for Applied Systems Analysis (IIASA), by Alan McDonald.
- The Role of Seismologists in Debates over the Comprehensive Test Ban Treaty, by Gregory E. van der Vink.
- The Role of Scientists in Normalizing U.S.-China Relations: 1965-1979, by Kathlin Smith.
- Nuclear Cooperation in South America: The Role of Scientists in the Argentine-Brazilian Rapprochement, by Paulo S. Wrobel and John R. Redick.
- Scientific Cooperation in Agriculture and Medical Research as a Means for Normalizing Relations between Egypt and Israel, by Alexander Keynan and Dany Shoham.
- The Impact of Pugwash on Debates over Chemical and Biological Weapons, by J.P. Perry Robinson.
- International Conflicts over Environment: Scientists' Roles and Opportunities, by Jesse H. Ausubel.

Information from the Belgian Pugwash Group

N° 11, April 2001

by André L. Mechelynck
Editor, GRIP

IN THE NEWS

Missiles in Belgium

About ten nuclear bombs controlled by NATO (or rather the US) are still on Belgian soil, in spite of Belgium itself having definitely renounced nuclear weapons and signed the Non-Proliferation Treaty. A number of anti-nuclear organisations from all parts of the country, including "Abolition 2000", the "Association des Etudiants pour la Prévention de la Guerre Nucléaire", "Voor Moeder en Aard", the "Forum voor Vredesactie", the "Mouvement Chrétien pour la Paix", &c., are conducting an "inspection tour" of the Kleine Brogel NATO nuclear-weapons base, where these bombs are located, on Monday, April 16th, 2001.

CO2 ? What's that ?

The UN-sponsored Intergovernmental Panel on Climate Change (IPCC) has officially declared in January 2001 that *most of the observed warming over the last 50 years is likely to have been due to the increase in greenhouse gas concentration,* the carbon dioxide and other heat-trapping gases that humans are pumping into the atmosphere.

By the year 2100, the warming might lie between 1.4 and 5.8 C. [*Science*, Vol. 291, p. 566, Jan. 26th 2001].

The West Atlantic Ice Sheet (WAIS) in Antarctica contains enough water to raise sea level by 5 meters if it was to melt completely. The Pine Island Glacier (appropriately designated by its initials: PIG) by itself is discharging 75 Gigatons of ice per year into the ocean; its grounding line has retreated inland by 5 km from 1992 to 1996; the glacier is thinning at a rate varying between 1.6 m/year near the grounding line to 0.1 m/year far inland. If this rate maintains, the whole glacier will be afloat in 600 years. It is also possible that the glacier's retreat may accelerate the discharge from the WAIS interior. [Shepherd et al., *Science*, Vol. 291, p. 862, Feb. 2nd 2001].

"I do not believe that the Government should impose compulsory reductions in carbon dioxide emissions on the energy producers. It is not a pollutant according to the law on air quality."—George W. Bush

Who gets what?

The continent of Africa counts 70% of the world's HIV/AIDS sufferers, 20% of the world's population, and uses 1% of the world's supply of HIV/AIDS medication.

Meeting the Energy Challenge

…The directions for addressing our short-term energy challenges are easier to describe than designing and implementing the details will be. But more daunting still are the energy challenges looming in the longer term. These include providing a sustainable energy basis for maintaining prosperity where it already exists and achieving it where it does not, limiting dependence on imported oil, reducing the risks from greenhouse gas-induced climate change, and minimizing the contributions of nuclear energy to nuclear weapons dangers… [John P. Holdren, Editorial, *Science*, Vol. 291, 9 February 2001, p. 945]

Nuclear Offense versus Defense

The United States has carried out R&D on a missile defense for several decades at an aggregate cost of about 100 billion of today's dollars. Yet no national missile defenses are in sight. The future is unlikely to be different. Scientific facts and technical reality cannot be coerced by policy. …[Wolfgang K. H. Panofsky, Editorial, *Science*, Vol. 291, 23 February 2001, p. 1447]

The dangerous help from the West to Albanian extremists

…For the third time, after Kosovo in 1998 and southern Serbia in 1999 and 2000, Albanian extremists are replaying their scenario of inciting by guerrilla actions Government forces into armed reprisals. The object is to

create a repression and call for the sympathy of the West…This strategy was supported in the past by some Western powers (including some US and Germany services)…The violence is now however directed against peaceful and democratic regimes… This shows once more the great danger offered by military actions … [Bernard Adam, Les Nouvelles du GRIP, N° 19, 1st quarter 2001 (Translated from the French)]

International Student/Young Pugwash

The Final Stretch

by Gina van Schalkwyk
International Student/Young Pugwash

In the previous *Pugwash Newsletter* there was an article by Tom Børsen Hansen on International Student/ Young Pugwash (ISYP). I am very happy to be able to report that the work of the Interim Committee (IC) on the establishment of ISYP has come a long way since December 2000. Professor Joseph Rotblat has joined us as a non-voting Pugwash representative and advisor. We have had the drafted Statutes formally approved by a majority of the registered national groups and have completed many of our other goals that were elaborated in that article.

Since the Interim Committee was created in September 2000 (following the Cambridge Annual Pugwash Conference), we have been working in three working groups. The first was composed of Tom Børsen Hansen (Denmark, European Representative and chair-person of the IC) and Carsten Rohr (UK) whom, with the help of a "Statutes Committee" (volunteers convened at the Cambridge conference) were responsible for the legal aspects related to the establishment of ISYP. Working Group Two consisted of Hugo Estrella (Argentina, Latin American Representative), Susan Veres (US, American Representative) and Lise Østby (Norway) and they took responsibility for issues related to fundraising for the establishment and initial running of ISYP as an organisation. Jin Xie (China, Asian Representative) and Gina van Schalkwyk (South Africa, African Representative) formed the third working group that was charged with resolving issues around the office structure while maintaining contact with national groups. The IC's mandate expires in September this year when a new Board will be elected according to the "Guidelines for the Election of the ISYP Board" which will be circulated to national groups for approval soon.

Our most important success thus far has undoubtedly been the drafting and voting in of the Statutes. Early on within the IC it was decided that Working Group One had the most pressing agenda. Tom, Carsten and "Cambridge Statutes Committee" did a tremendous job, conscientiously keeping to the tight deadlines that they set themselves. The Statutes bring together the preliminary work done by Hugo Estrella (as International Coordinator 1999/2000) regarding the importance of establishing an ISYP organisation, the main aims of such an organisation and its relation to senior Pugwash, and the requirements of a legal document of this nature/kind. According to the Statutes, ISYP will consist of a General Assembly of all registered national groups, a Board consisting of seven members (similar in composition to the present Interim Committee), and an Executive Director and Secretariat. After having been sent out to national groups for comment and having been on the web site for review and discussion, the statutes were put to the vote on 1

From left, Sue Veres (USA), Marina Krommenacker (Switzerland), Guido den Dekker (the Netherlands) and Sarahh Bokhari (Pakistan)

April 2001. A majority of the 38 registered groups have subsequently accepted the statutes – thus formally establishing ISYP as their representative organisation. The Statutes appear on the ISYP web site and will form the basis for our intended registration as a non-profit organisation and for future funding proposals.

Along with the Statutes, the Interim Committee presented to the national groups a very kind offer from the Swiss Pugwash Group to share their office space in Geneva as the permanent location for ISYP. Several logistical details are still being thrashed out, including staffing, which will be presented to the General Assembly. One proposal within the IC would allow the Executive Director, when appointed, to telecommute (be in virtual contact with the office while residing somewhere else, regularly visiting the office), thereby allowing for wider recruitment.

Working Group Three has drafted job descriptions for the Executive Director and an Information Director (whether these should be two equal positions or not has been a hot issue) and has composed a document entitled "The focus for ISYP, office structure and first six-month work plan". It is hoped that the position of Executive Director (as well as Information Director and other staff) can be filled by the end of 2001, though this is dependent on ISYP's financial situation. In the interim, most projects will be carried out by interns and part-time project leaders and thus will not depend on receiving large donations.

But, funding still remains a vital consideration. Without sufficient finances to support a permanent office and run projects, ISYP remains an unrealised vision.

Since November last year, the Interim Committee has distributed a monthly *Newsletter* to report on their activities, on those of national Pugwash groups world wide, and on other events of interest to S/Y Pugwash. We hope that this *Newsletter* will become a defining feature of the permanent ISYP organisation.

The database of Student/Young Pugwash Groups around the world has been updated and the number of confirmed groups currently stands at 38. A number of new national groups have been accepted into the ISYP circle, most of them from the 'developing' world: Bulgaria, Liberia, Papua New Guinea, Peru, Serbia, Ukraine, Venezuela, Zambia, and Zimbabwe. Representatives/Delegates of many of these 38 groups will be attending the S/Y Pugwash Pre-Conference as well as the main conference in Agra, India, this year November. A document entitled "Nomination Guidelines for ISYP Participants at Annual Pugwash Conferences" has been drafted, but not accepted by either the General Assembly or the conference organisers, so it is expected that it will only serve an advisory purpose this year. These guidelines should result in a more equitable pattern of attendance, especially when there are so many national groups registered while places remain limited. It is envisioned that ISYP will increase the number of opportunities for National S/Y Pugwash Groups to interact through projects and regional events.

As you can imagine, it was sometimes difficult to reach consensus (the basis for all decisions within the IC) on many of the above issues. We had to contend with communicating via e-mail and without the opportunity to meet in person, thus making it difficult to maintain the pace that we and others expected. Apart from one or two misunderstandings – which are to be expected in a committee

ISYP punting on the Cam

composed of members of seven different nationalities, speaking seven different languages and spread over five continents – we have been able to work together as a team over these last few months. I believe that I speak for all of us when I say that we intend to continue doing so until our dream has been realised.

For me, that dream is the creation of an interdisciplinary organisation which can bridge the gap that currently exists between developed vs. developing countries, between 'North' and 'South', in the same way that The Pugwash Conferences on Science and World Affairs bridged that gap between East and West during the Cold War period. Today, the agenda looks different, with one of the most important issues being the unequal distribution of resources between these two spheres of existence. Not only resources in terms of physical assets and finances, but even more importantly of culture, knowledge, science and technology. ISYP can play an indispensable role in redistributing these resources on a worldwide scale. By establishing a broad and inclusive network, ISYP's precedent in this respect can only snowball, and really make the world a better place to live in – for us and for future generations.

Another imperative is the need for a multi-cultural base and for ethical considerations in terms of new scientific and technological innovations that could make them globally beneficial and humano-centric. When Robert Cox (*Approaches to World Order*, 1996) speaks of the prospects for change in world order, he refers to the *'new prince'* – the only one who will be able to bring about the change needed to alter the unsatisfactory existing world order. That *prince* is the type of cooperation on the grass-roots level which is exemplified by global non-governmental organisations such as International Student/Young Pugwash.

I invite anyone and everyone who reads this article to support our efforts by visiting the web site http://www.student-pugwash.org/ and adding you expertise to our enthusiasm!

Academician V. I. Goldanskii (1923–2001)

On behalf of the entire community of the Pugwash Conferences on Science and World Affairs, some 3,000 scientists and academics from around the world, we write to pay tribute to Academician Vitalii Goldanskii, a valued and honored colleague and friend of Pugwash for 25 years.

Vitalii participated in his first Pugwash meeting in 1977 in Munich, Germany, possibly little realizing that this would lead to attendance at over 30 Pugwash conferences and workshops through the year 2000, to co-chairmanship of the Russian Pugwash Committee, and to membership on the Pugwash Council.

Whether during the Cold War tensions of the 1980s or the optimism of the 1990s, Vitalii Goldanskii's breadth and stature as a scientist and a seeker of political reconciliation were an inspiration to all who knew him in Pugwash. In this, he continued the honored tradition of Russian Pugwash extending from Academicians Topchiev and Millionshchikov to Artsimovitch and Sakharov.

The world will need many Vitalii Goldanskiis in the years ahead. Those of us in Pugwash who worked with, and greatly enjoyed the company of, Vitalii and his wife Ludmilla, will forever miss him.

—Sir Michael Atiyah, *President*
Prof. George Rathjens, *Secretary General*

Julio Cesar Carasales (1928-2000)

Julio Cesar Carasales, a retired Argentine ambassador and former member of the Pugwash Council, passed away on 2 November 2000 in Buenos Aires, the city where he was born in 1928.

Carasales graduated in law from the University of Buenos Aires in 1950 and entered into the Argentine Foreign Service, attaining the category of ambassador in 1973.

Among his government positions, Carasales was a subsecretary of the Foreign Affairs ministry, ambassador to Denmark and to the Organization of American States (OAS), and Director of the Department of International Organizations and of the Institute of the National Foreign Service. He was also a permanent representative to the International Atomic Energy Agency (IAEA) and *adjunto* representative to the United Nations (UN) and the UN Security Council. He was head of the Argentine delegation to the UN Disarmament Conference in Geneva for four years, from 1981-85.

During his tenure with the OAS, Ambassador Carasales was chairman of the General Assembly, of the Meeting of Chancellors, of the Permanent Council, and of the Interamerican Economic and Social Council. At the United Nations, he was vice-president of the First Commission (Disarmament and Security) of the General Assembly and of the Disarmament Committee.

With a special interest in issues relating to nuclear weapons proliferation, Amb. Carasales attended more than 10 Pugwash workshops and annual conferences beginning in the late 1980s, and he served as a member of the Pugwash Council from 1997 to 1999.

Amb. Carasales was professor at the Universities of Salvador and Belgrano, and the author of numerous articles and several books. Among the latter are *The Disarmament of the Disarmed*, in which he analyzed in great detail the merits and defects of the Non-Proliferation Treaty (NPT), and *From Rivals to Partners*, in which he described the process which led to nuclear cooperation between Argentina and Brazil.

—Luis Masperi

Bill Epstein (1912-2001)

William "Bill" Epstein, O.C., B.A.,LL.B, LL.D., born at Calgary, Alberta on 10 July 1912, died at home in New York after a long illness on 6 February 2001, in his 89th year. A long time Pugwashite, Bill will not be soon forgotten by those who knew him.

After graduation as a lawyer at the University of Alberta in 1935, Bill attended the London School of Economics on a scholarship. In 1938, he was awarded a Certificate in International Law. After 1939, when war broke out, he enlisted as a private in the Canadian Army. In 1945, he was a captain working as a lawyer in Canadian Military Headquarters in London, processing damage claims against Canadian troops in Britain. One day, toward the end of 1945, he was telephoned from the high commissioner's office at Canada House and asked if he was interested in a job at the UN Secretariat, working for the Preparatory Commission meeting in London. Thus began a career that lasted till the day of his death, 55 years later, including 27 of his retirement years, when he served as an unofficial adviser to UN delegations, as chairman of the editorial board of *Disarmament Times,* leader among the NGO communities, representative of Pugwash Conferences at the United Nations, writer, speaker, indefatigable traveller and crusader for nuclear disarmament, chairman of Canadian Pugwash Group, and persistent advocate of his cause. At the time of his death, he was by far the longest serving Canadian at the UN.

Details of Bill's career can be found on the World Wide Web (*Canadian Who's Who On the World Wide Web*, at http://utpress.utoronto.ca, and *William Epstein: Tlatelolco and the Golden Age of Détente*, at Canadians in the World, at http://www.canschool.org/un/canadians).

Bill was chairman of Canadian Pugwash Group when I met him in 1984. He invited me to the annual general meeting, attended by five or six members, that year, and sent me to the 35th Conference in Campinas, Brazil, in 1985. Two years or so later, I became deputy chairman, and succeeded him as chairman in 1990. Until forbidden by his doctor to carry heavy suitcases, he invariably arrived at meetings loaded down with copies of *Disarmament Times* and multiple copies of his own and other publications for distribution. His contributions to discussions were always valuable, though he became difficult to stop as he grew older. As chairman, I seldom nominated him to attend annual conferences because I knew he would get there anyhow, despite limits on attendance. With one or two exceptions, he had a perfect record of attendance as long as I knew him, and he was a permanent fixture in Working Group 1, Nuclear Disarmament.

Canadian Pugwash is indebted to Bill for a trust fund he raised and established, and which is now a memorial to his name. After the annual general meeting in October, 2000, the first in memory that Bill had been unable to attend, the members celebrated his life with a dinner. Tributes were recorded in a video sent to him.

—Leonard V. Johnson

A Vignette of Bill Epstein

I first met Bill at the 1965 Pugwash Conference in Venice. My impressions at that time were reinforced thereafter in more than thirty Pugwash meetings that we both attended. The focus of his attention was unremitting during discussions in the working groups that he preferred - arms control, especially those on nuclear weapons. He was steadfast in his purpose, which was to try to push through effective organizational structures in the UN headquarters where he worked. His intense involvement in Pugwash meetings was such that before a speaker could pause for breath, his hand would shoot up to dispute or reply to a point. As a lawyer Bill could argue with great emphasis brooking no contradiction. He was remarkably well versed in politico/diplomatic aspects of whatever point was under discussion. In plenary sessions he would stride to the microphone like a charging bull, head bent forward purposefully, and his forceful intervention withstood all opposition. His employment by the UN to head the newly established disarmament unit gave him unmatched opportunities which he exploited liberally in meeting with highly influential political figures including prime ministers and ambassadors, but not forgetting their assistants who formulated the substantive work.

Bill never let up on his proselytizing during coffee breaks and in relaxation lounges.

Perhaps the high point in Bill's Pugwash career was his conception and management of the excellent 1981 Conference in Banff, Canada, which all who attended will never forget. It is not well known that during this conference there was an incident (involving myself as the then Secretary-General of Pugwash) of some diplomatic delicacy. Senior scientists among the Soviet Union participants asked to see Bill and me confidentially, which we agreed to do. They had been asked by their political masters to include amongst the Soviet participants a well-known individual who we were convinced was most likely an employee of Soviet intelligence. They asked Bill if he could arrange for a visa to be issued for that participant, but would understand if that proved impossible. (Pugwash unwritten rules were very strict on the proposition that no participant requested by a national Pugwash group could be refused a visa, lest the conference be cancelled). Bill went through the motions of asking the highest Canadian political figures whom he knew would in all likelihood refuse the request despite the threat of cancellation of the meeting. In the event, the participant in question did not attend the conference, the Soviet participants were satisfied and made only a verbal protest to Bill and me, and Bill's honor (and mine) suffered not at all.

I last met Bill at the Rustenberg Conference in 1999. He was in excellent form, and that's how I will remember him and his great positive contributions in UN and Pugwash affairs.

—Martin Kaplan

A Tribute to Bill Epstein from UN Secretary General Kofi Annan

"I learned with great regret of the passing of Bill Epstein, a former staff member and a man who was well known to all seven Secretaries-General of the United Nations. He was indisputably one of the world's leading advocates of global nuclear disarmament, having devoted both his entire professional career and his long retirement to this noble cause. He will perhaps best be remembered for his important contributions to the negotiation of the Treaty for the Prohibition of Nuclear Weapons in Latin America and the Caribbean and for his long advocacy of a Comprehensive Nuclear Test Ban Treaty, the subject of his celebrated book, *The Last Chance*. Though his long-standing goal remains to be achieved, his efforts will surely inspire others to carry on his work."

—Delivered at the memorial service for Bill Epstein, New York, 14 February 2001

Johan Santesson

On 11 May 2001, Johan Santesson of Swedish Pugwash died after a long illness, which he had fought with enormous courage. Johan Santesson got his basic academic training as a chemist at the University of Uppsala, Sweden. In 1969 he received a PhD. During military service, which he did at the Swedish National Defence Research Establishment (FOA), he got involved in disarmament issues for the first time in the spring of 1971 when asked to prepare a working paper for the negotiations on a biological and toxin weapons convention, going on in Geneva. After his military service he started the Mass Spectrometry Laboratory at the University of Uppsala.

In 1981 Johan Santesson for the first time got involved in international investigations of alleged use of chemical weapons as a consultant for the United Nations' expert group to investigate various such allegations. When the United Nations Special Commission (UNSCOM) was set up in late April 1991 to implement the destruction of Iraqi weapons of mass destruction and ballistic missiles with a range of more than 150 kilometers, Johan Santesson got involved as a consultant for the World Health Organisation. Altogether during 1991-1993 he made 10 trips to Iraq, half of them as chief inspector for chemical or biological inspection teams.

Later he began work at the OPCW Provisional Technical Secretariat as Head of the Technical Cooperation Branch. He played a crucial role as Secretary to the Expert Group on Technical Cooperation and Assistance and despite the sometimes acrimonious debates he endeared himself to both delegates and staff by his efficiency and humour. He was then appointed as the Head of the Assistance and Protection Branch, and finally, Head of the International Cooperation Branch where he remained until the end.

Laszlo Revesz (1926-2000)

Laszlo (Laci) Revesz was an internationalist. He spoke eight languages (with a strong Hungarian accent) and much of his life was devoted to breaking down national barriers. It was natural that he should support the Pugwash movement but he was primarily concerned, during the Cold War period, with the day to day difficulties experienced by scientists in the Soviet bloc. He helped Soviet scientists to obtain scarce materials for their experiments, and to publish in western journals.

Laci was born near the border between Romania and Hungary. He spent the war in Budapest, where as a partly Jewish person, his life was in danger. Laci played a part in the anti-Nazi underground movement during the war, taking food to Jewish families, although he always said that his role was not an important one. His group was arrested by Hungarian Nazis, but they were rescued by some of their colleagues, posing as German Officers.

After the war, he began his medical studies. In 1948 before the Communists took over, when it was obvious that Communists would soon have total control, he left Hungary illegally, and this fact was to prove significant later on, when he wished to visit the Soviet Union. His first aim was to be a Neurosurgeon, but he soon changed over to scientific studies, joining another Hungarian, George Klein, at the Cell Research Institute, then led by Caspersson. Klein and Revesz published a series of papers on tumor biology together, but he moved into Radiology in 1954, and soon made a very important discovery, the stimulating effect of radiation-killed cells on survivors which came to be known as the Revesz effect. A chance meeting with Professor Saim Balmukhanov of Alma Ata (Almaty), Kazakhstan had a profound effect on the course of his life. Balmukhanov was a Radiotherapist with a deep interest in experimental work, and he cooperated with Revesz on several projects.

Balmukhanov was a brave man who opposed the Brezhnev regime, when all Soviet scientists were ordered to join in condemnation of the dissident, Sakharov. Revesz, with great courage, decided to visit the Kremlin, and to speak to the Soviet Minister of Health, his excuse being the existence of a signed agreement between himself and the Soviet Government to promote cooperative research. Through a network of influential friends in the medical establishment in Moscow, he succeeded in having a long interview with the Minister. Later, he heard that Balmukhanov had been restored to his position, and Balmukhanov said himself that the "Noise from the West" had been helpful.

Outside science, Laci had many interests. He read widely and made a particular study of the works of Arthur Koestler. It is sad to reflect that Laci and Koestler both died of Parkinson's disease, although Koestler was not able to face the consequences of his disease.

Revesz played an important part in the development of radiation studies in Sweden, but his many friends will remember him for his integrity, single-mindedness, and courage.

—Sir Oliver Scott, Bt., M.D.

Douglas Morrison (1930-2001)

Dr. Douglas Morrison, a well-known physicist who worked at CERN for many years, died in February 2001. He attended several annual Pugwash conferences and was an active member of the Swiss Pugwash group. He also gave much help to the Swiss Student/Young Pugwash group in holding at CERN annual conferences in 2000 and 2001. Morrison wrote extensively on popularization of science in the fields of physics and medicine. He was greatly respected and much liked by all who knew him.

—Martin Kaplan
Pugwash Geneva Office

Porter Jarrell, GM (1919–2001)

In the 54 years since it was founded, the Royal British Legion Swiss Branch has been privileged to have had many remarkable men and women in its ranks, none more so than Porter Jarrell.

Born in Canada of American parents, Porter, or Joe as he was known to many friends, began his working life as a journalist with the well-known newspaper, the *Washington Post*. Following the outbreak of the Second World War, he was determined to make his personal contribution to overthrowing the Third Reich and to help restore peace and democracy, joining a field service ambulance unit attached to British forces in June 1942. In 1943, he volunteered to join one of the crack units of Britain's Special Forces, the Special Boat Service under the command of Lord Jellicoe. Three months later, while on operations in the Dodecanese Islands with X Detachment of the SBS, he won the George Medal, second only to the Victoria Cross for gallantry.

Because he had served under the flag of another nation, Porter lost his US citizenship and it took him some years and a lot of paperwork to get it back. After working for UNRRA in Washington DC for a few years, Porter returned to Europe and as Head of Research and Statistics, became a founding staff member of what is today called the International Organization for Migration. When he retired in 1981, he was retained on a consultancy basis because of his knowledge and experience and headed, amongst others, the Afghan Medical Programme.

There is one last story that should be told about Porter Jarrell. Many years after the war, he went to a reunion of old Special Boat Service comrades at the Duke of York's Barracks in London. He recognized nobody at first but eventually went up to a group where he was greeted by somebody saying "Good God, it's the f****** Yank!" Now that Porter has gone to meet his Maker, one can only hope that he received a similar friendly greeting on arrival.

—Michael Type
Royal British Legion Swiss Branch

[Porter Jarrell worked with Martin Kaplan for several years in the Pugwash Geneva office.]

News from ISODARCO

FUTURE ISODARCO COURSES

XXI ISODARCO Summer Course

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20–27 January 2002

XXII Summer Course

Cyberwar, Netwar, and the Revolution in Military Affairs: Real Threats and Virtual Myths

Rovereto, Italy, 3–13
August 2002

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Pugwash Council for the 1997–2002 Quinquennium

Prof. Ulrich Albrecht graduated in aeronautical engineering, political science and economics at Stuttgart University. Since 1972, he has been professor of peace and conflict studies at the Free University of Berlin. He has worked as a consultant for the UN (Dept. of Disarmament Affairs), and served as head of planning in the East German Ministry for Foreign Affairs during the reunification process; Free University of Berlin, FB PolWiss. WE4, Kiebitzweg 3, 1000 Berlin 33, Germany, Tel. (++49-30) 8385-2360, Fax: (++49-30) 8385-5013, E-mail: ualbr@zedat.fu-berlin.de

Sir Michael Atiyah, President of Pugwash, is a mathematician, Master at Trinity College in Cambridge (1990-1997), and former president of The Royal Society (1990-1995). He was the first director (1990-1996) of the Isaac Newton Institute for Mathematical Sciences, and received the Fields Medal in 1966; Dept. of Mathematics & Statistics, James Clerk Maxwell Building, King's Buildings, Mayfield Road, Edinburgh EH9 3JZ, Scotland, E-mail: atiyah@maths.ed.ac.uk (*)

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Dr. Esmat Ezz is a toxicologist and retired general from Egypt who has been deeply involved in international negotiations and verification activities on chemical weapons. Currently he is a professor at the Military Academy in Cairo; 43 Misr Helwan Road, Maadi, Cairo, Egypt, Tel. (++20-2) 350-5899, Fax: (++20-2) 340-7915, E-mail: e_ezz@hotmail.com

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Maj.-Gen. Leonard Johnson is a retired Canadian general who served at intermediate and high levels of command and staff during 35 years in the Canadian Forces. On retirement, he had completed four years as Commandant of the National Defence College at Kingston, Ontario. A Pugwashite since 1985, he was until now chairman of the Canadian Pugwash Group; 172 Sunnyside Road, RR2, Westport, Ontario K0G 1X0, Canada, Tel. (++1-613) 273-3000, Fax: (++1-613) 273-4269, E-mail: general@rideau.net

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23–24 June 2001 Oegstgeest, Netherlands	**Pugwash Meeting no. 264:** 15th Workshop of the Pugwash Study Group on the Chemical and Biological Weapons Conventions
20–29 June 2001 Candriai (TR), Italy	**ISODARCO Meeting no. 45:** Global Climate Changes and the Impact on Natural Resources
19–21 July 2001 Pugwash, Nova Scotia Canada	**Pugwash Meeting:** 4th Pugwash Workshop on Intervention, Sovereignty and International Security
6–9 September 2001 Como, Italy	**Pugwash Meeting:** 2nd Pugwash Workshop on Nuclear Stability and Missile Defenses
10–16 November 2001 Agra, India	**Pugwash Meeting:** 51st Pugwash Conference: *Challenges for Peace in the New Millennium*
24–25 November 2001 Geneva, Switzerland	**Pugwash Meeting:** 16th Workshop of the Pugwash Study Group on the Chemical and Biological Weapons Conventions
20–27 January, 2002 Andalo (Trento) Italy	**XV ISODARCO Winter Course** South Eastern Europe and External Interventions
9–15 August 2002 La Jolla, California	**52nd Pugwash (Quinquennial) Conference**

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