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Background paper

Contribution of the Pugwash movement to the international regime against chemical and biological weapons¹

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1 Introduction

This essay is about an enterprise in which scientists have come together in support of efforts to mitigate deadly conflict. It describes activities directed against chemical and biological warfare (CBW) by what is called the "Pugwash movement" of scientists: the Pugwash Conferences on Science and World Affairs.²

Pugwash work on CBW has been in progress for forty years now, but it is probably known only to specialists in the field. When Pugwash was awarded the 1995 Nobel Peace Prize jointly with its leading spirit, the biophysicist Joseph Rotblat, the citation rightly emphasized Pugwash work on nuclear weapons. The professional literatures of political science and international relations are starting to include analysis and evaluation of Pugwash,³ but not yet its work on CBW. So this essay is located within what, for most people, is uncharted territory.

One purpose of the essay is to prepare the way for a fuller and more rounded assessment of the work than is yet possible. Even a bare narrative account does not exist in print, and not all of the CBW work is recorded in the Pugwash official history.⁴ Moreover, most of what Pugwash does, whether on CBW or anything else, takes place under ground rules that forbid disclosure of which individual said or did what, unless that person has expressly consented. Such confidentiality is believed essential to the Pugwash *modus operandi*. Even though the need for it to be maintained must presumably pass, Pugwash has yet to devise a mechanism for releasing participants from the obligation. Only now, as the more senior Pugwashites venture into print with memoirs, and as processes of declassification and opening of national archives disclose something of government-Pugwash relationships, is it starting to become possible to relate the ambitions of Pugwash to what it has actually been achieving. For CBW, however, this opening-up has barely begun. Readers of this essay who expect an evaluation as well as a description will have to make do with speculation. Such conclusions as are drawn about the achievements of Pugwash can, in the nature of things, be no more than tentative and provisional. The work of Pugwash on CBW is anyway far from finished.

²The present author has been associated with all but the first ten years of the activities described in this essay, but in his account of them he has relied on the published record, as cited in the text, wherever possible. He acknowledges with gratitude the comments on preliminary drafts received from Rolf Björnerstedt, Martin Kaplan, Alex Keynan, Milton Leitenberg, Johan Lundin, Matthew Meselson, Jorma Miettinen, Robert Neild and Joseph Rotblat. Errors and omissions, however, remain his responsibility.

³See for example: Bernd W Kubbig, "Communicators in the Cold War: The Pugwash Conferences, the U.S.-Soviet Study Group and the ABM Treaty: Natural Scientists as Political Actors: Historical Successes and Lessons for the Future", translated by Gerard Holden, *PRIF Reports* [Frankfurt am Main: Hessische Stiftung Friedens- und Konflikt-Forschung] no 44, October 1996.

⁴The Pugwash official history comprises the following: J Rotblat, *Pugwash: A History of the Conferences on Science and World Affairs*, Prague: Czechoslovak Academy of Sciences, 1967; J Rotblat, *Scientists in the Quest for Peace: A History of the Pugwash Conferences*, MIT Press, 1972; J Rotblat, "The Fourth Pugwash Quinquennium 1972-1977: A Supplement to the History of the Pugwash Conferences", *Pugwash Newsletter* special issue, May 1977; J Rotblat, "The Fifth Pugwash Quinquennium 1977-1982: Second Supplement to the History of the Pugwash Conferences", *Pugwash Newsletter* special issue, July 1982; J Rotblat, "The Sixth Pugwash Quinquennium 1982-1987: Third Supplement to the History of the Pugwash Conferences", *Pugwash Newsletter* special issue, July 1987; J Rotblat, "The Seventh Pugwash Quinquennium 1987-1992: Fourth Supplement to the History of the Pugwash Conferences", *Pugwash Newsletter* vol 29 no 4, May 1992; and J Rotblat, "The Eighth Pugwash Quinquennium 1992-97: Fifth Supplement to the History of the Pugwash Conferences", *Pugwash Newsletter* vol 34 no 2, July 1997.

2 Aims of the Pugwash work on CBW

The ambition which most of the people involved in Pugwash CBW work would seem to share is the formation, and then the effective operation, of an international regime⁵ for eliminating CBW weapons: a regime that would modernize and strengthen the long-standing vilification of CBW, and thus substantially reduce the likelihood of resort to chemical or biological mass-destruction warfare during deadly conflict. It is an ambition which manifestly remains unrealised, for only in outline form does the regime exist. Nevertheless, the outline is a promising one, and it is useful to begin by summarizing its main features. There are four:

First, the 1972 Biological Weapons Convention, which is an international declaration now fully subscribed to by some 140 states renouncing germ weapons in order to "exclude completely" the possibility of such weapons being used against human beings, other animals or plants. This international treaty was founded upon unilateral renunciations of biological and then toxin weapons which the United States through President Nixon announced during 1969-70. The 1972 Convention extended the existing regime of CBW no-first-use -- long established by the 1925 Geneva Protocol and its antecedents -- by explicitly outlawing development, production and stockpiling of biological and toxin weapons. But the extended regime is still a primitive one. The 1972 Convention makes essentially no provision for any particular procedures or forms of international coöperation or organization to implement its rules, or to enforce its norm of non-possession. At the time, this was judged to be acceptable -- for quite different reasons, it would now appear -- by the United States and the Soviet Union, although not by everyone else. Opportunity for building upon the treaty would, however, recur during the review conferences for which the Convention provided.⁶ These opportunities were indeed taken, with the institution of a variety of voluntary "confidence-building measures". But a sense that such measures could never in themselves be sufficient led, in 1995, to the opening of negotiations for an agreement among the states parties on a legally binding instrument that would strengthen the treaty by establishing verification or other compliance-promoting procedures. These negotiations are still in progress.

Second, the particular provisions of the 1977 Convention on the Prohibition of Military or Any Other Hostile Use of Environmental Modification Techniques which prohibit warfare with antiplant chemicals "having widespread, long-lasting or severe effects". This treaty entered into force in 1978, and currently has 64 states parties, including Russia and the United States.

Third, empowerment of the Secretary-General of the United Nations to investigate allegations of the use of CBW weapons. The absence of international machinery for investigating reports of germ warfare, such as those heard during the Korean War, was what originally triggered Pugwash attention to CBW. What the machinery might comprise again became prominent in Pugwash CBW work during the late 1970s, when bizarre reports of CBW -- "yellow rain" -- began to emanate from Laos and neighbouring regions, causing the administration of President Carter in the United States to seek the assistance of the international scientific community in an effort to clarify the reports, as did the UN General Assembly.⁷ Several UN investigations were mounted during the 1980s and early 1990s, initially, and inconclusively, in regard to the "yellow rain", and then during the Iran-Iraq war, when the Secretary-General conclusively verified Iraqi resort to mustard gas,

⁵The term "regime" is being used in this essay in the sense of a construct of international law which, through explicit rules, gives expression to an international norm of behaviour, here the norm of eschewing CBW. A developed regime will also incorporate internationally agreed procedures for implementing its rules. A regime that comprises only a norm and rules, no implementing procedures, is regarded here as an underdeveloped or outline regime.

⁶Matthew Meselson, Martin M Kaplan & Mark A Mokulsky, "Verification of biological and toxin weapons disarmament", in Francesco Calogero, Marvin L Goldberger and Sergei P Kapitza (editors), *Verification: Monitoring Disarmament. A Pugwash Monograph* (Westview Press, 1991), pp 149-64.

⁷Julian Robinson, Jeanne Guillemin & Matthew Meselson, "Yellow rain: the story collapses", *Foreign Policy* no 68 (Fall 1987) pp 100-117. There is a more fully documented version of this paper in Susan Wright (editor), *Preventing a Biological Arms Race* (MIT Press, 1990), pp 220-38.

and later in Mozambique and Azerbaijan, where his investigators reported non-verification of the alleged chemical-warfare episodes on which evidence had been presented. A key element in the empowerment of the Secretary-General was the conference of January 1989 convened in Paris by the government of France, during which 149 states formally reaffirmed their commitment to the 1925 Geneva Protocol.

Fourth, the 1993 Chemical Weapons Convention. This, like the 1972 biological treaty, originated in intergovernmental talks on CBW that commenced in 1968. It is a full-blown disarmament *cum* antiproliferation treaty directed against all weapons which rely for their effects upon the toxicity of chemicals towards human beings or other animals. It prohibits development, production and stockpiling of any such weapons, or assistance in acquiring them, and obliges parties to the treaty not only to institute domestic compliance-assuring measures, including penal legislation, but also to participate in a verification system operated by an international agency based in The Hague, the Organization for the Prohibition of Chemical Weapons (OPCW). The treaty further extends the 1925 Geneva Protocol by including among its provisions an express prohibition of any use of toxic chemical weapons, including retaliatory use. Thus far signed by 169 states, the 1993 Convention entered into force on 29 April 1997. Experience gained from its negotiation and now from its implementation is inevitably influencing the current efforts to strengthen the Biological Weapons Convention.⁸ Some see the 1993 Convention, especially its features of nondiscrimination, penetration of private industry, and intrusive international verification, as the makings of an international regime for the control or suppression of all types of weapon of mass destruction, including nuclear weapons.

Pugwash has been intimately involved at all stages of the regime-building process just described. Its current CBW work is aimed at promoting the efforts to strengthen the 1972 Convention and to bring the 1993 Convention properly into force -- in the form originally negotiated, and with all significant states participating.⁹

3 Narrative account of the Pugwash work on CBW

3.1 Origins of the Pugwash movement

The larger story of Pugwash is rooted in the second world war, when such products of new science as radar, electronic computing and, above all, nuclear weapons, elevated the status and influence of natural scientists in the councils of state. In countries such as Britain and the United States, and no doubt also in France, the USSR and elsewhere, scientists were now being sought out by people in power. In the subsequent period of deepening cold war, one other rare characteristic of natural scientists stood out: the intellectual milieu of science is international, cosmopolitan. It is the observation or the idea that is important, not where it comes from. Scientific inquiry can transcend national borders. Pugwash came into existence because it was able to build those two attributes -- access to policy levels of government, and transnational peer-grouping -- into something for which a genuine though unstated need existed: an enduring open framework for East-West dialogue on security-related issues at a time when exchanges of mutual suspicions and propaganda were clogging the more conventional channels of communication.¹⁰

⁸Julian Perry Robinson, "Some lessons for the Biological Weapons Convention from preparations to implement the Chemical Weapons Convention", in Oliver Thränert (editor), *Enhancing the Biological Weapons Convention*, Bonn: Dietz, 1996, pp 86-113.

⁹At the time of writing, 120 states have ratified their signatures of the Convention or otherwise acceded to it, thus becoming fully bound by the treaty. They include China, India, Iran, Japan, Jordan, Pakistan, Russia and all of NATO, the European Union and the Australia Group, but not yet such signatory states as Israel. The relatively small number of states that have not even signed the Convention include Egypt, Iraq, Libya, North Korea, Serbia & Montenegro and Syria, all of which are among the states that have been reported, not necessarily correctly, in the Western press as having chemical-weapons programmes.

¹⁰See, further, Bernd Kubbig, *op cit* (note 3) p 8.

There was also a belief in the "objectivity" of science and how the special wisdom of scientists, and the manners of scientific discourse, could illuminate the options open to policy makers for resolving East-West conflict. Insofar as this implied that scientists could somehow detach themselves from their social context, such thinking seems odd today, and perhaps did not actually count for much even then. But insofar as it implied that the rigour of their intellectual discipline and the manner in which they approached problems were distinctive assets that should be valued in political affairs, then it was indeed a part of the glue that held the movement together, and has continued to do so to this day.¹¹ As for the outside world, what mattered was that senior scientists from different countries -- from the Old World, the New World, and the Third World, persons of eminence and world reputation -- came together in conference and, in so doing, brought into existence a continuing forum that proved capable of serving an increasing variety of purposes. Such was the answer-for-everything public image of science in the 1950s that politicians saw benefit in welcoming the enterprise. As time went on and that image of science changed, the fact that Pugwash did not seek to operate in the public eye as a mass movement enabled governments to tolerate it, sometimes to listen to it, and sometimes to use or exploit it.

The question remains as to what actually it was, at the level of the individual, that inspired Pugwash and then kept its people participating year after year, in growing numbers. There are, after all, no obvious rewards for the foot-soldiers of Pugwash beyond the pleasure of seeing old friends and familiar faces every so often. Perhaps it was the following. Scientists have always had to contend with what has been called their "double loyalty": a sense of duty not only to their country but also to their science. In some disciplines, this duality could be conflictual, and, during those early years of the "national security state", it was indeed for more and more people. Loyalty to science is an abstraction not easily described or understandable outside its own world. In some scientists it is nonexistent, but in others it is passionate, overriding. Maybe it has to do with desire to protect newborn knowledge from deformation, from distraction, from loss, from waste. Maybe it also has to do with belief that science is for the common good. In nuclear physics and the other disciplines that produced the atomic bomb, the double loyalty clearly became a source of much personal stress. What could be more antithetical to belief in science for the good of humanity than use of science to make new weapons of mass destruction? Yet what could be more disloyal to one's country than to disregard the military potentials of the atomic nucleus? Some scientists reacted by asserting the primacy of one or the other loyalty, notwithstanding the risk in so doing of becoming branded by their fellows, as some were, either as enemy dupes or as bigoted patriots. Most of the rest preferred to ignore their predicament, seeking refuge in the notion that these were "political" matters which therefore had no place in the laboratory; a notion propagated, one might think, for that very purpose. But there were a few who chose neither the one retreat nor the other: scientists who accepted that, if science really were to be beneficial, the double loyalty could neither be fragmented nor evaded. It had instead to be recognised and somehow accommodated. These were the people who set and kept the Pugwash movement in motion.

A catalyst was needed to set it all going. It came in the form of a manifesto written by the British mathematician and philosopher Bertrand Russell, launched on 9 July 1955 at a conference in London organized by *The Observer* newspaper and chaired by Professor Rotblat. It was a manifesto which Russell had got ten eminent scientists from around the world to sign, among them, as one of the very last acts of his life, Albert Einstein. The manifesto drew from a broadcast that warned against the perils of nuclear war, a "new dirge for the human race", which Russell had made on BBC radio in December 1954. The final words of the broadcast were carried over into the final words of the manifesto: "There lies before us, if we choose, continual progress in happiness, knowledge, and wisdom. Shall we, instead, choose death, because we cannot forget our quarrels? We appeal, as human beings, to human beings: Remember your humanity, and forget the rest. If you can do so, the way lies open to a new Paradise; if you cannot, there lies before you the risk of universal death."¹²

¹¹See, further, Joseph Rotblat, "Pugwash -- the social conscience of scientists", valedictory presidential address at the 47th Pugwash Conference, Lillehammer, Norway, 1-7 August 1997.

¹²*The Autobiography of Bertrand Russell: [Volume III] 1944-1967*, London: Allen & Unwin, 1969, pp 72-78 and 97-100; J Rotblat, *Scientists in the Quest for Peace: A History of the Pugwash Conferences*, MIT Press, 1972, pp 2 and 137-

The manifesto opened with a call to action: "In the tragic situation which confronts humanity, we feel that scientists should assemble in conference to appraise the perils that have arisen as a result of the development of weapons of mass destruction". Further on: "We have to learn to think in a new way. We have to learn to ask ourselves, not what steps can be taken to give military victory to whatever group we prefer, for there no longer are such steps; the question we have to ask ourselves is: what steps can be taken to prevent a military contest of which the issue must be disastrous to all parties. ... Most of us are not neutral in feeling, but, as human beings, we have to remember that, if the issues between East and West are to be decided in any manner that can give possible satisfaction to anybody, whether Communist or anti-Communist, whether Asian or European or American, whether White or Black, then these issues must not be decided by war. We would wish this to be understood, both in the East and in the West."

The Atomic Scientists' Association in the United Kingdom, and the Federation of American Scientists in the United States, had for years been working towards an international conference such as the manifesto called for, but only with the passing of the Stalin regime in the Soviet Union could the conference materialize. It finally took place, in July 1957, through the hospitality of the Cleveland industrialist Cyrus Eaton. Fifteen physicists, two chemists, a biophysicist, a biologist, two physicians and one lawyer, all but one of them (a physician) from academic institutions in ten countries (Australia, Austria, Canada, China, France, Japan, Poland, the Soviet Union, the United Kingdom and the United States), assembled in Nova Scotia, Canada, in the village of Pugwash, to consider the issues raised in the manifesto and to discuss what might be done. The meetings were conducted in English and Russian, the USSR participants being accompanied by an official¹³ who acted as interpreter. The conference issued a public statement, drafted by the Nobel physicist Cecil Powell, presenting the substance and outcome of its discussions, but doing so over the objections of Leo Szilard, who favoured a more focussed communiqué. And it established a Continuing Committee, to be chaired by Bertrand Russell, to organize such further conferences "as it sees fit".¹⁴

3.2 The Pugwash Conferences on Science and World Affairs

That Pugwash conference was to be the first of many. The way in which it was organized and conducted guided subsequent conferences. These eventually came to be hosted, almost all of them in places other than Pugwash, by national "Pugwash groups" whose character, institutional affiliations (if any) and methods of work and fundraising varied from country to country. There are currently 38 national Pugwash groups around the world.¹⁵

The conferences have ranged in size up to that of the 42nd in Berlin in September 1992, which was attended by 274 people from 51 countries. A national quota system is operated in order to promote balance. The agenda of each conference is carefully negotiated among the organizers many months in advance so that appropriate people can be invited, and papers written in good time. Each conference now proceeds through a mix of plenary sessions and working groups, the latter reporting back to the former for a closing debate.

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¹³The late Dr Vladimir P Pavlichenko, Assistant General Scientific Secretary of the USSR Academy of Sciences. During 1957-65 he participated in all the first 15 conferences, and, during the period 1974-90, in numerous other Pugwash meetings. It was generally assumed throughout the Pugwash movement that Pavlichenko was an officer of the KGB, an assumption of which he must have been aware but did nothing to change.

¹⁴Joseph Rotblat (editor), *Proceedings of the First Pugwash Conference on Science and World Affairs (Pugwash, Nova Scotia, Canada, 7-10 July 1957)*, London: Pugwash Central Office, 1982.

¹⁵J Rotblat, "The Eighth Pugwash Quinquennium 1992-97: Fifth Supplement to the History of the Pugwash Conferences", *Pugwash Newsletter* vol 34 no 2, July 1997, at p 7.

Except for some of the plenary sessions, the conferences are closed to all but the invited participants. Afterwards there is typically publication of a final statement summarizing the proceedings, drafted by the Pugwash leadership in such a way as to inform but not unduly to offend. Participants sometimes find that the value of these gatherings lies less in the formal proceedings than in the associated opportunities for smaller meetings, including ones elsewhere in the host country, and for chance conversations. The conferences tend to be spread over several days, with participants accommodated in proximity to one another and with a social programme as well, so as to facilitate such encounters.

The conferences are the core of the Pugwash movement. As the years have gone by, a structure for the movement has evolved in which international elements -- the Pugwash Council (which is what the Continuing Committee became in 1975) and its Executive Committee with a small supporting secretariat and offices originally in London, but now in Geneva, Rome and Cambridge (Massachusetts) as well -- are funded both by a system of voluntary levies on the national groups and by central fund-raising activities. The conferences have become annual events, with a larger than usual one every five years during which the future of Pugwash is discussed and participants are invited to endorse a new platform of officers and Council members. The Council, through the Executive Committee, also sponsors symposia and a number of otherwise autonomous Study Groups which, from time to time, hold meetings of their own, provided national Pugwash groups are willing and able to host them. It is at the study-group level of Pugwash that most of the CBW work has been done. Anyone accepting an invitation to participate in any Pugwash meeting automatically becomes a member of Pugwash and a recipient thereby of the quarterly *Pugwash Newsletter*. Such people now total some 2800 (not counting those among them who have since died) and have come from 107 countries.¹⁶ The membership is no longer dominated by natural scientists. Social scientists have participated from the beginning, and became a majority in the late 1980s.

The decision-making processes of Pugwash resemble those of other long-lived international non-governmental organizations in their transparency. The Pugwash official history¹⁷ provides an account of these arrangements and of the many other aspects of the movement that need not be described here.

How the high command of Pugwash sees the movement today is set out in the description of Pugwash which, for newcomers, accompanies the letters of invitation to Pugwash meetings, all of which are now issued by the Secretary-General.¹⁸ Here is an excerpt from the edition of 13 July 1996: "The purpose of the Pugwash Conferences is to bring together, from around the world, influential scholars and public figures concerned with reducing the danger of armed conflict and seeking cooperative solutions for global problems. Meeting in private as individuals, rather than as representatives of governments or institutions, Pugwash participants exchange views and explore alternative approaches to arms control and tension reduction with a combination of candour, continuity, and flexibility seldom attained in official East-West and North-South discussions and negotiations. Yet, because of the stature of many of the Pugwash participants in their own countries (as, for example, science and arms-control advisers to governments, key figures in academies of science and universities, and former and future holders of high government office), insights from Pugwash discussions tend to penetrate quickly to the appropriate levels of official policy-making."

¹⁶J Rotblat, "The Eighth Pugwash Quinquennium 1992-97: Fifth Supplement to the History of the Pugwash Conferences", *Pugwash Newsletter* vol 34 no 2, July 1997, at p 16.

¹⁷Rotblat, *op cit* (note 4).

¹⁸Who, during 1989-97, was Francesco Calogero, professor of theoretical physics at the University of Rome. The present incumbent is a professor emeritus of the Massachusetts Institute of Technology: George Rathjens, chemist and political scientist.

The international environment of Pugwash has changed dramatically since the time of the "Russell-Einstein Manifesto", and the movement itself has been changing in character, as that last quotation illustrates. The adaptation continues.¹⁹

3.3 The Fifth Pugwash Conference (1959)

The reference to weapons of mass destruction (WMD) in the Pugwash manifesto imported an allusion to chemical and biological weapons, for in United Nations parlance "WMD" had by then become a technical term expressly embracing not only nuclear weapons but also radiological and CBW weapons. It denoted the category of weapons which, since 1947-48, the UN had differentiated from conventional weapons in order to guide its work on the plans for a "system for the regulation of armaments" required under Article 26 of the Charter. However, CBW did not figure to any now-discernible extent in the deliberations of Pugwash until the Third Conference, in Kitzbühel, Austria, in September 1958.

This was a large gathering, funded mainly by an Austrian foundation directed by Bruno Kreisky. It culminated in the adoption of a declaration of principles and a public meeting in Vienna in which conference-participants addressed an audience of some 10,000 people. The Pugwash official history records that "several speakers [during the conference itself] drew attention to the rapid development of biological and chemical weapons and to the magnitude of the disaster which might follow from their use in war". The Continuing Committee subsequently decided to call a special conference on CBW, which, as the Fifth Conference, duly took place in Pugwash during 24-29 August 1959 with the financial support of Cyrus Eaton. The official history records²⁰ that "Much help and advice in planning this conference was obtained from Martin Kaplan,²¹ a very active Pugwashite, who later attended many Pugwash Conferences as an official World Health Organization observer". That was the beginning of the leadership role which Kaplan continues, to this day, to play in Pugwash CBW work.

Who the people at Kitzbühel were who pressed for a conference on CBW, the official history does not record. Perhaps they were among the 8 of the 84 Kitzbühel participants who were also among the 26 participants at the Fifth Conference: Kaplan (USA), his then-retired former master at the WHO Brock Chisholm (Canada), Patricia Lindop (UK), Vladimir Pavlichenko (USSR), Robert Watson-Watt (Canada) and three members of the Pugwash Continuing Committee, namely Bentley Glass (USA) and founder-members Eugene Rabinowitch (USA) and Joseph Rotblat (UK). Together with André Lwoff (France) and Mikhail Dubinin (USSR), Chisholm, Glass, Kaplan and Rotblat constituted the Steering Committee for the Fifth Conference²² which, so the official history states, prepared the draft of a document embodying the findings of the meeting and its recommendations. The official history describes this draft as having been "carefully discussed at two plenary sessions" and then adopted unanimously.²³ Kaplan's recollection today is that Glass

¹⁹Modest changes are envisaged in two documents adopted by the 47th Pugwash Conference (Lillehammer, Norway, 1-7 August 1997): "Goals of Pugwash for the Quinquennium 1997-2002", and "Principles, Structure and Activities of Pugwash for the Quinquennium 1997-2002".

²⁰J Rotblat, *Scientists in the Quest for Peace: A History of the Pugwash Conferences*, MIT Press, 1972, p 43.

²¹Kaplan, a microbiologist and epidemiologist, had joined the World Health Organization soon after World War II, entering its division of Communicable Disease Services. He rose to become Scientific Adviser to the Director-General and later to head the Organization's directorate of Research Promotion and Development. This post he relinquished in 1976 upon becoming the first Director-General of Pugwash.

²²J Rotblat, personal communication, 24 September 1997.

²³J Rotblat, *Scientists in the Quest for Peace: A History of the Pugwash Conferences*, MIT Press, 1972, pp 43-44.

coordinated the draft, the main components of which were submitted by Theodor Rosebury (USA), Lwoff and Kaplan.²⁴

It is important that details such as these do not remain obscure, for the Fifth Conference was the first occasion since the onset of the cold war during which scientists knowledgeable in fields from which CBW weapons derive participated in an international conference, coming from both East and West to consider and discuss CBW. The meeting had no precedent. It was the first clear marker on the route towards the new international anti-CBW regime that exists today. Certainly one can, if one is so minded, regard the Fifth Conference as mere reaction to events in the wider world. In his welcoming message, Bertrand Russell drew attention to one such event, namely the public-relations campaign which the US Army Chemical Corps was conducting with the aim of increasing the acceptability of CBW weapons by portraying them to the United States Congress and to the press as both effective and humane.²⁵ Yet that campaign had barely begun at the time of the Kitzbühel conference, and to see the Fifth Conference simply as reaction to it is to characterize the conference itself as no more than propaganda, an analogous play to the public gallery. That would manifestly belittle its achievements, for the Fifth Conference and what it set in train were clearly much more than that. The aforementioned Final Statement, for example, is a strikingly constructive and prescient document.²⁶ And the papers of the meeting presented information which substantially extended what was known in the public domain about CBW.²⁷

Kaplan writes of having been invited to attend the Kitzbühel conference "because of the concern of some of the leaders of Pugwash who were interested in CBW" and who knew of his affiliation with WHO.²⁸ He writes, too, of the influence of Chisholm, who had participated not only in the Kitzbühel conference but also in the inaugural Pugwash conference a year previously. A major general in the Canadian army where he was Director-General of Medical Services, Chisholm had had involvement in Allied biological-warfare preparedness during the second world war.²⁹ He was Director-General of WHO until 1953, his tenure

²⁴M M Kaplan, personal communication, 22 September 1997.

²⁵See "Opening address of The Earl Russell" in Pugwash Secretariat, *Pugwash Conference of International Scientists on Biological and Chemical Warfare (Pugwash, Nova Scotia, Canada, August 24-30, 1959)*, Pugwash, 31 August 1959.

²⁶The text is printed in full in *Nature* 184: 1018-20 (3 October 1959), "Pugwash International Conference of Scientists: statement on biological and chemical warfare".

²⁷See, for example, the statement in the paper by Academician M M Dubinin (USSR), a physical chemist long associated with Soviet chemical-warfare preparedness: "Some of the substances ... in the class of ethers of dialkylamino-alkylthiophosphinic acid are lethal when man's skin is exposed to approximately 2 mg of it". He was here reporting an estimated percutaneous lethal dose in human beings for what in the West had by then become known as the "V agent" nerve gases, and he was doing so at a time when even the chemical identity of these substances, let alone their quantitative toxicity, was security-classified information. Some 20 years would go by before the US Army would publicly disclose its own human-lethality estimates for the V agents. The United States commenced large-scale production of V-agent nerve gas for chemical-weapons purposes in 1961; the Soviet Union, in 1972. So this, in 1959, was a remarkable act by Dubinin.

²⁸Martin M Kaplan, "Towards abolishing biological and chemical weapons: contributions of the Pugwash Conferences and the World Health Organization -- A memoir", 5 June 1997, as yet unpublished but see *Pugwash Newsletter* vol 34 no 2 (July 1997) p 26. Kaplan speaks of having been referred to Pugwash in 1957 by Ritchie Calder, then a science journalist and an adviser to WHO, during a conversation in which Kaplan had been voicing concern about nuclear, chemical and biological warfare. Kaplan got in touch soon afterwards with Pugwash Secretary-General Rotblat, who invited him to the Kitzbühel conference, then some 8 months into the future, telling him that Pugwash had been thinking about holding a conference on CBW and that the Kitzbühel conference would be occasion for considering the idea further.

²⁹John Bryden, *Deadly Allies: Canada's Secret War 1937-1947*, Toronto: McClelland & Stewart, 1989, p 125. See also: Brock Chisholm, "Biological warfare: demand for answers", *Bulletin of the Atomic Scientists* vol 15 no 5 (May 1959) pp 209-211.

coinciding with the allegations of biological warfare which China and North Korea directed against the intervening United Nations forces during the Korean war. Chisholm had suggested to UN headquarters in New York that WHO should assist in an investigation of the charges, if so requested, and to this end he alerted his Communicable Diseases division to prepare for the formation of an investigating team. As matters turned out, there was no WHO investigation,³⁰ but the Organization remained alert to BW issues and was later ready to sanction the unofficial participation of one of its staff, namely Kaplan, in Pugwash BW work. Chisholm's successor in office at WHO, the Brazilian physician Marcolino Candau, was also a supporter of Pugwash, and, after his retirement from WHO in 1973, an active participant in Pugwash meetings. Kaplan's *sub rosa* leadership of Pugwash work on CBW, work which he had himself largely instigated, thus had sustained support at the highest level of WHO. So, too, did his CBW-related work within the Organization, notably production of the influential *Health Aspects of Chemical and Biological Weapons: Report of a WHO Group of Consultants* (1970). A second edition of this publication is currently in preparation, under Pugwash editorship.

The Fifth Conference in fact made no recommendation for continuing Pugwash work on CBW, nor would any such recommendation be made until the 13th Conference, five years later. The Final Statement from the Fifth Conference expressed its central conclusion in the following terms: "Our discussions suggest that the difficulties of establishing a stable and lasting peace are aggravated by the fact that all nations, whether or not they possess nuclear weapons, might produce biological and chemical weapons; international tension would consequently be increased". The Statement went on later to observe that, "however difficult the international control of atomic weapons may be, the international control of biological and chemical weapons by any system of inspection seems incomparably more difficult".

The Final Statement then presented two recommendations on ways of reducing the likelihood of CBW weapons actually coming into use. The first was that general agreement should be sought on the international renunciation of any use of CBW weapons, as by universal adherence to the 1925 Geneva Protocol (prominent non-parties at that time included Brazil, Indonesia, Israel, Japan, Syria and the United States, all of which have since joined) and by withdrawal of reservations of a right to retaliate in kind which some states had arrogated to themselves when joining the Protocol. The second recommendation, was "the renunciation of official secrecy and security controls over microbiological, toxicological, pharmaceutical and chemical-biological research". To this end, in other words in order to dispel apprehensions generated by undue secrecy, the Statement proposed the formation of a scientific committee comparable to the UN Scientific Committee on the Biological Effects of Radiation, or else a permanent UN Scientific Commission on biological and chemical modes of warfare. Such a body could also stand ready "to investigate impartially the claims by plaintiff nations that others had openly or surreptitiously used methods of biological or chemical warfare against them".³¹

³⁰The United States favoured an investigation, not by the WHO, but by the International Committee of the Red Cross. When this was proposed in the UN Security Council, the Soviet Union vetoed it. See: Jozef Goldblat, *CB Disarmament Negotiations, 1920-1970*, volume IV in the SIPRI series, *The Problem of Chemical and Biological Warfare*, Stockholm and New York, 1971, pp 212-214. See also: J E Van Courtland Moon, "Biological warfare allegations: the Korean War case", in R A Zilinskas (ed), *The Microbiologist and Biological Defense Research*, Annals of the New York Academy of Sciences, vol 666 (1992) pp 53-83.

³¹"Statement of Pugwash International Conference of Scientists on Biological and Chemical Warfare", *op cit* (note 26).

3.4 Formation of the BW Study Group (1964)

The years immediately following the Fifth Conference saw the emergence of "arms control" as a formative concept³² in East-West relations, with Pugwash initially as the primary channel within which the new ideas could be discussed internationally but noncommittally. Most of the founding fathers of arms-control theory and practice are listed as participants in the Pugwash conference-proceedings of the time, as well as many of the better-known scientific advisers to government. The published proceedings of the 8th Conference, held at Stowe, Vermont, during September 1961 (an inauspicious time, the USSR having just resumed nuclear-weapons testing) are striking for the names of the attendees who found themselves unable to subscribe to the Final Statement, including from the United States Robert Bowie, Donald Brennan, Amrom Katz and Henry Kissinger, though not including, from among the UK participants, Patrick Blackett, John Cockcroft, Michael Howard, Ben Lockspeiser, William Penney or Solly Zuckerman. One may perhaps, in retrospect, see this as a turning point in Pugwash affairs, a retreat still further from a public-education type of approach that placed emphasis on public statements emanating from the conferences (such as the 1958 Vienna Declaration). While that was an approach which some Pugwashites evidently favoured, others clearly saw it as dangerously close to cold-war rhetoric.

The transition coincided with the growth of a tendency within Pugwash to concentrate certain particular efforts within smaller, exclusive subgroupings. Recently opened US State Department papers from 1960-61 cited by Kubbig³³ document this process in regard to the US and, by implication, the Soviet Pugwashites who initiated the long-running private US-Soviet discussions that, on the US side, grew out of the Committee on International Studies of Arms Control which had been formed in March 1961 within the American Academy of Arts and Sciences. The State Department papers indicate an impatience on the US side with what was seen to be a strengthening of an ideological-propagandist faction at the expense of, in Walt Rostow's words, "serious discussions between technicians".

One may speculate that developments such as these underlay the actions initiated during the 13th Conference, held in Karlovy Vary, Czechoslovakia, on 13-19 September 1964, to establish study groups under the auspices of the Pugwash Continuing Committee. These would engage participants in more extended consideration of certain specific topics than was possible during the Pugwash conferences themselves. Two such Pugwash Study Groups were formed at that time, one on European Security, the other on Biological Warfare (BW).

What led Pugwash to accord such special treatment to BW? Two factors seem to have been influential. One was the sense among some Pugwashites, which had already found expression at the Fifth Conference, that BW weapons might become a form of WMD altogether more accessible than nuclear weapons. So, while there might well be value in regarding nuclear arms control as essentially a bilateral matter, and a fit topic, therefore, for the new US-Soviet arms control study group, the same was not obviously true for BW. Establishing a special Pugwash BW study group might not only be a way to escape the cold-war grandstanding that some feared was now an inevitable feature of the big Pugwash conferences, but it might also be a way of preventing Pugwash attention to the subject becoming unduly confined within the bilateral US-Soviet relationship. Rumours (not entirely unfounded) of West-German work on biological weapons underlined this consideration and emphasized the need for a proper multilateralism.

³²"Arms control", in the new thinking, stood in contrast to disarmament, on which intergovernmental talks had long since become mere occasion for cold-war posturing. What had animated enthusiasm for disarmament was belief that armament *per se* could endanger security. Arms-control theory rejected this proposition but recognised that armament technology, if unconstrained, could become a source of insecurity. Prominent among the founding texts of the new school was the Fall 1960 issue of *Daedalus*, the journal of the American Academy for Arts and Sciences. This presented a symposium of US and European writings later published as *Arms Control, Disarmament and National Security*, edited by Donald G Brennan, New York, 1961.

³³Kubbig, *op cit* (note 3).

The second factor was the benefit that might be gained from establishing a forum in which the views of physicists on arms control, which then mostly meant nuclear arms control, did not necessarily dominate the consideration of BW. Physicists tended, it seemed then, towards approaches to security and arms control more suited to bilateral than to multilateral application: a mechanistic type of outlook that did not readily accommodate the more chaotic aspects of the natural world. One may read with astonishment today the conclusion of Working Group 1 at the Ninth Conference (Cambridge, UK, August 1962): "It was agreed that the procedures envisaged for the elimination of nuclear weapons and the means of delivery would also be adequate for the elimination of biological and chemical weapons of mass destruction".³⁴ If this was the direction in which Pugwash had been heading on CBW arms control prior to the Karlovy Vary conference, establishment of the Pugwash BW Study Group was a most necessary expedient.

The Karlovy Vary BW initiative had as its immediate stimulus two events of the previous year that occurred during the 11th Conference (Dubrovnik, 20-25 September 1963). One was the presentation of a joint paper by Academician Ivan Málek of the Czechoslovak Academy of Sciences and Professor Karel Raska, director of the WHO Communicable Diseases division and formerly director of the Institute of Epidemiology and Microbiology in Prague. This paper drew attention to the greater accessibility of biological WMD as compared with nuclear ones; to their potential for what would today be called terrorism; and to the extreme difficulty of protecting a country against them. The paper therefore called for the opening of talks aimed at "the conclusion of an agreement on international co-operation in protection against biological warfare, and disarmament in the field of biological weapons". The paper proposed several specific topics for such talks, ranging from the criminalization of BW to the creation of an international scientific staff ready to advise on assistance to victims of BW attack.³⁵

The second Dubrovnik stimulus is described by Kaplan as "several informal beach discussions" on the topic of CBW.³⁶ Taking part were people from the Working Group to which the Málek & Raska paper had been assigned and also other conference participants as well. Kaplan names them as Herbert Marcovich (France), Ivan Málek (Czechoslovakia), Matthew Meselson (USA), Ole Maaløe (Denmark), Alexander Rich (USA) and himself. Among other things, they talked about the biological-weapons controls which, having started in 1959, were then being applied, in a voluntary fashion, within the mainland countries of the Western European Union by its Armaments Control Agency.³⁷ Meselson had just visited the Agency's headquarters in Paris under the auspices of the US Arms Control and Disarmament Agency, and he had inquired, among other things, into the rumoured West-German BW work. Under the WEU controls, laboratories were visited periodically by a small inspection team which examined production records and research trends. The beach discussion group proposed that a similar arrangement be instituted on a trial basis by a small group of countries that represented not only Western but also Eastern and non-aligned Europe. Several benefits might flow. For example, some such scheme, if it were found to work, could be the underpinning of a BW disarmament treaty as proposed in the Czechoslovak paper, pan-European to begin with, but maybe later embracing the superpowers. It could, moreover, be a way of communicating more widely views on the value of openness, to which the Final Statement from the Fifth Conference had attached high importance.

³⁴The working group statement is reproduced in J Rotblat, *Scientists in the Quest for Peace: A History of the Pugwash Conferences*, MIT Press, 1972, pp 190-1.

³⁵I Málek and K Raska, "Some problems of disarmament in the field of biological warfare", a paper presented at the 11th Pugwash Conference on Science and World Affairs, Dubrovnik, Yugoslavia, 20-25 September 1963, as printed in the *Proceedings*, pp 194-198. This was the first formal paper on a CBW topic to be submitted to a Pugwash conference since the Fifth Conference four years previously.

³⁶M Kaplan, "Biological warfare", *Pugwash Newsletter*, vol 1 no 3 (January 1964), p 51.

³⁷In accordance with the revised Brussels (WEU) Treaty of 1954, which incorporated the formal renunciation of nuclear and CBW weapons by Chancellor Adenauer on behalf of the new Federal Republic of Germany. The ACA controls can be viewed as a part of a contemporary NATO-wide effort to render West-German rearmament more generally acceptable.

The idea of this biological inspection experiment found support. Six months later, representatives of European Pugwash groups met in Geneva to plan their contributions to the Karlovy Vary conference, and it was agreed that Kaplan should coördinate the preparation of a collective paper on the subject.³⁸ The paper was duly written and presented at Karlovy Vary. It took the form of a summary of the views of five biologists on the requirements for a satisfactory pilot study. Besides Kaplan, Maaløe and Málek, the authors were Carl-Göran Hedén (Sweden) and John Humphrey (UK).³⁹ The paper proposed that its ideas be discussed further at the Karlovy Vary conference with a view to establishing a study group prepared to spend at least two full consecutive months developing a pilot scheme.

The agenda for the Karlovy Vary conference had long since been set, and none of its five working groups had been tasked to consider BW.⁴⁰ A special working group on BW was nevertheless convened during the conference in order, so the official history says, "to take advantage of the presence in Karlovy Vary of a number of scientists with authoritative knowledge of this subject".⁴¹ Of the 74 people attending the conference, 16 participated in the special working group.⁴² Málek was the rapporteur of the group. Among the conclusions which he put before the conference was one couched in the classical language of arms control which nowadays would be, and frequently is, stated in terms of "proliferation". It read: "The continued development of biological weapons and their introduction into the arsenals of nations would have a seriously destabilizing effect by increasing the number of nations possessing major mass destructive capabilities". The conclusions were followed by six specific recommendations:

- "1. A study group should be set up to examine the requirements for an inspection scheme for BW weapons and for cases of accusation. For trial purposes, the inspection scheme should be limited to a small group of Central European countries representative of Eastern, Western, and non-aligned nations.
- "2. The study group should carry out its work under the auspices of Pugwash. Since it is expected that results should be forthcoming within the next few months it is desirable that they should be reported to the 14th Pugwash Conference.
- "3. The Continuing Committee is asked to consider the financing of this study group as a priority project among those recommended to the proposed Peace Research Institute in Sweden.
- "4. The study group should consist of six to eight members recommended by the Pugwash Continuing Committee. The study group could then draw up a further panel of collaborating members for further participation in its work.
- "5. The study group should limit its work in the first instance to microbiological weapons. The experience gained could then be applied to the problems of chemical and radiological weapons.

³⁸*Pugwash Newsletter*, vol 2 no 1 (July 1964), pp 10-11, "Meeting of European Pugwash groups". The meeting was hosted by Martin Kaplan and James Wise.

³⁹M Kaplan, C Heden, J Humphrey, O Maaløe and I Málek, "Proposal for a study group on inspection for biological warfare weapons as a pilot scheme in central Europe", a paper presented at the 13th Pugwash Conference on Science and World Affairs, Karlovy Vary, Czechoslovakia, 13-19 September 1964, as printed in the *Proceedings*, pp 147-149.

⁴⁰*Pugwash Newsletter*, vol 1 no 4 (April 1964), pp 78-79, "Pugwash events".

⁴¹J Rotblat, *Scientists in the Quest for Peace: A History of the Pugwash Conferences*, MIT Press, 1972, p 62.

⁴²Some of the participants had duties elsewhere in the conference. Meselson, for example, was rapporteur of Working Group 3, Progress towards Comprehensive Disarmament.

"6. The potential of radiological and chemical weapons and problems of their control should be subjects for consideration at a future Pugwash Conference."⁴³

Underlying these recommendations was an important but unstated proposition. With the outlook for controlling biological weapons more promising than had appeared in 1959, the moment had come to consider the details of possible control systems that could be agreed upon internationally; since governments seemed to be doing nothing at all in this area, Pugwash should now advance its own efforts on CBW by studying the practicalities of possible frameworks. In other words, Pugwash should now move beyond providing occasion for like-minded individuals familiar with sciences from which CBW might draw to come together in order to voice concerns and share ideas about desirable remedies; it should now embark upon actual policy research.

In accepting, as it then did, the Karlovy Vary recommendations, and in deciding thereby to travel the long and time-consuming route of international research, the Pugwash leadership was perhaps also accepting something of what had motivated the Stowe dissenters three years previously, for it now seemed to be acknowledging that, on their own, political statements by eminent scientists were not enough. Such statements would always be open to damaging political criticism and one-sided interpretation. In addition, the Pugwash leadership was perhaps recognizing that the voice of scientists in world affairs could now, in the mid-1960s, have substantial influence only if expressed on matters of which scientists had a special cognizance, and of which they had made thorough study.

The official Pugwash history describes the meeting of the 13th Conference's special working group as "the first of a series to be held subsequently by the Study Group on Biological Warfare".⁴⁴ Formation of the group did not, however, remove the subject of BW from the general scope of the Pugwash conferences, though that was clearly a possibility. The Pugwash leadership was usually able to ensure that, during each annual conference over the decades ahead, CBW was included somewhere in the agenda of one of the working groups, and that, once in a while, an entire working group would be dedicated to the subject. In the latter event, one or more Study Group members would be asked to write a review paper which could be distributed beforehand so as to bring the working group, and thus the conference itself, up to speed on the subject. The conferences at which this happened are identified in Table 1.

Sometimes the annual conferences offered suggestions on what the Study Group should be doing. For example, as the increasing resort by the United States in Vietnam to weapons using chemical herbicides and irritants heightened the anti-war animosity still further, the 17th Conference (Ronneby, Sweden, 3-8 September 1967) urged an extension of the Group's work to embrace chemical warfare.⁴⁵ This duly happened, even though similar recommendations from earlier conferences had been disregarded. One consequence was a decision by the Pugwash leadership to transmit a paper on the new chemical warfare,⁴⁶ drafted in the Study Group, to the Secretary-General of the United Nations, who then had a mandate from the General Assembly to produce an expert study of CBW issues, and who had already received a brief general submission from Pugwash. There would be other such interchanges between the Conferences and the Study Group as the years and the work progressed, but the relationship has not always been a close or a smooth one.

⁴³Report of [the 13th Pugwash Conference] Special Working Group on Biological Warfare, *Proceedings of the Thirteenth Pugwash Conference on Science and World Affairs* [Karlovy Vary, Czechoslovakia, 13-19 September 1964], pp 57-58 and 79.

⁴⁴J Rotblat, *Scientists in the Quest for Peace: A History of the Pugwash Conferences*, MIT Press, 1972, p 62.

⁴⁵Report from Working Group 3 of the 17th Pugwash Conference, *Pugwash Newsletter*, vol 5 nos 2+3 (October 1967 & January 1968), pp 77-80.

⁴⁶M Meselson and J P Perry Robinson, "The status of tear gas and other sensory irritants in chemical warfare", *Pugwash Newsletter*, vol 7 no 1 (July 1969), pp 17-20.

3.5 The work of the Pugwash BW Study Group and its successors

Formation of the Pugwash BW Study Group initiated the concerted Pugwash work on CBW that would continue throughout the next thirty and more years. The general *modus operandi* was established early on. There were, and still are, three main elements: a steering committee, a succession of what later came to be called "workshops", and one or more specific policy-related research projects on which members of the study group collaborate.

The main job of the *steering committee* has been to function as interface between the Pugwash leadership, which can control the agenda and invitations for any Pugwash meeting, and the real world of CBW affairs, which determines which subjects are or are not worth discussing or studying in depth and which persons could usefully be involved in the work of the Group. Over the years, the steering committee has varied in its degree of formality and in its membership, and it has had varying degrees of intimacy with the CBW world. Kaplan has been its linchpin throughout. Within the Pugwash movement, the steering committee functions as a drafting group for such public statements as the Pugwash Council may decide to issue on CBW topics.⁴⁷

The *workshops* have had a variety of functions. They have been occasion for exposing the research projects to wider scrutiny and discussion; for airing quite new topics; for increasing awareness within the Study Group of new developments; and, maybe most important of all, for bringing policy-makers and other governmental officials into continuing working contact with the Study Group. Whatever the function, the success of each workshop has depended on the topicality of its agenda and on the match between agenda and participation-list. The onus in all these respects has fallen upon the steering committee, which sometimes has displayed remarkable foresight, while at other times might just as well have left everything to chance. For example, the initial engagement of Henry Kissinger with Study-Group ideas came not during the May 1967 Marianske Lazne workshop (see Table 2) but elsewhere in Marianske Lazne, where Kissinger was participating in a workshop of the Pugwash European Security Study Group. Kissinger would later be the primary influence upon President Nixon's renunciation of biological weapons, from which stemmed the successful conclusion of the Biological Weapons Convention. Of course this Pugwash occasion was not his only exposure to the issue prior to the crucial decisions of 1969 and 1970, but it was his first exposure to serious arms-control thinking about BW, to which he was introduced by his Harvard colleague and key member of the steering committee, Matthew Meselson.⁴⁸

As for the *policy-research projects*, which were the Group's initial *raison d'être*, they have tended to dominate the Group's work at times of low governmental activity on CBW arms control, as during the mid 1960s, much of the 1970s and early 1980s, and then again during the mid 1990s. Policy research in the security area, if it is to be effective, tends to require rare or protected data, this necessitating special resources, skills and forms of access on the part of the researchers. Being both impecunious and international, Pugwash has never found it easy to mount such work, and has had to exploit the goodwill of friendly research institutions.

In this last regard, it was especially fortuitous that the initial years of the BW Study Group coincided with a project of the government and parliament of Sweden to commemorate 150 years of peaceful Swedish progress by establishing an international institute for "peace research". This was a subject that was then starting

⁴⁷The Pugwash submissions to the UN Secretary-General's expert group on CBW are examples; likewise, the Pugwash submissions to the successive Biological Weapons Convention review conferences.

⁴⁸Meselson, who had moved from CalTech to the Harvard biology faculty in 1961, had begun serious study of BW arms control during June-August 1963, when, on the suggestion of Paul Doty, he had taken a summer appointment with the new US Arms Control and Disarmament Agency. There he had chosen to study biological weapons and to think about their policy implications. Some of this work is reflected in the paper he submitted for the April 1965 Trieste/Venice meetings: "A proposal to inhibit the development of biological weapons", *Proceedings of the 14th Pugwash Conference*, pp 297-304.

to make its mark within the academic world, notably in Scandinavia. The Swedish administration formally sought guidance on how such an institute might best be structured and what it might try to achieve, from outside bodies. These included Pugwash, the contacts being mediated through the Swedish Pugwash Group.⁴⁹ The upshot was the inauguration, in July 1966, of the Stockholm International Peace Research Institute (SIPRI), generously funded by the Swedish Parliament, and having, as a central element of its research programme, a substantial BW project. As the Karlovy Vary recommendations quoted above adumbrated, the Pugwash BW Study Group and that SIPRI BW project were actually two facets of the same activity. The likelihood of eventual support from the still-nascent SIPRI had encouraged Pugwash down the path of practical policy research, a path which, to the Swedish administration, must have seemed preferable to the peace research then being done in the universities. SIPRI, once established, would have an up-and-running research project to display that would be genuinely international in character and connected, initially through its Swedish participants, to governmental defence and foreign-policy communities.

For what had happened was that the proposal put forward at the 1963 Karlovy Vary conference for a biological inspection experiment had attracted serious interest in Czechoslovakia and then in Sweden, Denmark and Austria. In October 1965, at a Study Group meeting convened in Stockholm (no 4 in Table 2) through the good offices of the nascent SIPRI, detailed planning for the experiment could now commence, funds having been made available for Hedén, a key member of the Pugwash BW Study Group, immediately to start preparatory work as project co-ordinator. A senior official of the WEU Armaments Control Agency was present at the meeting and offered practical guidance for the experiment, notably on the forms of questionnaire which facilities under inspection should be asked to complete beforehand. It was also made clear at the meeting that a second project as well could be initiated. This was one that had been mooted at the April 1965 Trieste meeting (no 3 in Table 2), and would investigate the possibility of collaborative international research on methods for the rapid detection and identification of microbes. Such collaboration had been seen by the Study Group as another means for reducing the secrecy surrounding national BW preparedness, since, if it worked, states might be less inclined to conduct the research within their own military structures. This second project would begin with an exploratory international symposium,⁵⁰ and would be co-ordinated by Rolf Björnerstedt, then a figure in the Swedish defence-science community who would shortly become acting director of SIPRI. Evident at the meeting was the degree of high-level support which the new projects could expect from different parts of the Swedish administration, including its CBW defence laboratories. Though SIPRI would be independent, that support would not be disinterested. The Foreign Ministry would soon be setting a fast and constructive pace in the intergovernmental talks on CBW when these began in 1968, on a Swedish proposal the previous year,⁵¹ at the Geneva disarmament conference. And the Swedish General Staff was, from the beginning, looking to the BW Study Group for help in its project to secure international reaffirmation, updating and expansion of the 1925 Geneva Protocol.

The BW Study Group also decided at the meeting to recommend to the Pugwash leadership that its work should be taken over by SIPRI.⁵² The recommendation was not wholly adopted. Although SIPRI, once it

⁴⁹Swedish Pugwash Group, "An international institute for peace research", a paper presented at the 13th Pugwash Conference (Karlovy Vary, September 1964), *Proceedings*, p 330. The initial draft of this paper was prepared by Rolf Björnerstedt, who presented it at the conference.

⁵⁰In fact there was no such symposium, though papers for it were written, notably "The technical basis for studies of rapid detection of B-weapons" (22 Nov 66) by the director of the Swedish CBW defence laboratories, Lars-Erik Tammelin, and "Detection of remote biological weapons field tests -- a preliminary assessment" (Dec 66), by Matthew Meselson. These papers were, however, presented at the May 1967 meeting of the Study Group, alongside two other major papers: C-G Hedén, "Defence against biological warfare", subsequently published in *Annual Reviews of Microbiology*, 21: 639-76, 1967, and Henri Meyrowitz, "Biological Weapons and International Law", subsequently published as the monograph *Les Armes biologiques et le Droit international* (Paris: Pedone, 1968).

⁵¹The Swedish proposal to the Eighteen Nation Committee on Disarmament was made on 23 February 1967: see ENDC/PV.288.

⁵²Patricia J Lindop, "Informal summary of conclusions of meeting of Pugwash Study Group on Biological Warfare,

got going in late 1966, did indeed take over the management and operation of the two projects agreed in October 1965, and added a third one (a study of the possibility of a BW test ban), the report of the next meeting of the Study Group included this observation: "While projects requiring continuing studies should be sponsored by SIPRI it is felt important for the Study Group to retain its direct connection with the Pugwash Continuing Committee because of the political aims to be achieved by the work". The Group should also function, it recommended, to receive, assess and make recommendations on interim reports from the SIPRI BW work.⁵³

Yet for practical purposes the SIPRI BW Project did indeed come to subsume the Pugwash BW Study Group. Once SIPRI was fully established (with much practical support from Pugwash in the composition of its Governing Board and the recruiting of staff), it became understandably disinclined to continue accepting oversight from the Group, and by 1970 there seemed little point in the Group itself reconvening since so many of its members were involved in the SIPRI work. And SIPRI by then had its own international connections into the world of CBW, not least through the Swedish CBW defence community and through association with the UN Secretary-General's 1969 expert-group study of CBW, both directly and by involvement in Kaplan's complementary project at the World Health Organization, *Health Aspects of Chemical and Biological Weapons*. The Study Group accordingly went into temporary abeyance and would not reconvene until after SIPRI had completed the projects which the Group had originally promoted. During the period 1964-69, the Study Group had had seven international meetings involving 64 people from 16 countries. Particulars are given in Table 2.

3.5.1 The first SIPRI CBW Project (1966-73)

This is not the place to review the work of SIPRI in any detail or to recount its early history.⁵⁴ The SIPRI work on CBW does, nevertheless, represent a part of the Pugwash influence on the international CBW regime-building process, so at least its bare outlines need to be recorded here.

That three-component BW project was one of the three major elements of SIPRI's initial research programme. The other two were a study of the global arms trade and the annual-report project from which 29 editions of the *SIPRI Yearbook on World Armaments and Disarmament* have since resulted. Each project was staffed by an international group of researchers recruited on short-term contract, a team-work approach which was, and unfortunately still is, unusual in social-science research. It worked because of the management skills, intellectual enthusiasm and general bonhomie of the first director of SIPRI -- Robert Neild, an economist (and Pugwashite) recruited from the UK Treasury. The overall approach was empirical: through concerted data-collection and analysis, SIPRI would try to illuminate the different options that existed for public policy on the security issues that were, or should be, engaging intergovernmental negotiators. Since the governments of the rich industrialized countries were quite capable of doing such work for themselves, SIPRI saw its chief audience as existing within other governments, and also in the non-governmental world. The stereotype reader conjured up for the instruction of early SIPRI writers was a technical adviser to the Egyptian delegation at the Geneva disarmament conference.

Soon into the BW project, the director and governing board of SIPRI decided to take chemical warfare into consideration as well. Pugwash had been planning to devote a symposium in Helsinki to the subject, but agreed to defer to SIPRI, which saw such an international meeting as a convenient entrée into the field. SIPRI

Stockholm, 22 and 23 October 1965".

⁵³Study Group on Biological Warfare, "Report of the meeting of the Pugwash Study Group on Biological Warfare held in Stockholm, September 4-6, 1966", *Proceedings of the 16th Pugwash Conference* [Sopot, Poland, September 1966], pp 88-106.

⁵⁴On which see especially Frank Blackaby, "How SIPRI began", in SIPRI's 30th anniversary commemorative volume, *SIPRI: Continuity and Change, 1966-1996* (SIPRI, 1996), pp 3-64.

thereupon hired a British chemist -- in fact the present author, then a trainee patent lawyer in London -- on a three-month contract to organise the symposium, which took place during August 1968. SIPRI subsequently decided to incorporate some of the themes of the symposium, suitably developed, into an awareness-raising book that was being planned from its BW project. Events in the Geneva CBW talks, however, began to move so rapidly that this popular-book concept soon gave way to an altogether more ambitious undertaking: a compilation of historical, technical, political and military information on CBW, plus analyses of its policy implications, that might allow the Geneva negotiators, their supporting staffs and their critics (especially in the media) to become more knowledgeable about CBW and its hidden problems than many of them actually were.

During 1971-75 SIPRI duly published such a study, a closely documented work in six volumes entitled *The Problem of Chemical and Biological Warfare*. Such practical influence as it had on the talks came through its imminence and through the distribution to delegations and their capitals of draft chapters and then of a mimeographed "provisional edition" of three of the volumes. This interim publication process began in the latter part of 1968.

Continuing alongside this information collection and dissemination work was the practical laboratory and other field work which SIPRI had been sponsoring in the BW area under the direction of Hedén: the rapid-detection studies, the trial inspections in different parts of Europe, and a new project having to do with mechanized data-retrieval for verification purposes. Some of this was written up for inclusion in the six volumes. Pugwash briefly re-entered the picture when it devoted its 12th Symposium to the rapid detection and identification of microbiological agents, principally in order to explore the "Biological Agents Monitoring System" that had been proposed from the SIPRI work. The symposium, attended by 25 specialists from 9 countries, plus 3 from the WHO, was held in Geneva during February 1971. By that time, however, the governments negotiating the BW disarmament treaty were deciding not to seek incorporation of any serious verification measures. SIPRI's technical work on the biological side was ending, and it now focused more on the possibilities for international collaboration in the peaceful applications of microbiology,⁵⁵ including the verification and confidence-building potential of what was about to become Article X of the 1972 Biological Weapons Convention.

The Pugwash BW Study Group had decided, in October 1965, against expanding to cover chemical warfare, on the grounds that chemical weapons were now too well established for worthwhile treaty constraints to be negotiable quickly; but, for biological armament, where technological development was less advanced, the Group saw a window of opportunity.⁵⁶ The argument against this position had been stated six months previously by a working group of the 14th Pugwash Conference in which several members of the Study Group had participated after their Trieste meeting: "The dangers to world security posed by all classes of biological and chemical weapons are closely inter-related. Both in public opinion and in military practice it does not appear possible to maintain any lasting distinction between incapacitating and lethal weapons, or between biological and chemical warfare. The great variety of possible agents forms a continuous spectrum, starting from those that are temporarily incapacitating and ending with highly lethal ones. If the restraints on the practice of any kind of biological or chemical warfare are broken down, the entire spectrum of these weapons may come into use."⁵⁷ It was this argument which SIPRI espoused and later developed: an unusual instance of a policy-research institute putting more weight on a longer-term consideration than on a short-term expediency. For of course there would be no chance of an international agreement outlawing chemical weapons while the

⁵⁵See, for example, C-G Hedén and K Sinyak, *The Fight against Infectious Diseases: A Role for Applied Microbiology in Military Redeployment*, Stockholm: SIPRI, 1979. See also: S J Lundin, C-G Hedén and M M Kaplan, "A short comparison between Pugwash/SIPRI and VEREX BWC verification approaches", in J Altmann, T Stock and J-P Stroot (eds), *Verification after the Cold War: Broadening the Process*, Amsterdam: VU University Press, 1994, pp 184-90.

⁵⁶Patricia J Lindop, "Informal summary of conclusions of meeting of Pugwash Study Group on Biological Warfare, Stockholm, 22 and 23 October 1965".

⁵⁷The report is quoted in: J Rotblat, *Scientists in the Quest for Peace: A History of the Pugwash Conferences*, MIT Press, 1972, p 242.

United States was using them in Vietnam; but that did not mean the principle of seeking to strengthen restraint should be abandoned by focussing solely on biological warfare, as some influential voices seemed expressly to be advocating.⁵⁸ That way, SIPRI believed, lay condonation of chemical warfare.

This position of principle put SIPRI into what was widely perceived as an anti-Western camp when it came publicly to oppose the separation of biological from chemical in the advancing CBW negotiations in Geneva. In fact, before the United Kingdom formally proposed that separation -- by tabling in Geneva a succession of working papers and drafts for what ultimately became the 1972 Biological Weapons Convention -- UK government ministers with whom SIPRI was in contact had been encouraged to support the projected initiative and had been told about the experiences which SIPRI had by then gained from the biological trial inspections and agent-detection studies. As Fred Mulley, who was the minister immediately responsible, would later say at the cabinet meeting of the UK government on 12 July 1968 where the first of his BW papers for Geneva was on the agenda, it was difficult to make any progress in the chemical warfare field because the United States refused to ratify the Geneva Protocol.⁵⁹ The thought was that, if the United States could be induced to join a BW disarmament treaty, even one that did not expressly prohibit use of biological weapons, the United States would then find it much harder to remain outside the Protocol. That is what eventually happened, and Pugwash can justifiably claim to have promoted it through influence at several different levels, including that of SIPRI.

Nor, in the end, was the separation of biological from chemical either clear-cut or permanent. The inclusion of toxins within the scope of the Biological Weapons Convention meant that that treaty extended, in effect, part way into the domain of chemical weapons. And Article IX of the Convention required negotiation "in good faith" for the counterpart convention on chemical weapons which, two decades later, was finally concluded.

Publication of *The Problem of Chemical and Biological Warfare* marked the end of the original SIPRI CBW project.⁶⁰ Over its 5-year lifetime some 90 people from 19 countries had worked in the project or been associated with it through participation in its half-dozen international symposia and working groups or through other consultations. Not all of the work done during the project is reported in the six volumes,⁶¹ but by the mid

⁵⁸Starting with an op-ed article by Joshua Lederberg: "A treaty proposal on germ warfare", *Washington Post*, 24 September 1966.

⁵⁹Barbara Castle, *The Castle Diaries 1964-70*, London: Weidenfeld & Nicolson (1984), p 485.

⁶⁰A resumption of SIPRI research on the subject would commence in 1982: long-range research, for this was a time of deepening cold war, with signs both of burgeoning chemical-warfare armament and of disregard for the existing CBW arms-control treaties. SIPRI's reentry into the field was marked by inauguration of the "Scorpion Paper" monograph series, *SIPRI Studies in Chemical & Biological Warfare*, the 16th issue of which has, at the time of writing, just been published. Scorpion Papers were originally conceived as rapid-turnaround publications for the CBW policy research community. The three initial editors -- the present author (1982-87), Johan Lundin (1987-92) and Thomas Stock (1992-96) -- drew heavily on their Pugwash connections in order to build the series. About 110 people from 24 countries have contributed over the 12 years of its lifetime thus far. A prominent feature has been the integrated approach to CW and BW studies, even though CW monographs have preponderated; see, especially, S J Lundin (editor), *Views on Possible Verification Measures for the Biological Weapons Convention*, SIPRI Chemical & Biological Warfare Studies no 12, Oxford University Press, 1991. SIPRI's main publishing programme has further redressed the balance; see, in particular, Erhard Geissler (editor), *Biological and Toxin Weapons Today*, Oxford University Press, 1986.

⁶¹Express references to then-unintentionally unpublished work recur throughout Volume II (1973) of the study, where several apparently nonexistent appendices are cited. They include an important study by Milton Leitenberg of the "dual use" attributes of biological and chemical technologies, and a study by the present author of production methods for the nerve gases, an understanding of which is essential for chemical-weapons-nonproduction verification. The missing appendices also include a detailed quantitative study of the possible effects of different forms of CBW attack on cities. SIPRI had conducted this study by reconvening the expert group whose preliminary work on the subject had been published by WHO in *Health Aspects of Chemical and Biological Weapons* (1970), pp 84-112. The subject would not be

1970s the attention of governments had largely moved away from CBW arms control, even though the question of a Chemical Weapons Convention had now entered the agenda of the Geneva disarmament conference in accordance with Article IX of the Biological Weapons Convention, and even though, in July 1974, the Watergate-beleaguered administration in Washington announced agreement with Moscow on the preparation of a "joint initiative" on chemical weapons. SIPRI, however, had entered a change of direction, and was disinclined to continue committing resources to CBW work on anything like the earlier scale.

So when, in August 1973, Working Group 1 of the 23rd Pugwash Conference (Aulanko, Finland) proposed the establishment of a study group on chemical warfare as a form of assistance to the Conference of the Committee on Disarmament in Geneva, and when the Finnish Pugwash Group led by the radiochemist Jorma Miettinen then proposed an association between SIPRI and what would in effect be a revitalized Pugwash CBW Study Group, the proposal found favour on all sides. The association was marked by the inaugural workshop of a newly constituted Pugwash Study Group hosted in Helsinki in April 1974 by the Finnish Pugwash Group, with SIPRI publishing the proceedings. The workshop recommended that the new study group should continue with a series of small specialized meetings on related themes until a treaty banning chemical weapons had been achieved.⁶²

3.5.2 The Pugwash CW Study Group (1974-92)

The Study Group steering committee, which for the first time now included a Soviet scientist⁶³ as well as European and US ones, drew up a work-plan for the years ahead which, at the 24th Pugwash Conference (Baden, Austria, August 1974), it communicated to the rest of the Pugwash movement.⁶⁴ It proposed a series of workshops on different aspects of possible verification systems for the projected Chemical Weapons Convention. It also set the ground for what would become a series of roundtables on medical defence against chemical weapons, this being seen as an area in which beneficial secrecy-diminishing international coöperation might be achievable. The work-plan was accepted by the Pugwash leadership, and the Study Group embarked upon what over the next 18 years would become a course of 25 meetings involving 312 people from 38 countries. Particulars are given in Table 3.

The role of SIPRI in its new association with the Study Group was more that of occasional publisher than of research resource. The Study Group therefore had to look elsewhere for institutions with which to align itself for the policy research which had once again become its chief *raison d'être*. This it did initially by providing a framework within which an international working party originally convened by SIPRI to develop a records-based system for verifying chemical-weapons non-production could complete its work. The key institution here was the Midwest Research Institute of Kansas City, which had originally been contracted to develop the scheme (of phosphorus accountancy) by the US Arms Control and Disarmament Agency; the Agency was now interested in international reactions to the scheme, especially from the West-European chemical industry. The first steps were also taken, in 1974, to establish what would become a long-standing working relationship between the Group and the University of Sussex Science Policy Research Unit (SPRU), soon to become the largest social-science research institute in the UK. And out of the Finnish Pugwash Group grew, gradually, another key collaborating entity, the Finnish Research Project on the Verification of Chemical

taken up in the open literature again until the paper by Steven Fetter, "Ballistic missiles and weapons of mass destruction", in *International Security* 16(1): 5-42, Summer 1991. The Fetter estimates and the unpublished SIPRI ones are remarkably close.

⁶²J Rotblat, "The Fourth Pugwash Quinquennium 1972-1977: A Supplement to the History of the Pugwash Conferences", *Pugwash Newsletter* special issue, May 1977, p 26.

⁶³Academician Oleg Reutov, the organic chemist who had served as the USSR expert on the UN Secretary-General's CBW expert group.

⁶⁴As an annex to the report of Working Group 1. See *Proceedings of the 24th Pugwash Conference*, pp 42-44.

Disarmament, supported in the University of Helsinki and elsewhere by the Ministry of Foreign Affairs. Started initially to support SIPRI and Pugwash by providing concrete scientific data,⁶⁵ and foreshadowing an enterprise which would later be vigorously pursued at the intergovernmental level, the nascent Finnish Project collaborated with the Netherlands CW defence laboratories at Rijswijk in organising, through the Pugwash CW Study Group, interlaboratory comparisons of analytical methods for dealing with dirty dilute samples of CW agents, their precursors and their degradation products. This was the genesis of the famous Finnish "Blue Book" series on sample analysis for purposes of verification.

The medical-defence roundtables represented a different form of alignment. Here, at the urging especially of the Yugoslav members of the Study Group, the steering committee arranged meetings in the margins of large professional conferences: an international congress of toxicologists in Herzegovina in 1974, of pharmacologists in Helsinki in 1975, and of occupational medicine in Dubrovnik in 1978.

Through these and other such arrangements, the CW Study Group was able to produce a succession of competent papers and reports, transmitted to the disarmament delegations in Geneva and their head offices, setting out ideas and schemes which might prove helpful if and when serious multilateral negotiations on the projected Chemical Weapons Convention began (which finally happened in 1984). They included papers on the necessity of international verification; on particular techniques of verification that would minimize intrusion into areas of legitimate secrecy, such as instrumented near-site and off-site inspection and reported-data monitoring; on the then-novel concept of confidence-building measures; on ways for responding to CBW-use allegations; and on regional approaches to CW arms control. On most of these topics, what Pugwash was proposing was then highly original.

Of more obvious value was the work done by the Study Group on the philosophy and design of on-site inspections in the civil chemical industry. Here the Group built on the coöperation it had received, initially through SIPRI, from such companies as Shell, Bayer, the latter's US subsidiary Chemagro, and Albright & Wilson. Working contacts were later made, too, in the European biotechnology-based industry and, in the mid-1980s, with the US, Swiss and Japanese chemical manufacturers' associations. This work included a succession of trial inspection visits at facilities in West Germany (1977), the United States (1978), Sweden (1979), Switzerland (1982) and, after postponement in 1980, East Germany (1987). Through these visits and, especially, through the consultations and planning that preceded them, prominent figures in the chemical industry became aware of the demands that CW arms control, if it succeeded, would inevitably place on their corporations. All of this eased the way of the Geneva negotiators when it subsequently became opportune for them to draw the industry into their talks. Moreover, the learning-by-doing approach of the Study Group to the practicalities of non-production verification came to be emulated by the negotiators when the Conference on Disarmament agreed to encourage member states to mount national trial inspections. One of the last activities of the Study Group in this area was to provide an otherwise absent framework in which an international comparative assessment could be made of these national trial inspections.⁶⁶ In a somewhat similar vein, the penultimate workshop of the Study Group sought, successfully, to bring one other sector of potentially affected industrial enterprise into the CW arms-control arena: the developers and manufacturers of anti-chemical protective equipments.⁶⁷

As governmental attention to the projected Chemical Weapons Convention began to increase in the 1980s, the Study Group developed working contacts with the diplomats who were now obliged to learn about chemical warfare, with the officials in capitals who were instructing them, and with the growing number of

⁶⁵J K Miettinen, personal communication, 24 September 1997.

⁶⁶Ralf Trapp, *Verification under the Chemical Weapons Convention: On-Site Inspection in Chemical Industry Facilities*, SIPRI Chemical & Biological Warfare Studies no 14, Oxford University Press, 1993.

⁶⁷P Deshingkar, M Meselson and J P Robinson (eds), *Antichemical Protection and the Chemical Weapons Convention*, HSP Occasional Paper no 2, Washington: HSP, 1993.

technical experts on CW now being assigned to the delegations in Geneva, some of whom were already members of the Study Group. The character of the workshops changed accordingly, most of them now being hosted in Geneva by the Swiss Pugwash Group and becoming increasingly focussed on particular negotiating issues in which technical and political considerations were intertwined. Some policy research continued, notably through an alignment with the Leipzig Institute of Chemical Toxicology of the GDR Academy of Sciences, whose director, the late Karlheinz Lohs, was a member of the Group's steering committee. There was also a revival of research collaboration with SIPRI, in a case study of a representative dual-use chemical precursor. The chemical chosen for study was thiodiglycol, which Iraq had been buying on the world market for purposes of mustard-gas manufacture, but which was otherwise used as a precursor for a range of commodity chemicals and as a specialized solvent in, for example, the textiles industry. The case study investigated the normal patterns of production and consumption of thiodiglycol worldwide in order to assess the merits of competing approaches to non-diversion and non-production verification contained in the "rolling text" of the projected treaty. Both here, and in its effect on the content of the treaty's control schedules, the study⁶⁸ had concrete influence.

By the time a treaty-text was finally agreed, in the late summer of 1992, people from the national negotiating teams outnumbered the more traditional participants in the Study Group workshops. It is not yet possible to assess the influence which this type of interaction had on the agreement, with or without the prior consciousness-raising phase of the work of the Study Group. But given the closeness and the duration of the interaction, and the variety of levels at which it occurred, it is hard to imagine that there was no influence at all.

3.5.3 The Pugwash Study Group on Implementation of the CBW Conventions

Conclusion of the Chemical Weapons Convention brought with it a reconstitution of the Pugwash CW Study Group into a new body that would concern itself with problems arising from the practical implementation of the treaty, and also of the 1972 Biological Weapons Convention. Such work would necessitate establishing the same sort of relationship with the cognizant intergovernmental bodies as had existed between earlier embodiments of the Study Group and the negotiators in Geneva. In practice this came to mean two series of workshops, one on each treaty, but with each workshop always including a session on the other treaty. One series, hosted by the Netherlands Pugwash Group, has involved officials from the Preparatory Commission for the OPCW and then from the OPCW itself. The other series, hosted by the Swiss Pugwash Group, has interacted with diplomats and experts involved with the successive fora -- first "VEREX" and then the "Ad Hoc Group" -- that have been established by states parties to the Biological Weapons Convention for purposes of studying and then negotiating arrangements for strengthening their treaty. The new study group has a close alignment -- as, in its final phase, did its predecessor -- with the Harvard Sussex Program on CBW Armament and Arms Limitation, a research and communication activity now rooted in the Harvard University Belfer Center for Science and International Affairs and in the University of Sussex Science Policy Research Unit. Table 4 lists the first eight workshops to have been organized by the Study Group; 177 people from 37 countries participated in them.

The practical effect which the Study Group may be having on the growth of the international anti-CBW regime is not yet clear. The Group sees itself as having at least one other function as well: serving as a private point of international contact for, so to say, friends of the CBW treaties. Because the regime impacts widely across science, technology and industry, so also may developments there impinge upon the regime, maybe adversely so if the regime is poorly understood or appreciated. So the treaties are likely to need all the supporters they can get, once they begin to bite and to consume discernible amounts of taxpayers' money. To this end, the Pugwash leadership is now embarking upon an enterprise of international education on the CBW treaties.

⁶⁸S J Lundin (editor), *Verification of Dual-Use Chemicals under the Chemical Weapons Convention: The Case of Thiodiglycol*, SIPRI Chemical & Biological Warfare Studies no 13, Oxford University Press, 1991.

4 Analysis and conclusions

Between August 1959 and March 1998, a total of 645 people from 46 countries participated in the Pugwash or Pugwash-associated efforts described in the foregoing narrative to strengthen the international regime against CBW. Who all these people were and how they contributed are identified in the Annexes. On a rough measure of person-hours expended, more than half of the work was done by people from seven countries: the United States, the United Kingdom, Germany, Russia (or the USSR), the Netherlands, Sweden and Switzerland, in that order.

Reports of CBW are now much less frequent than they were twenty or thirty years ago. Great arsenals of chemical weapons, mostly accumulated since the 1950s, are being destroyed under international supervision. Factories once built to mass-produce biological weapons are being dismantled. So the anti-CBW regime is manifestly stronger today than it was when the Pugwash effort commenced.

As an aid to speculation on whether that strengthening of the regime and the work of Pugwash have in fact been related, two sets of concluding remarks are now presented: an analysis of influence, and an analysis of function. The first characterizes forms of influence which Pugwash has sought to exert. The second distinguishes different pathways along which Pugwash, in so doing, has proceeded.

Pugwash is a movement of scientists, most capable therefore of influencing through ideas. It has tried to exert intellectual influence both at the level of government and at the level of non-government: influence, in other words, both upon state practice and upon the wider development of civil society. To some scientists in Pugwash, the level of state practice is the only one that matters, perhaps because it was access by scientists to the corridors of power in the aftermath of the second world war which started the movement. The chief mechanism of influence has been to seek to increase the strength of people inside government able and willing to argue for policies of CBW disarmament, the strengthening coming from novel ideas, new arguments and evidence of external support. The mechanism has been different where there have been no such people within government. When it became apparent during the 1960s that, in areas such as the militarization of the life sciences, government was neither interested nor, perhaps, capable of acting in what Pugwash saw as the public good, Pugwash sought to fill the gap until government became more responsive to the need for action. This was the period in which the CBW Study Group started to assume what has now become its chief characteristic: an intimacy of association between officials and representatives of government on the one hand and, on the other, academic scientists and other specialists from the non-governmental world. In a number of national Pugwash groups, most strikingly in Japan, this association between government officials and Pugwash scientists was regarded as supping with the devil, just as it was among officials of certain Western governments, notably the French, during the cold-war years. It was indeed the case that association with government could vitiate the independence of Pugwash, just as it was also the case that governments occasionally sought to exert leverage through Pugwash. Perhaps the greatest achievement of Pugwash at this level has been its role in gradually securing respectability for the goal of an international treaty on chemical weapons. This was a goal which, in the late 1960s, government officials in the more prominent Western countries would often simply mock. The fact that 20 years later it had come to be regarded as a sound idea and was entering mainstream policy objectives is due, in some measure, to Pugwash.

As for intellectual influence beyond government, this has been sought chiefly through a wide breadth of the recruiting base for the Pugwash CBW Study Group: breadth both in terms of nationality or citizenship and in terms of occupation or intellectual discipline. A remarkable community of interest has thereby been fostered and promoted. Connections have been enabled which otherwise would not have happened, enriching the experience and general outlook brought to bear on CBW-related issues. Would the chemical industry, whose willing and active participation is vital for the Chemical Weapons Convention, have become so effectively engaged in the negotiation of the treaty without the preliminary contacts made with the negotiators through the Pugwash CW Study Group? Possibly that would have happened whether Pugwash had been there or not, but it would probably have been a slower and more discordant process. Such Pugwash/industry contacts continue today as part of the context for the work of the BWC Ad Hoc Group. This link into manufacturing

industry is one of several such connections which Pugwash has succeeded in establishing with other non-state entities that nurture civil society. And, with statist conceptions of international relations now on the decline even within government, non-governmental organizations that are genuinely transnational in character may increase further in influence.

The ideas which Pugwash has sought to propagate have sometimes been grand and ambitious, as in its work to develop and promote the new "arms control" thinking of the 1960s. In the particular field of CBW, Pugwash has also continuously emphasized two other ideas as well. One has been the fundamental importance of openness in national CBW-related activities. This idea recognises the way in which secrecy, however justifiable each one may be in commercial or national-security terms, can together engender suspicion and mistrust that will debilitate any collective international endeavour, especially where dual-use technologies are concerned. The greater part of the practical work which Pugwash has done on CBW issues has involved searching for ways of reconciling the principle of openness with imperatives of state and commercial behaviour that necessarily incorporate secrecy.

The other pervasive idea in the intellectual influence that Pugwash has sought to exert is the importance of resisting divergence of the chemical and biological elements of the international anti-CBW regime beyond that which is strictly necessary for practical purposes. Here the reasoning rests on more than the notion of chemical and biological agents constituting -- as the 14th Conference put it in 1965 -- a "continuous spectrum". The reasoning also draws from the idea that what has enabled the expansion of the regime over the past half-century is the continuing existence of that ancient norm of behaviour which, down the millennia and across cultures, has spurned and vilified resort to disease for war-fighting purposes (disease whether caused by poison or pathogen, toxic agent or microbe, the distinction is a relatively recent one): a taboo codified in such instruments of international law as the 1925 Geneva Protocol prohibiting CBW. Fragment the norm, and one risks fragmenting the foundation upon which the regime is being built. Strengthen the norm, and there is real hope of the regime surviving the continual jeopardy of technical and political change.

As for pathways to influence, the Pugwash narrative related earlier in this essay displays an organization which, as it has matured, has come to serve four successive functions, in addition to the primordial function of educating its own members on CBW. The first of these functions was to provide occasion for person-to-person contacts between people with well-informed things to say that might bear on policy-making for CBW and people who actually worked in policy-making circles. This was, and perhaps remains, the most valuable of the four functions. Would the Biological Weapons Convention, for example, in fact have come about at all without those contacts between such people as Hedén, Humphrey, Kaplan, Meselson and Neild on the one hand, and Kissinger and Mulley on the other?

The second function has been to give continuity to the contacts. Through its CBW Study Group, Pugwash provided the requisite structure. This offered, furthermore, a private channel of communication between governments and was, it seems, occasionally used as such.

The third and most onerous function has been to conduct research into options for policy when this has appeared necessary. At one level the purpose has been to undertake tasks which should have been, but apparently were not being, done by government. At another level the purpose has been to strengthen the hand of policy-level members of the Study Group, or of recipients of its reports. Lacking the necessary resources of its own, however, Pugwash has here been forced into association with research institutions in different countries. This is a situation with which the Pugwash leadership, jealous of the independence of Pugwash, has rarely been comfortable. Only in the case of SIPRI, for which Pugwash can properly claim a degree of parenthood, and, more recently, the Harvard Sussex Program, has the leadership readily acknowledged collaboration.

Finally, there has been the function of communication: of reaching beyond the policy makers to the world at large, with the aim of adding political weight to whatever influence Pugwash might be able to exert more privately. The problem here is that such publicity can be counterproductive, as when solid research findings become portrayed as political propaganda, which was not a rare occurrence during the cold-war years.

So Pugwash has approached the communication function very cautiously indeed, initially through the medium of statements issued by what is now the Pugwash Council, drafted by committee and often obviously so. Pugwash has also come to use its collaborating institutions for this purpose, first SIPRI and then the Harvard Sussex Program.

Could all this have been attempted, one may ask, by other organizations? Certainly any one, even two or three, of the four broad types of function could have been undertaken by different groups; and sometimes they have been, as for example in the work of UNIDIR, Wilton Park, BICC, VERTIC or any one of a whole range of organizations, governmental and non-governmental, that have taken interest in the subject of CBW once it has become sufficiently topical. What is unique about Pugwash, however, is the sustained attempt to do all four together and, to the degree that is now evident, to have succeeded in the attempt. In seeking to explain this phenomenon, one cannot but observe that Pugwash is a movement of scientists, and that matters for CBW policy turn so often on scientific and technological questions that people who lack grounding in the natural sciences sometimes feel obliged to pay heed to those who have it. Pugwash has enabled this communication to happen at several interacting levels, and one may very well suppose that, because of the nature of the subject, only scientists could have achieved the interaction. One may also observe that Pugwash, in contrast to such other organizations of scientists as, for example, the World Federation of Scientific Workers, or Scientists Against Nuclear Arms, is broad in its aims, flexible in its structure, and not dominated by any one particular country. As each of its main functions came to seem worth taking on, Pugwash was thus capable of adapting itself to the new task and of holding to its basic principles throughout the forty years of its existence.

It is not unreasonable to conclude, then, that Pugwash and the present strengthened state of the anti-CBW regime are indeed connected.

Table 1. Pugwash conferences that have emphasized CBW

Date	Location	Meeting	Published account
24-29 Aug 59	Pugwash, Canada	# 7	Procs 5th Conf (entire).*
13-18 Sep 64	Karlovy Vary, Czechoslovakia	# 19	Procs 13th Conf, pp 57-8 & 79.
11-16 Apr 65	Venice, Italy	# 22	Procs 14th Conf, pp 16-19.
9-14 Jul 84	Björkliden, Sweden	# 128	Procs 34th Conf, pp 33-35.
1-6 Sep 87	Gmunden, Austria	# 148	Procs 37th Conf, pp 39-41.
29 Aug - 3 Sep 88	Dagomys, USSR	# 155	Procs 38th Conf, pp 44-46.
23-28 Jul 89	Cambridge, United States	# 164	Procs 39th Conf, pp 41-45.
9-15 Jun 93	Hasseludden, Sweden	# 197	Procs 43rd Conf, pp 60-64.
1-7 Aug 97	Lillehammer, Norway	# 227	Procs 47th Conf, in prepn.

* The participants in the Fifth Conference are identified in Table 5 (see Annex A).

Table 2. Meetings of the Pugwash BW Study Group*

Meeting serial number	Date	Location	Participants**		Published account (PNL = <i>Pugwash Newsletter</i>)
			People	Countries	
1	-	13-18 Sep 64	Karlovy Vary	16 7	Procs 13th Conf: 57-8 & 79.
2	# 20	31 Jan 65	Geneva	12 9	PNL 2(3):52. Procs 14th Conf: 253-4.
3	# 21	8-10 Apr 65	Trieste	14 9	Procs 14th Conf: 24-6 & 255-307.
4	# 23	22-23 Oct 65	Stockholm	19 9	PNL 3(2+3):63-64.
5	# 30	4-6 Sep 66	Stockholm	19 10	PNL 4(1+2):29-34. Procs 16th Conf: 88-106.
6	# 33	11-12 May 67	Marianske Lazne	17 8	PNL 5(1):1-5.
7	# 43	22-23 May 69	Marianske Lazne	26 11	PNL 7(1):15-20.

* Renamed the "Pugwash CBW Study Group" in time for its seventh meeting. The Group continued to meet for some time thereafter, though not in name, participating in the work of SIPRI and then in the work of the World Health Organization group of consultants convened by Kaplan to produce the 1970 WHO study, *Health Aspects of Chemical and Biological Weapons*. Members of the WHO group are identified in Table 8 (see Annex A).

**Identified in Table 6 (see Annex A). A total of 64 people from 16 countries participated.

Table 3. Meetings of the Pugwash CW Study Group*

Meeting serial number		Title of PCWSG meeting	Date	Location	Participants** People Countries		Published account and other resulting publications (PNL = <i>Pugwash Newsletter</i>)
1	# 64	1st Workshop	16-18 Apr 74	Helsinki, Finland	24	11	PNL 11(5):115-72, Jun 74; SIPRI, <i>Chemical Disarmament: New Weapons for Old</i> (1975).
2	--	1st Roundtable	10 Oct 74	Herzegovina, Yugoslavia	13	7	SIPRI, <i>Medical Protection Against Chemical Warfare Agents</i> (1976).
3	# 70	2nd Workshop	22-23 Apr 75	Stockholm, Sweden	17	11	PNL 12(4): 170-77, Apr 75.
4	--	2nd Roundtable	22 Jul 75	Helsinki, Finland	21	11	PNL 13(3): 177-80, Jan 76.
5	# 74	3rd Workshop	12-14 Apr 76	London, UK	20	11	PNL 13(4): 188-202, Apr 76.
6	# 76	4th Workshop	22-23 Aug 76	Mühlhausen, GDR	10	9	PNL 14(1+2): 62-68, Oct 76.
7	# 82	5th Workshop	17-19 Aug 77	Köln & Leverkusen, FRG	22	12	PNL 15(3): 84-95, Jan 78.
8	# 88	6th Workshop	8-12 May 78	Salt Lake City & Kansas City, USA	17	10	PNL 16(1): 4-12, Jul 78.
9	--	3rd Roundtable	27 Sep 78	Dubrovnik, Yugoslavia	28	8	PNL 16(3): 85-86, Jan 79.
10	# 95	7th Workshop	14-16 Jun 79	Stockholm, Sweden	30	16	PNL 17(1+2): 40-48, Jul/Oct 79; SIPRI, <i>Chemical Weapons: Destruction and Conversion</i> (1980).
11	--	Informal session at 30th Conf	22-23 Aug 80	Breukelen, Netherlands	7	6	[no published record]
12	# 105	8th Workshop	2-4 Apr 81	Geneva, Switzerland	27	19	PNL 18(4): 106-12, Apr 81. PNL 19(1): 3-5, Jul 81.
13	# 113	9th Workshop	12-14 Mar 82	Geneva, Switzerland	31	19	PNL 19(4): 151-66, Apr 82.

Meeting serial number		Title of PCWSG meeting	Date	Location	Participants** People Countries		Published account and other resulting publications (PNL = <i>Pugwash Newsletter</i>)
14	# 120	10th Workshop	19-20 Feb 83	Geneva, Switzerland	30	9	PNL 20(4): 129-50, Apr 83.
15	# 136	11th Workshop	24-27 Oct 85	Stockholm, Sweden	31	19	PNL 23(3): 87-91, Jan 86; SIPRI, <i>The Chemical Industry and the Projected Chemical Weapons Convention</i> (1986).
16	# 145	12th Workshop	5-8 Mar 87	Berlin, GDR	38	18	PNL 24(4): 106-16, Apr 87; SIPRI, <i>Non-Production by Industry of Chemical Warfare Agents</i> (1988): 62-66.
17	# 150	13th Workshop	23-24 Jan 88	Geneva, Switzerland	66	23	PNL 25(3): 116-35, Jan 88.
18	# 159	14th Workshop	28-29 Jan 89	Geneva, Switzerland	60	22	PNL 26(4): 167-72, Apr 89.
19	# 168	1st SG/SIPRI TDG-project mtg	25-26 Jan 90	Geneva, Switzerland	22	12	PNL 27(4): 162-65, Apr 90.
20	# 169	15th Workshop	27-28 Jan 90	Geneva, Switzerland	65	25	PNL 27(4): 166-76, Apr 90.
21	# 173	2nd SG/SIPRI TDG-project mtg	29 Jun - 1 Jul 90	Geneva, Switzerland	23	16	PNL 28(1): 89-94, Jul 90. SIPRI, <i>The Case of Thiodiglycol</i> (1991).
22	# 178	16th Workshop	26-27 Jan 91	Geneva, Switzerland	54	21	PNL 28(4): 242-56, Apr 91.
23	# 180	17th Workshop	15-16 Jun 91	Geneva, Switzerland	28	19	PNL 29(1): 28-34, Jul 91; SIPRI, <i>On-Site Inspection in Chemical Industry Facilities</i> (1993).
24	# 181	18th Workshop	5-7 Aug 91	El Escorial, Spain	24	17	PNL 29(2): 41-53, Oct 91; HSP, <i>Antichemical Protection and the Chemical Weapons Convention</i> (1993).
25	# 186	19th Workshop	11-12 Jan 92	Geneva, Switzerland	47	18	PNL 29(3): 154-69, Jan 92.

* Renamed the "Pugwash CBW Study Group" in time for its final meeting.**Identified in Table 9 (see Annex A). A total of 312 people from 38 countries participated.

Table 4. Workshops of the Pugwash Study Group on Implementation of the CBW Conventions

Meeting serial number		Date	Location	Participants* People Countries		Published account (PNL = <i>Pugwash Newsletter</i>)
1	# 196	8-9 May 93	Geneva	42	20	PNL 31(1): 20-34, Jul 93.
2	# 202	27-29 May 94	The Hague & Noordwijk	44	15	PNL 32(1): 1-14, Jul 94.
3	# 207	19-21 May 95	Noordwijk	45	17	PNL 33(1+2): 1-18, Jul/Oct 95.
4	# 212	2-3 Dec 95	Geneva	52	20	PNL 33(3): 190-208, Jan 96.
5	# 219	21-22 Sep 96	Geneva	43	17	PNL 33(6): 426-42, Dec 96.
6	# 220	11-13 Oct 96	Noordwijk	38	20	PNL 33(6): 443-56, Dec 96.
7	# 224	6-8 Jun 97	Noordwijk	41	23	PNL 34, in prepn.
8	# 229	20-21 Sep 97	Geneva	47	20	PNL 34, in prepn.

* Identified in Table 12 (see Annex A). A total of 177 people from 37 countries participated in the first eight workshops.