Truth, Science and Chemical Weapons

Expert advice and the impact of technical change on the Chemical Weapons Convention.

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I hereby declare that this thesis has not been, and will not be, submitted in whole or in part to another University for the award of any other Degree.

Katie Smallwood

For my family

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Abstract

Scientific narratives are pervasive in international policy, in part, due to the increasing degree to which technological considerations enter modern thinking. These narratives are particularly visible in the chemical weapon prevention regime, which must accommodate changes in science and technology to ensure that they do not result in the application of new utilities for toxic chemicals as weapons. The dissertation investigates the function of technical experts, and the perceptions of their role, in the procedures of the chemical weapon prevention regime that address technical change. It explores expert involvement in three elements of the Chemical Weapons Convention (CWC): its negotiation; the Scientific Advisory Board; and in national policy formulation. Ethnography – from an extended placement within the Convention's monitoring body, the Organisation for the Prohibition of Chemical Weapons (OPCW) – as well as interviews and documentary sources provide the methodological basis for the research.

The dissertation finds that science is often made political within the international policy setting, and shows how science is employed to support political aims whether it is in accelerating or slowing policy formulation, or in deflecting the policy agenda. It argues that whilst the role of experts and their capacity to influence policy vary with the forums in which they are placed, their effectiveness depends also upon other factors, including institutional support. The dissertation also holds that national approaches to expert advice are reflected in state relationships with experts advising at the international level.

The research supports much of the Science and Technology Studies (STS) literature on experts in national settings and has substantial implications for a concept popular in International Relations (IR) literature, namely, 'epistemic communities'. A case for reframing 'epistemic communities' is developed which incorporates notions drawn from STS, such as the important role of 'boundary organisations'. These are applied to the CWC, and policy recommendations for the OPCW and its member states are presented.

Table of Contents

Abbreviations

ACNAB	Arms Control and Nonproliferation Advisory Board
AIM	Advanced Institute of Management Research
BERR	Department for Business, Enterprise and Regulatory Reform
BIS	Department for Business, Innovation & Skills
BRIC	Brazil, Russia, India, China
BSE	Bovine spongiform encephalopathy
BWC	Biological Weapons Convention
BZ	3-quinuclidinyl benzilate
CAS	Chemical Abstracts Service
CBW	Chemical and biological weapons
CCD	Conference of the Committee on Disarmament
CD	Conference on Disarmament
CSP	Conference of the States Parties
CWC	Chemical Weapons Convention
DECC	Department for Energy and Climate Change
DG	Director-General
DOC	Discrete organic chemical
DSTL	Defence Science and Technology Laboratory
DTI	Department of Trade and Industry
ENDC	Eighteen Nation Disarmament Committee
ESRC	Economic and Social Research Council
ESTO	European Science and Technology Observatory
FACA	Federal Advisory Committee Act
FCO	Foreign and Commonwealth Office
FO	Front Office
GPC	General Purpose Criterion
GSS	Group of Socialist States

HSP	Harvard Sussex Program
IAEA	International Atomic Energy Agency
ICCA	International Council of Chemical Associations
INPA	Institute for Nuclear & Particle Astrophysics
IR	International Relations
ISAB	International Security Advisory Board
ISN	International Security & Non-proliferation
IUPAC	International Union of Pure and Applied Chemistry
OCAD	OPCW Central Analytical Database
OCPF	Other Chemical Production Facility
OEWG	Open-Ended Working Group
OIV	Overseas Institutional Visit
OPCW	Organisation for the Prohibition of Chemical Weapons
OTA	Office of Technology Assessment
MoD	Ministry of Defence
NAAC	National Authority Advisory Committee
NAM	Non-Aligned Movement
NGO	Non-governmental Organisation
NNA	Neutral and Non-Allied
NPT	Nuclear Non-Proliferation Treaty
PFIB	Perfluoroisobutene
PrepCom	Preparatory Commission
QUNO	Quaker United Nations Office
REACH	Registration, Evaluation, Authorisation & restriction of Chemicals.
SAB	Scientific Advisory Board
STS	Science and Technology Studies
TIC	Toxic Industrial Chemical
TS	Technical Secretariat
TSG	Technical Sub-Group
TWG	Temporary Working Group
UK	United Kingdom
UKNA	United Kingdom National Authority

UN	United Nations
USA	United States of America
USSR	Union of Soviet Socialist Republics
WEOG	Western and Others Group

Key definitions

Chemical weapon: as defined by the Chemical Weapons Convention, a chemical weapon is taken to mean together or separately: (a) Toxic chemicals and their precursors, except where intended for purposes not prohibited under this Convention, as long as the types and quantities are consistent with such purposes; (b) Munitions and devices, specifically designed to cause death or other harm through the toxic properties of those toxic chemicals which would be released as a result of the employment of such munitions and devices; (c) Any equipment specifically designed for use directly in connection with the employment of munitions and devices.

Chemical Weapons Convention (CWC): signed in 1993 and entered into force in 1997, the CWC is the first international convention to ban the development, production, stockpiling and use of chemical weapons. It also mandates their destruction and prescribes intrusive verification measures for the inspection of state party chemical facilities.

Conference of the States Parties (CSP): the Conference of the States Parties is the principal decision making organ of the OPCW. Plenary sessions usually take place annually, however special sessions may be convened at any time.

Dual-use technology: a technology that has both military and civil applications.

Executive Council (EC): this is the executive organ of the OPCW whose membership is limited to 41 OPCW member states. Membership is allocated on a rotational basis, by regional group, and for a period of two years.

Expert: a person with a high degree of skill in or knowledge of a certain subject.

General Purpose Criterion: a central feature of the CWC's prohibition. It is this focus on intent, expressed in the definition of a chemical weapon (above) as "except where intended for purposes not prohibited under this Convention, as long as the types and

quantities are consistent with such purposes", that grants the Convention its comprehensive nature.

National Authority: each state party to the CWC is required to designate or establish a national authority to serve as the national focal point for effective liaison with the OCPW and other States Parties. A National Authority escorts OPCW inspections of relevant industrial or military sites; submits initial and annual declarations; assists and protects those states party which are threatened by, or have suffered, chemical attack; and fosters the peaceful uses of chemistry.

Open-Ended Working Group: within the context of the CWC, an open-ended working group's membership is open to all member states of the OPCW.

Organisation for the Prohibition of Chemical Weapons: this is the international organisation based in The Hague that oversees the CWC and comprising the Conference of the States Parties, the Executive Council and the Technical Secretariat.

Technical change: the production, adoption and spread of technical innovations.

Technical Secretariat (TS): the Technical Secretariat assists the Executive Council and the Conference of the States Parties in the implementation of the CWC. It is composed of a Director-General and his/her staff, which includes the Convention's chemical weapons inspectorate.

Table of figures

‘To begin, begin’

1 Introduction

Once upon a time a young German changed chemistry forever. He did so in two very different ways. One won him academic glory, a Nobel Prize in 1918, and revolutionised agricultural production; the other won him national glory and with it a title that has come to overshadow his brilliance. He became the 'Father of chemical warfare'. In this sinister role, he pioneered the use of chlorine on the First World War battlefield. He is said to have called it a 'higher form of killing'. His wife, another groundbreaking chemist, committed suicide in 1915 many believe in reaction to her husband's new vocation. In tragic personal irony he went on to oversee the development of the gas that was later used to exterminate millions of Jews in Nazi concentration camps. In 1933, he was forced out of Germany because he was Jewish. The following year, Fritz Haber died on his way from Britain to Switzerland.

This story is no fairytale but it encapsulates with extraordinary poignancy the life of a scientist torn between conflicting loyalties. It serves to illustrate that scientific progress is indiscriminate in its applications, and that the call of duty may influence scientists to become involved in morally despicable acts. Nowadays, chemists are not often placed in such extreme and difficult positions, partly because of the existence of an

international agreement, the 1993 Chemical Weapons Convention[1] (CWC), which excludes the existence of chemical weapons. But scientists continue to experience a tension between their professional and their moral standards, which may have ambiguities of their own. Society, moreover, continues to ascribe motives to scientists that do not adequately reflect their reality.

My dissertation explores these tensions through a study of the role of experts in the field of chemical weapons, both on the international stage (within the CWC) and within national policy settings (the United Kingdom and the United States). It addresses the assumptions and myths that have guided opinions about the nature of science and the role of technical experts.

1.1 Technical change and the CWC

The context of this research is set in a period of dramatic technical change[2] in the field of chemical sciences. In the run-up to and in the aftermath of the first formal review of the Chemical Weapons Convention (the 'First CWC Review Conference') in 2003, several scholars contributed to the chemical weapon literature on developments in science and technology. These papers have approached the challenge of accommodating technical change by identifying novel areas in science and technology that could potentially threaten the CWC. Such an approach is not new: in the 1970s, scholars in the field drew attention to the threat posed by new techniques of recombinant DNA (Perry Robinson, 1973). Since then a number of technologies have been identified as posing significant dangers to existing regulatory structures, either by giving them the appearance of being out of date or by altering the costs of remaining within them.

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[1] The CWC opened for signature in January 1993 and entered into force in April 1997. At the time of writing it has been ratified by 188 states. Current signatory states that have not ratified the Convention are Israel and Myanmar (Burma), and current non-signatory states are Angola, Democratic People's Republic of Korea, Egypt, Somalia, and the Syrian Arab Republic.

[2] As defined in the glossary, technical change is taken to mean "the production, adoption and spread of technical innovations" (Pavitt, 1984, p. 343).

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Instances of this include Mark Wheelis' (2002a, 2002b) work highlighting the possible impact of the biotechnology revolution - in the form of combinatorial chemistry and ligand identification, genomics, microassays, proteomics and toxicogenomics – on the Convention. Wheelis calls for a greater willingness to review the CWC Schedules that guide the Convention's inspection regime.[3] In considering the role of the chemical and biological weapon (CBW) conventions in preventing the misuse of biotechnology, Matthew Meselson (2000) argues that all key paradigm-defining technologies have been exploited by the military but that the misuse of biotechnology might be avoided. This trend reversal could occur because of the taboo associated with chemical and biological weapons which has been used by the two chemical and biological weapon conventions to create powerful normative safeguards.

Whereas Wheelis and Meselson addressed advances in biotechnology, George Parshall focused on dual-use innovation in the chemical sector.[4] Parshall distinguishes between new science – combinatorial chemistry, synthetic biology and the discovery of new toxic mechanisms – and new technologies such as automated process control, microreactors and new heterogeneous catalysts (Parshall, 2002b, 2002a). Parshall also draws attention to the effects of the spread of technical change on the infrastructure of the chemical industry. He identifies three areas that will impact on chemical weapon monitoring and inspection procedures: the movement of research to BRIC countries (these are Brazil, Russia, India and China); greater numbers of chemical contractor companies; and the internet as an unregulated platform for trade and information sharing.

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[3] There are three Schedules of Chemicals in the CWC that list some of the chemicals most relevant to the Convention that are subject to international verification measures. Under the General Purpose Criterion however, *all* toxic chemicals and their precursors are classed as chemical weapons should they be used with such intent.

[4] Dual-use technologies have both military and civil applications, as stated in the key definitions. As a concept in chemical and biological weapons, and as a framework for building policy, dual-use has been explored by scholars such as Jordi Molas-Gallart (1997), Brian Rappert and Caitriona McLeish (2007).

A significant study carried out on technical change in relation to the CWC originated at an International Union of Pure and Applied Chemistry (IUPAC) workshop on the *Impact of Scientific Developments on the Chemical Weapons Convention* (IUPAC, 2002). This workshop, stimulated by the impending First CWC Review Conference, addressed four specific subject areas: chemical synthesis; biological synthesis of chemical compounds; processing and manufacturing; and analytical techniques. Drawing from scientists' views on a range of technologies, the report put forward a number of recommendations which were forwarded through the OPCW Scientific Advisory Board to the Technical Secretariat's Director-General and then to the First CWC Review Conference in 2003.

Tuan Nguyen, who uses microreactors as the focal point of his study, has covered the delicate issue of verification. Nguyen's principal concern is how an absence of misuse can be demonstrated for new dual-use technologies under the General Purpose Criterion (GPC) of the CWC (Nguyen, 2005). This is a valid concern as, although hotly debated during the design of the Convention, the original focus of OPCW verification of compliance placed greater emphasis on the production of Schedule 1 chemicals and relatively little on the monitoring of civil dual-use technology (or discrete organic chemicals (DOCs)). However, this is slowly changing: under international pressure there has been a gradual increase in the numbers of DOC-producing Other Chemical Production Facilities (OCPFs) that are inspected under the Convention (Organisation for the Prohibition of Chemical Weapons, 2003b; Republic of Korea, 2003).

During activities celebrating the tenth anniversary of the entry into force of the CWC in 2007, the OPCW hosted an 'academic forum' to sound out the concerns of chemical weapon scholars. At the Forum, the focus given to developments in science and technology was overwhelming with papers addressing the opportunities and challenges brought by technical change (Hart and Sutherland, 2007; Krutzsch and von Wagner, 2007; Matousek, 2007; Phillips and Perry Robinson, 2007). Such issues were again raised in the run-up to the Second CWC Review Conference which took place in April 2008.

More recently, the Bulletin of the Atomic Scientists hosted an online roundtable[5] that was completed in October 2008 to discuss the potential military implications of recent developments in the neurosciences. This initiative to discuss neuroscience from a security perspective, which can be traced back to a presentation by Matthew Meselson in Geneva in 1992 under the auspices of the Quaker United Nations Office (QUNO) then a briefing discussion in Washington DC (Meselson, 1992), was catalysed by papers highlighting that better understanding of human cognitive physiology has led to new opportunities in the development of chemicals that influence human cognition and behaviour (Gusteron, 2007; Huang and Kosal, 2008).

1.2 Science and expertise in chemical weapon policy

All of the studies outlined above have succeeded in drawing the attention of the chemical weapons community to new challenges posed by the evolution of science and technology and to the dangers of what has been termed 'technological surprise' (see, for instance, Perry Robinson, 1973). These careful exponents of the risks of changes in chemical technology have focused principally on defining the challenge by identifying where the technology could present a threat. Although valuable, at least two important shortcomings exist in such a strategy. First of all, in a context of fast-paced change, such identification will very quickly be superseded by other, more salient, challenges: i.e., there is an inherent danger that when identified technologies are placed under close scrutiny, developments in others might go undetected. Secondly, the role that scientists and other experts play in addressing these issues, both through formal and informal structures in the policy domain, is overlooked.

My dissertation has, as its point of departure, the claim that the dominant approach outlined above is necessary but not sufficient. That an 'eyes to the horizon' approach must be supplemented with a good understanding of how science and experts relate to

[5] The roundtable discussion is available at http://www.thebulletin.org/web-edition/roundtables/the-military-application-of-neuroscience-research?order=asc

policy and politics. Such an understanding, which I will argue is currently lacking, is essential in responding to changes in science and technology and to effective policy formulation within the field of chemical weapons.

But first I shall say a little about what this research does *not* address. Not taking centre stage in this dissertation are other important ways in which science and technology affect the field of chemical (and biological) weapons. One remarkable example of the decisive role science may play was in the early 1980s during United States' allegations that Soviet-backed forces were using chemical weapons against the Khmer Rouge in Cambodia, and against Hmong resistance fighters in Laos.[6] Botched scientific analyses and unreliable interview data led the United States to pursue a conclusion that the 'yellow rain' that fell was toxin warfare. An alternative conclusion though – arrived at by discrediting American data and presented through the application of rigorous field tests, chemical analysis and repeat interviews – was that the 'yellow rain' incidents were not chemical weapon attacks, but simply a consequence of mass Asian honey-bee defecation. Yet the US government failed to take the overwhelming evidence against toxin warfare into account, and instead continued to pursue a policy to implicate the Soviet Union (Meselson and Perry Robinson, 2008). Within the CWC too, there exists recognition that opportunities presented by technical change must be exploited to render its inspection procedures more effective and new techniques for sampling and analysis are seen as particularly valuable for the Convention. The function of science and technology (and developments therein) to support investigations into instances of alleged use, and to provide better tools to implement technology governance is therefore substantial but will not be addressed herein.

Another fascinating and fertile ground for academic research not covered in my dissertation, is the actions that certain scientists have taken themselves against their states; namely the actions of government scientists-cum-whistleblowers. The recently published memoirs of Vil Mirzayanov*, State Secrets: An Insider's Chronicle of the Russian Chemical Weapons Program*, shed new light on the motives that led

[6] For a detailed account of the 'Yellow Rain Affair' see Robinson and Meselson (2008).

Mirzayanov, in 1992, to reveal secret information about the existence of Russia's 'Foliant' programme.[7] His motives ranged from horror at the hypocrisy of Russia's position at the Geneva disarmament conference, to revulsion, when his pleas for better safety at the government research institute where he worked were disdainfully cast aside by his superiors, and shock, when Novichok testing took place close to the Uzbek city of Nukus. These were reinforced by Mirzayanov's deep hatred of the military-industrial complex which, he saw, as a leader in the power struggle to maintain Communist structures, and by his personal admiration of the actions of another whistleblower, the Israeli, Mordechai Vanunu (Mirzayanov, 2009). Vil Mirzayanov therefore represents another poignant example of how individual scientists can influence policy at the highest levels.

Returning now to the subject of my dissertation, epistemological examinations of how science and scientists contribute to policy formulation have appeared in a number of academic disciplines, and some will be explored later. These have led to disparate platforms from which normative views on the nature and the function of science and scientists have been voiced. My research addresses two of these perspectives in the specific context of the chemical weapon prevention regime. By exploring the framing of science from the academic perspectives of both science and technology studies (STS) and of international relations (IR), my dissertation contributes to knowledge by informing both disciplines. More specifically the dissertation addresses an imbalance in the science policy literature, notably its heavy focus on national systems, by applying the field's concepts to the setting of international and multilateral decision-making. The empirical evidence presented herein contributes to IR through a re-examination of the notion of 'epistemic communities' and by promoting a less idealised view of science.

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[7] The fruits of the 'Foliant' programme, that was progressing as the negotiations for the CWC entered their end game, were the Novichok nerve agents, weaponised and tested in binary form. This new family of nerve agents, more potent than previous generations, were being developed unbeknownst to the rest of the world. Mirzayanov's revelations, published simultaneously in Russia (the Moscow News) and the United States (in the Baltimore Sun) on 16 September 1992, shocked the international community. To this day, no formal recognition of the Novichoks has been made, and they are not included in the verification lists of the CWC.

The feasibility of my research has benefited from its timing. The issue of technical and scientific change is not a priority of many states party to the CWC but it does feature during the Convention's quinquennial review process. The Second CWC Review Conference took place in April 2008, towards the end of my fieldwork at the Organisation for the Prohibition of Chemical Weapons (OPCW). As will be discussed further in chapter 4, this timing allowed extensive access to debate between states party on the issues covered by my research. More generally, this dissertation has been written at the end of the first stage of the OPCW's lifecycle. Having existed now for over a decade,[8] the Organisation will soon face some important changes as the Convention slowly moves towards the completion of one of its main objectives, namely, the destruction of all declared chemical weapons. A new phase to prevent the re-emergence of chemical weapons will therefore have to devote more attention to changes that take place within the chemical and biological sciences (Mahley, 2009; McLeish, 2007, 2008).

The audiences to which this dissertation is pitched are diverse, and the style of writing reflects this diversity by trying to avoid disciplinary jargon and unnecessarily complicated writing. The communities that will find this dissertation of relevance are in both the academic and the non-academic spheres: within academia, to scholars of science policy, STS, and IR; and more broadly, the subject matter will appeal to the chemical weapons community and to the communities of related regimes.

1.3 Research questions

Using the backdrop of technical change and the concerns that arise from it, my research explores the ways in which experts are perceived and operate in the chemical weapon prevention regime. This international regime manifests itself primarily through the norms, rules and procedures of the Chemical Weapons Convention (CWC) which

[8] The Organisation came into existence with the entry into force of the CWC, on 29 April 1997.

opened for signature in 1993. Bounds to the research are set by the assumption that the chemical weapon prevention regime is embodied by the CWC.

The research deals primarily with the Convention and is therefore tied to an international level of analysis, but if one assumes that international and domestic policy are interlaced, it becomes difficult to understand one without the other. It thus makes sense to address both levels of policymaking, and for reasons that will be explained in the methods chapter, the United Kingdom and the United States will serve as specific national examples.

A further demarcation in the research arises from a temporal consideration: the text of the Chemical Weapons Convention is the written product of over two decades of intergovernmental discussion and negotiation, and it was during this early period that the Convention's initial identity was defined. Although the constructive ambiguities of multilateral negotiation have allowed for extensive interpretation and sometimes, redefinition, the CWC remains bound closely to the text signed in 1993. The fact that a number of references are made in the text of the Convention both to science and to experts suggests that these were issues that had been discussed, and these are parts of the Convention that continue to influence its operation.

Bearing this in mind, the over-arching research question that directs this dissertation may be stated as follows:

To what extent has the design of the CWC shaped the chemical weapon prevention regime's effectiveness in rising to challenges presented by technical change through the use of expert knowledge, and how might its effectiveness be improved?

Each empirical question addresses each of these three concerns directly: the history; the international level; and the national level.

- *How did the negotiating period of the CWC shape the treaty's provisions for monitoring and addressing technological change?*

- *How does the OPCW Technical Secretariat use technical expertise to accommodate changes in science and technology?*
- *How do individual states parties to the Chemical Weapons Convention make use of technical expertise in order to monitor relevant technical change?*

These questions have guided the research and the findings that are presented through the theory and empirics of my dissertation. Each sub-question is addressed at length in the empirical chapters, and the resultant findings underpin the analysis contained in chapter 8.

1.4 Outline of chapters

So the dissertation will proceed in the following manner. Chapter 2 will lay out the body of literature upon which my research is grounded, this being the Science and Technology Studies work on the nature and role of science (and of those that *do* science) in policy. It draws significantly on studies that have highlighted the discrepancies between what many academics hold to be true about science and what is habitually said and done within governmental and other political fields.

Chapter 3 introduces an alternative framework for exploring the role of science in international decision-making, drawn largely from the academic discipline of International Relations. By way of a concise foray into IR ideas of international regimes, this chapter introduces and critiques the model of epistemic communities. The critique is based largely on the theoretical insights from chapter 2.

The research methods are described in chapter 4. The assumptions that drive this research, as well as some of the ontological drivers, are followed by an explanation of

the mixed methods used for data collection. Ethnography, participant observation and interview techniques are all discussed in the context of the research questions.

Chapter 5 addresses the first of the three empirical research questions and explores the discussions and negotiations that led to the signing of the CWC. Following a brief review of the structure and context of the negotiations, the chapter explores more thoroughly the manner in which technical change was broached by the negotiators and the discussions that led to technical change becoming a visible component of the Convention's text.

Chapter 6 presents the results of an ethnographic data-collection campaign conducted at OPCW Headquarters. It focuses almost completely on the activities of the OPCW's Scientific Advisory Board and highlights many of the factors that influence its role and function.

Chapter 7 is in two parts; the first addresses state perceptions of the role of technical expertise in international policy, and the second focuses specifically on the use of science and scientists to inform national policies. The latter uses the examples of policymaking in the United Kingdom and the United States to illustrate both the complementarities and divergences of the relationships of two states party to the CWC.

Drawing upon the theoretical concepts outlined in chapters 2 and 3, chapter 8 presents an analysis of the results. This penultimate chapter sets out the thesis as derived from empirical findings. It also proposes that the results have broader implications for science policy and for IR.

Chapter 9 states the conclusions of the dissertation and applies them to the different audiences targeted in this dissertation.

2 The role of science and expertise in decision-making

The function of science and those who practise it in democratic societies has been the subject of extensive and rich academic debate. Substantial bodies of literature have broached the different relationships between scientists and society at large, between separate scientific disciplines, and between scientists and governments. It is to this third interaction that the following review of the academic literature will largely be addressed, but disentangling such issues completely is both difficult and sometimes undesirable. This review limits itself to the discussion of expertise in the twentieth and twenty-first centuries, though much of the underlying philosophy can be traced back to Plato who had Socrates maintain that the responsibility of government was to mirror the knowledge of the experts, via the French positivists of the nineteenth century such as Auguste Comte, who argued that politics should be depoliticised (Millstone, 2004).

The interaction between science and state brings with it a very specific family of tensions between a scientist's duty towards a government (or a society) and the notion that the scientist's work should maintain a characteristic commonly associated with science: independence. A striking demonstration of such a tension was played out through the extraordinary involvement and personal sacrifices of Fritz Haber. The participation of research chemists, including Haber, in the development of chemical

weapons during the First World War contrast with the scientist-led movements for peace after World War II. The World Federation of Scientific Workers, the Pugwash Conferences on Science and World Affairs, and the Federation of American Scientists are examples of these movements. The role of these groups in influencing chemical weapons policy matters, specifically the role of the Pugwash Conferences in the negotiation of the Chemical Weapons Convention, will be explored in subsequent chapters.

The use of science and scientists for military ends during the World Wars catalysed a careful examination of the aforementioned tension; examples of this are evident from the writings of JD Bernal (1939) and Vannevar Bush (1945). Both Bernal and Bush, although writing in quite different contexts and from very different perspectives, recognised a requirement to organise resources to put in place explicit policies for science.

After the Second World War, it became apparent that the atom bomb had demonstrated once again that achievements in science and technology could be equated with power. The Cold War fuelled this by maintaining an atmosphere of innovation and by developing a tight-knit relationship between governments and scientists which was at first received with mixed feelings; "[s]cientific expertise was seen as a threat to representative democracy or hailed as a solution of its shortcomings" (Weingart, 1999, p. 154).[9] This era came to be regarded by some as a 'golden age' of science policy (Salomon, 1979), but to others it was an 'age of innocence' (Jasanoff, 1987) and a time during which science policy was entrenched in a technocratic ideal (Bocking, 2004; Habermas, 1971; Jasanoff, 1990). No matter which way this period is described, there is general agreement that there was a significant shift away from the predominant views on science in policy after 1968-69 (Benveniste, 1972; Jasanoff, 1987; Salomon, 1979). The most marked change was seen in the United States where a combination of factors such as use of the Freedom of Information Act, the Vietnam War, and

[9] An example of this was the close military-government relationships that were propagated by the British and American governments during the inter- and post-war eras.

increasing environmental and public health concerns served to reframe the science policy debate.

The complex relationship between science, scientists and government has been reflected in the various ways in which governments have sought advice from scientists. Although the literature has not addressed the handling of expert advice through one particular approach, it has been consistent in identifying and correcting common misconceptions about science and the forms of advice it can provide. What follows here is not an exhaustive summary but an outline of the major themes of the literature on scientific expertise. The sub-discussions identified are the following: the misrepresentation of science in policy; the boundaries between science and politics; reinventing technocracy; and, democratising expertise.

2.1 The misrepresentation of science in policy

One of the misconceptions alluded to above is that science brings rationality to politics. When Jürgen Habermas wrote about the 'scientization of politics', he was referring to the rise of technocracy in governments that had inverted the 'decisionist model'[10] that had hitherto given power to the bureaucrats (Habermas, 1971). Habermas discredited the technocratic ideal by demonstrating that its assumptions about scientific process were wrong: that technical progress in fact occurs only to the extent that it is driven by social interest, and that scientific decisions are not made purely on the basis of rationality. Similarly, Dorothy Nelkin's influential accounts of the impact of an increased dependence on technical advice in the United States argued that the power of scientific experts lies in the basic assumption that science is a rational process (Nelkin, 1975, 1979).

> "[I]nterpretations and predictions made by scientists are judged to be rational because they are based on 'objective' data gathered through rational procedures, and evaluated by the scientific community through a rigorous

[10] In Habermasian decisionism, politics dominates science in all aspects of decision-making.

> control process. Science, therefore, is widely regarded as a means to de-politicize public issues." (Nelkin, 1975, p. 36)

As will be discussed below, this assumption ultimately undermines the political impact of scientists because scientific conflict between experts habitually occurs and the fallible, irrational and subjective side to science is revealed (Mazur, 1973; Nelkin, 1975).

Debunking these myths in the literature on the nature of science has thus allowed another belief about the nature of scientific advice to be questioned: that science is able to claim cognitive authority in policy. Both Sheila Jasanoff (1990, 1987) and Peter Weingart (1999) have demonstrated that when science is used in policy, it is deconstructed, exposed, and therefore loses its legitimacy and authority. This is a result of a situation whereby "[i]rrespective of their position, the different actors have to borrow the forms and language of scientific argumentation; hence, a proliferation of contradictory statements in the name of science and a simultaneous erosion of science's authority" (Joly, 2007, p. 918). Others have argued that expert involvement in policy is in fact no different from the involvement of other political agents, and the role of the scientific expert becomes that of another political advocate (Collingridge and Reeve, 1986). Contradicting the latter view, Weale claims that science does have a 'special role' and that there is an argument for "linking the regulative ideal of science as method with democracy" (Weale, 2001, p. 415) and this, Weale argues, is down to the 'inter-subjective' reproducibility that science offers over any other discipline. But for this process to occur effectively, the results of any technical debate should be complemented by democratic discussion. This process will be discussed further under the subsequent headings.

Alvin Weinberg's seminal 1972 paper assigned problems associated with science in policy to what he called 'trans-science': issues that can be raised from science but not answered by it, which he contrasted with 'science' (Weinberg, 1972). Weinberg argued that trans-science, which sits at the boundary of science and policy, is removed from the core of the scientific discipline and therefore requires non-scientific methods to be applied if a trans-scientific problem is to be resolved. Although Weinberg's work was highly influential in the field and rallied much support at the time, it vigilantly

defended the view that ‘pure’ science maintained a higher standard of independence that gave it an exclusive position over other branches of knowledge (Jasanoff, 1987).

Similarly, Jerome Ravetz and Silvio Funtowicz (1999) theorised that three types of science exist: applied science; professional consultancy; and ‘Kuhnian’ notions of post-normal science (Kuhn, 1962). It is in post-normal science, which takes place under conditions of high uncertainty and high stakes, that new ways of ‘doing’ science should be found (Ravetz and Funtowicz, 1999). However, these views differ significantly from those of others in the field such as Collingridge (1980; Collingridge and Reeve, 1986), Rüdic (1993), Rip (2003) and Jasanoff (1990; 2003b; 1987) who claim that the idea of (even ‘pure’) science being interpretable in one, objective way is a myth. The latter position has now come to represent the general position of the academic community, and many more recent studies base themselves on the premise that science is shaped by the culture, social values and politics of scientists (see, for example, Cooney and Lang, 2007; Evans and Collins, 2008; Irwin, 2008; McNie, 2007; Montpetit, 2008; Stirling, 2008b). This has led to a more open examination of the processes by which policies of a technical nature are influenced by experts and to an alternative analysis of how matters such as power, bias, and judgement play into these processes.

In exposing some of the misconceptions about science, this chapter has so far said little on the realities of expert advice. On this matter however, the literature is agreed on at least one point; that experts almost always disagree on the interpretation of scientific data.

> “[T]his old ideal of the appeal to facts and their interpretation by accredited experts has been eroded by the increasingly obvious limitations of experts and expert knowledge in resolving issues of public controversy. There is now a widespread public perception that experts can and do disagree, that they are not infallible by virtue of their specialist access to some rigorous scientific methodology that can guarantee their “objectivity”, and that their purportedly “disinterested” advice may be influenced by professional, economic, or political considerations.” (Martin and Richards, 1995, p. 507)

More often than not, the scientific controversy mirrors the political debate, or as Collingridge and Reeve put it: “[r]ather than scientific research serving to limit the political debate, argument over policy generates a matching dispute of a technical kind

which can well continue indefinitely" (Collingridge and Reeve, 1986, p. 31). In this context, scientific rivalry can be interpreted as a positive attribute if a pluralistic approach is adopted whereby many actors with equitable political power can provide manifold explanations of the science. Brian Martin and Evelleen Richards (Martin and Richards, 1995) have expanded on Collingridge's thesis by advancing an integrated approach to scientific controversy which is based on four analytical ideals: the positivist approach; the group politics approach; the constructivist approach; and the social structural approach. By either combining the four approaches, or through a 'multiperspective' analysis, Martin and Richards argue that a well-rounded understanding of scientific and technical debates integrates the role of experts into a wider and more open discussion.

But the problem remains that any authority of science is eroded when it is applied by scientists to political issues, and the only way in which science can maintain its autonomy and authority is by remaining outside the policy domain altogether. The discussion on this subject has often found itself centred around one particular paradox: as Thomas Gieryn puts it, "[i]f there is nothing inherently, universally, and necessarily distinctive about the methodology, institution, history, or even consequences of science, then why and how is science today routinely assigned a measure of 'cognitive authority' rarely enjoyed by other cultural practices (…)?" (Gieryn, 1995, pp. 404 - 405). This raises the question of how the boundaries between science and politics might be demarcated and maintained in order to render scientists their autonomy while retaining value on the policy agenda. Additionally, with the fallibility of science exposed, there arises a need for expertise to be opened-up to wider discussion. These two issues will be examined in the next sections.

2.2 Boundaries of science and politics

Having given a brief deconstruction of the scientific ideal, what follows here is an account of how this has influenced another area of the literature on scientific expertise

and its relationship with policy. This debate heavily parallels – and is part of – a much wider discussion on the sociology of science and on the boundaries between science, technology and society, otherwise known as the 'boundary problem'. In this context it is the respective works of Karl Popper (1959), Robert Merton (1942) and Thomas Kuhn (1962) that are contrasted with later notions of constructivist thought. It is in the wake of increased prominence in constructivist impressions of science that the science / politics boundary has been explored and scrutinised. Constructivism in science policy has triggered contradictory responses: on the one hand it has been implicated in the erosion of the authority of science because it is seen to justify "a dangerous relativism" (Guston, 2000, p. 27). On the other hand constructivism is seen by others as a medium to improve the standing of science in society by stripping it of its rational façade (Guston, 2000).

The literature on this specific aspect of the relationship between science and politics stems from the work of Sheila Jasanoff (Gieryn, 1995; Jasanoff, 1987; Jasanoff, 1990) who has argued that any such boundary between the two disciplines is in fact constructed by political, scientific, and other actors with an interest in the subject at hand. Jasanoff's accounts of policy-making emphasise that boundaries are created and designated in order to advance an actor's interest, or as Thomas Gieryn has put it: "the "social construction" of the science/politics border is a crucial strategy through which distinctive interests of diverse players are advanced or thwarted" (Gieryn, 1995, p. 436). For the scientist, maintaining a conceptual distance between science and policy equates to avoiding the deconstruction of science and thereby maintaining his, or her, claim to cognitive authority. Scientists, according to Jasanoff, can achieve this through 'minimising' or 'enlarging' the function of science in policy discussions. This discussion has prompted significant academic curiosity into the role of so-called 'boundary objects' and 'boundary organisations': bodies that are able to bridge the gap between science and politics (Raman, 2005).

Adhering to the second of the aforementioned reactions to constructivism, Jasanoff argues that although science/politics boundaries are constructed by actors to further their own interests, more effective decision-making models might result from a process

of blurring rather than through a process of emphasising borders. David Guston (2000) has drawn on Jasanoff's analysis to set out a context whereby mutually beneficial and fluid boundaries are populated by boundary organisations. These organisations straddle the divide between science and politics by answering to both and are thus able to control boundaries. Other authors (e.g. Kelly, 2003; Leinhos, 2005) argue that boundary organisations are able to act as gatekeepers to protect the authority of science from the intrusion of other stakeholders. In other words, boundary work has come to be seen by many as the demarcation of science from non-science. Guston concludes that "[t]he politicization of science is undoubtedly a slippery slope. But so is the scientization of politics. The boundary organization does not slide down either slope because it is tethered to both, suspended by the coproduction of mutual interests" (Guston, 2001, p. 405). According to Elizabeth McNie, boundary organisations carry out three functions: the translation of information; mediation across the science/politics divide; and communication with all stakeholders (McNie, 2007).

Guston uses the US Office of Technology Transfer as one example of a boundary organisation, whilst Stephen Bocking (2004) has described the Intergovernmental Panel on Climate Change as another. Other authors have cited specific advisory bodies as examples that demonstrate the use of boundary work in policymaking. For examples here, see Sheila Jasanoff's account of the boundary work conducted by the EPA's scientific advisory board (Jasanoff, 1990), the works of Mary Leinhos and Susan Kelly on the US Bioethics Advisory Commission (Leinhos, 2005; Kelly, 2003).

After Guston, Brian Wynne and Simon Shackley (1996) applied the concept of boundary work to cases of greater scientific uncertainty. They concluded that boundary work enabled scientists to position the boundary to set an 'ordering' in the relationship between science and politics to maintain the authority of science. This is achieved by allowing the uncertainty of science to be interpreted according to the pre-existing assumptions of both the policymakers and their scientific peers. This echoes Guston's description that "[t]he boundary organization gives both the policy-makers and the scientists an opportunity to construct the boundary between their enterprises in a way

favourable to their own perspectives" (Guston, 1999, p. 106) but differs according to the allocation of authority.

There is little clarity in the literature on where exactly boundary work should take place but Guston's preference is for it to take place exclusively within an institutional framework to ensure the function of boundary setting is internalised. However, other examples of boundary work take place outside specific frameworks, such as the work of some NGOs. The recent focus on boundary work has come at a time when the traditional borders of science and society have become blurred, and as the social contract that granted science its autonomy has become eroded. In this context, boundary work has taken on a new function; to blur the boundaries of science as well as to establish them (Raman, 2005).

The relationship between science and politics was never straightforward, and the nature of the divide between the two remains hotly debated. Although the approach presented by boundary work has been heralded for its flexible and contextual analysis, Alan Irwin (2008) has cautioned that its flexibility might allow an interpretation that assumes an inherent separation between science and politics even though the distinction is fluid around the edges. Another critique, somewhat related to the first, is that "traditional boundaries between experts and non-experts remain strong in the wider society even though they have been shown to be permeable" (Evans and Collins, 2008, p. 610). Linked to this is Daniel Sarewitz's concern that "the notion that science is a source of facts and theories about reality that can and should settle disputes and guide political action remains a core operating principle of partisans on *both* sides […]" of controversies (Sarewitz, 2004, p. 386). This concern reflects another view among many scholars that the value of 'lay' expertise is routinely discredited (if sought at all) by policymakers in favour of 'traditional' notions of expertise upheld by common misrepresentations of science as described above. The section below will outline some of the arguments in favour of a wider involvement in the governance of science, specifically in areas of scientific uncertainty.

2.3 Democratising expertise

In an environment where some of the boundaries between science and non-science are socially constructed and fluid, a new problem emerges. Within traditional conceptions of science as autonomous, rational and objective, the identification of the expert is simple; the expert is the scientist. But as the academic perception of science has evolved, particularly since the 1970s, so too has the definition of what constitutes expertise. As Stephen Bocking has put it:

> "Many see science not as objective truth, but as an instrument in the service of its patrons, or as a realm in which, in all but the simplest situations, the claims of opposing experts cancel each other out. Deprived of any special status, scientific knowledge is not able to demonstrate why it should have any priority over, say, the clash of competing interest groups in shaping environmental policy." (Bocking, 2004, pp. 163 - 164)

This view of science, although at the extreme, has heavily influenced academic writing on the use of scientific expertise in policymaking. The problem of 'who the experts are' has been compounded by a number of examples in the literature demonstrating that policymakers often ignore the advice of so-called 'lay' expertise. This section describes the various efforts made by the academic community to 'democratise' expertise. Echoing earlier work by Collingridge and Reeve, Bocking (2004) argues that experience has taught us that traditional expertise has a rather modest role to play in decision-making. In one sense, these authors argue that the penny has dropped and science can no longer be seen as providing 'truth to power'. Instead, the limitations of science having been exposed, its accountability must now be demonstrated.

The loss of science's 'social contract' in the United States and in Europe has led to a strong call from academia for change in the manner in which expertise is conceptualised by governments. [11] This call to 'democratise' expertise challenged the

[11] This loss of trust seemed to happen earlier in the United States than in Europe; in the US a series of scandals took place in the 1980s contributed to the end of science's 'social contract' (Jasanoff, 2003c), whereas in Europe, and particularly the UK, it was the BSE crisis that catalysed changes in public attitudes towards science. For more detail on how the BSE scandal affected science policy in the United Kingdom, refer to the work of Patrick van Zwanenberg and Eric Millstone (e.g. 2003).

assumption that scientific problems can only be assessed by traditional experts and advocates the transition towards transparent, participative and accountable processes (see, Abraham and Sheppard, 1997; Carolan, 2006; Christoforou, 2003; Epstein, 1995; Evans, 2004; Jasanoff, 2003b; Jasanoff, 2003c; Mayer, 2003; Nowotny, 2003; Rayner, 2003; Renn et al., 1993; Stirling, 2007; Tickner and Wright, 2003). Some authors have even examined whether expertise and democracy are in fact compatible. For instance, Liberatore and Funtowicz find that "expertise is a cornerstone of an intelligent democracy, when such expertise is itself democratised" (Liberatore and Funtowicz, 2003, p. 148) and go on to claim that out of the five models of science policy that they propose, it is the extended participation model that democratises expertise to the fullest extent.

Several scholars have assessed the inclusion of 'lay' expertise in decision-making (Carr, 2004; Fischer, 1993; Wynne, 1996). Brian Wynne's examination of nuclear contamination of rural Cumbria (1996) found that the 'lay expertise' of sheep farmers had been extremely valuable in hindsight but was routinely ignored by policymakers at the time. Carolan (2006) describes this type of expertise as 'contributory'. It is expertise that is distinct from other types, including 'public' expertise: itself attained through an open discussion of social impacts and risks. By shifting away from the notion of 'science' to pluralistic concepts of 'expertise', Carolan seeks to remedy the assumption made by other authors that science can be divided into pure / normal science and trans / post-normal science (c.f. Ravetz and Funtowicz, 1999; Weinberg, 1972).

Sheila Jasanoff argues that – following public demand – this process of democratising expertise represents a general shift away from processes of selective peer-review and towards participatory processes. However, her view is that increased participation is necessary but not enough and that public participation also has a number of practical limitations that can hinder scientific governance (Jasanoff 2003b, 2003c). For example, Jasanoff argues that the general public may not be able to take advantage of formal procedures due to lack of knowledge; wider participation might occur at too late a stage to have any real effect; and public participation may even confuse or complicate

scientific debates rather than constructively inform them, as is demonstrated by the debate surrounding climate change. What is required is more than a procedural change by governments to widen participation, but additional social technologies – 'technologies of humility' – to deepen the understanding of "*how* to promote more meaningful interaction among policy-makers, scientific experts, corporate producers, and the public" (Jasanoff, 2003c, p. 238, author's emphasis). Equally, Helga Nowotny (2003) highlights some of the tensions that might arise from the democratisation of expertise on epistemological, political and institutional levels. In this context, Nowotny calls for a transition from 'reliable' knowledge to 'socially robust' and 'accountable' knowledge. According to Nowotny, robust and accountable knowledge transmits science into the social world, incorporates participatory methods, and becomes robust through repeated testing, expansion and modification (Nowotny, 2003).

As the calls for higher degrees of democratisation through increased participatory processes and thorough institutional change resound, there still remains much to do in the field. It is perhaps the former of these two phases of democratisation which is the easier and the one which has been recently visible in western governments. But empirical evidence shows that once the surface is scratched, more familiar foundations are revealed which expose governments as still using older models of science policy based on out of date conceptions of science and of expertise. This trend is elaborated upon below.

2.4 Reinventing technocracy

As the literature on the role of expertise in decision-making has advanced, the ideas put forward in the sections above have become increasingly accepted in academia, and this shift of thought has closely paralleled the consistent rejection of the 'linear model' of science that once dominated policy circles. However a number of commentators have noted that the ideas expressed by academia have been extremely slow in moving across to the policy domain. Following Jasanoff and Wynne's calls for radical change in substantive treatment of expertise, as outlined above, many scholars have drawn

attention to an apparent unshakable pattern of ‘quasi technocratic’ practice. Such a re-emergence of technocracy might almost be cast as a reinvention of technocracy. It is not a crude demand for the old ideal of a government of scientists; it is a more subtle interpretation that selectively exploits the perception of science as a unique provider of ‘authoritative’ and ‘indisputable’ information to support policy decisions.

Roger Pielke argues that despite the consensus between academics in STS that there is no straightforward relationship between science and any particular political position, scientists still tend to assign certain findings directly to political positions. This politicisation of science can lead to instances of science becoming “little more than a mechanism of marketing competing political agendas” (Pielke, 2004, p. 406). Pielke calls for higher levels of responsibility from the scientific community involved in policy formulation, which would require not only stronger communication between scientists and policy-makers, but also the development of a “capability to place science into the policy context, i.e. to address the question: what policy alternatives are consistent with and inconsistent with scientific results?” (Pielke, 2004, p. 414) Similarly, Black (2001) concludes that the use of expertise in healthcare policy “depends on the degree of consensus on the policy goal. It is used if it supports the consensus and is used selectively if there is a lack of consensus” (Black, 2001, p. 277). In other words, polarised expert opinion is still equated to politics, scientists are still asked to give guidance beyond their capabilities, and their advice is used selectively to legitimise policy.

Albert Weale blames this on the fact that the process of democratising expertise is still in its early stages. He states that

> “we still have to recognise that the political institutions of public discussion are relatively novel and will not substitute for effective decision making. This is particularly so when public discussion leads to the articulation of such widely divergent and incompatible values, when authoritative decision making is called for.” (Weale, 2001, p. 420)

Maintaining that initiatives towards more democratically engaging public policy have remained largely in the image rather than in the substance of policy making, Alan Irwin calls for new epistemological and political understandings of science before any real change may be achieved. He argues that the “very plausible implication is that

relations of professional power are not likely to disappear simply as a consequence of publicly stated recommendations" (Irwin, 2006, p. 301). Others have begun to question the validity of democratising expertise and have advocated a return to a more cautious view of expertise and a new framework for expertise which Collins terms the 'Third Wave of Science Studies' (Collins and Evans, 2002, 2003). This model has been vigorously debated (see for instance: Jasanoff, 2003a; Rip, 2003; Wynne, 2003) and its question of whether the "political legitimacy of technical decisions in the public domain be maximised by referring them to the widest democratic processes, or should such decisions be based on the best expert advice?" was rebuffed by the absolute need for both (Jasanoff, 2003a; Wynne, 2003).

This section has demonstrated that even though the academic literature has steadily evolved towards models of expertise that incorporate a more nuanced understanding of the nature of expertise and involve broader governance systems, there still remains much to be done in the *substantive* implementation of these concepts in policy. Some scholars have viewed this as a demonstration that these models of policymaking have been found wanting, others have concluded that although the concepts are sound, instigating institutional change is both a difficult and a slow process. Whether a new framework is necessary or not, one thing is largely agreed: that the relationship between science, society, and policy is still routinely misunderstood by both scientists and decision-makers.

2.5 Conclusions

As stated in the introduction to this chapter, the literature on the interaction between science, society and policy – in the context of scientific controversy – is diverse but it does demonstrate that government policy has generally been based on a type of technocracy that is attractive to scientists and decision-makers alike. Particularly in Europe, but also in the United States, science is still used as a tool to legitimise policy decisions. This is all well and good until, as was demonstrated by the handling of the

BSE outbreak, the policy is exposed as the wrong one. The authority of science is easily undermined in cases of uncertainty.

The literature has been successful in calling into question the role that science should play in public policy. It has also rejected the idea that scientific experts can – or should – provide a consensus voice to policy; on the contrary, it is widely accepted that the role experts can play is to limited to providing pluralistic and conditional advice. Furthermore, there is strong recognition of the unique role of the public in shaping and determining the outcomes of policy discussions. Where the literature has been less successful is in defining a singular framework for expertise that might be more easily adopted by governments beyond the rhetorical level.

Another shortcoming of the literature, as identified by Horst Rakel (2004) is that it is too heavily focused on state level policy and not the international level. Although some comparative analyses examining both state and international practice do exist, for example see a European Science and Technology Observatory (ESTO) study (Glynn et al., 2001) and some recent research on the use of expertise in the European Union (Radaelli, 1999b), these are few and far between. This is particularly relevant in the context of my dissertation which addresses the international level extensively. Nevertheless, and following Rakel, the discussion of science has not been restricted to science and technology studies because interesting insights into international policymaking can be found in International Relations (IR). These ideas will be explored in the next chapter.

3 Regime theory, science and experts

Whereas the previous chapter concentrated on the academic discipline of science and technology studies (STS), this chapter approaches the topic from the field of international relations (IR). Through the use of regime theory and epistemic communities it will outline a more theoretical approach to the concepts described in the previous chapter. Because the subject of the present dissertation is international in character, it demands a framework able to accommodate issues that arise in an international setting. The dominance of state level research in the science policy literature is reason enough to seek a complementary and international approach. But as will be illustrated below, the purpose of using these two disciplines is twofold. From a structural point of view, regime analysis provides a general scaffold upon which the international efforts to control, ban and destroy chemical weapons can be placed: it has been applied widely in international relations and is used often to describe security regimes. Science and technology studies on the other hand, can be applied to the problematique of this study: how can experts help mitigate the challenges that technological change poses to the prevention regime?

From a theoretical standpoint also, there are advantages from drawing upon two disciplines, as both suffer from limitations that might be compensated by the other.

Having already set out the relevant concepts used in the science policy literature, this chapter will describe and apply regime theory to chemical weapons and will then demonstrate how regime analysis can benefit from a better understanding, drawn from science and technology studies, of the dynamics of science as applied to policy. The foremost perspective taken in this dissertation is that of science policy and although this chapter will discuss issues associated with the field of IR, these issues will be examined and analysed from a policy-based angle. The relationship between the theoretically rich discipline of international relations and the more 'grounded' study of policy is not straightforward and although not widely studied, this praxis has been an area of scholarly exploration in itself (Buger and Gadinger, 2007; Buger and Villumsen, 2007; Walt, 2005). This chapter aims to make a contribution to the understanding of how expert groups – conceptualised in IR terms as 'epistemic communities' – interact with policy coordination in an international context. As an introduction, the chapter will briefly summarise the study of regimes in international relations, outlining its theoretical and philosophical origins, its main approaches and its shortcomings.

3.1 The origins of regime analysis

The concept of 'regime', as a descriptive and explanatory tool to describe the international system, first emerged during the 1970s as a reaction to state-centric perspectives dominant in international relations during the preceding decades. These realist assumptions were undermined by the transnational structures prevalent during the 1970s (Krasner, 1983). Although originally a critique of the realist school of international relations, the study of regimes has in fact been adopted by both realists and (neo)liberals to analyse the international system (Hasenclever et al., 1996).

The 'consensus definition' of an international regime resulted from a conference organised to prepare a special issue of *International Organization* which aimed to produce a synthesis of the various approaches to regime analysis. Later codified in Stephen Krasner's volume on international regimes (Krasner, 1983), the definition

highlights four key terms: principles; norms; rules; and decision-making procedures. In Krasner's words a regime is

> "implicit or explicit principles, norms, rules, and decision-making procedures around which actors' expectations converge in a given area of international relations. Principles are beliefs of fact, causation, and rectitude. Norms are standards of behavior defined in terms of rights and obligations. Rules are specific prescriptions or proscriptions for action. Decision-making procedures are prevailing practices for making and implementing collective choice." (Krasner, 1983, p. 2)

Although Krasner's description has continued to define the field, it has been subject to significant criticism and debate. Andreas Hasenclever (1996) has summarised the limitations of the consensus definition: the first arises from Oran Young's criticism that the four aspects of the definition – principles, norms, rules and procedures – are difficult to separate conceptually and impossible to fully separate in real-life politics; and the second limitation comes from the ambiguity of the clause "around which actors' expectations converge" (Young, 1986). Young felt that the definition displayed a 'disconcerting elasticity' when applied to real events, and that it lacked in conceptual foundations (Young, 1986). Although other definitions have been proposed, for example the one offered by Keohane[12] (Hasenclever et al., 1996), they encountered strong resistance as many scholars continued to favour the consensus version proposed by Krasner. As Hasenclever notes, in spite of the consensus definition's convoluted nature and the need for its four elements to be demonstrated as distinguishable, it does allow for the examination of those elements and for the distinction between two phenomena – regime change and change within a regime – which are discussed below.

Contrary to early warnings that the study of international regimes might prove to be a passing fad because of its conceptual thinness and woolly character (Strange, 1982; Young, 1986), regime analysis has in fact become a broadly used tool in international relations and has been applied successfully to a number of areas. Regime analysis has traditionally been applied to trade and security regimes, but in recent years it has found widespread recognition as a useful tool for the examination of environmental issues, particularly with respect to regime effectiveness which is covered below. The

[12] For example, Robert Keohane proposes that regimes should be defined simply as "institutions with explicit rules, agreed upon by governments, that pertain to particular sets of issues in international relations" as quoted in Hasenclever *et al.* (1996).

following sections of this chapter will proceed with a discussion of the main concepts used in the analysis of international regimes, the manner in which scientists (and more generally, expertise) is portrayed in the application of regime analysis, and the ways in which progress made in the field of science and technology studies can inform and enrich the study of technology-based international regimes.

3.1.i General criticisms of regime analysis

Regime analysis has encountered criticism both from outside and within the field itself. The initial criticism of regime analysis came from the realist school of international relations which dismissed the neo-liberal assumption that international cooperation was sustainable. Others, such as John Mearsheimer (as quoted in Bernauer, 1993), denied that institutions mattered at all in the international domain, and that, worse, misplaced reliance on international institutions would lead to failures in international relations. But despite the realist knee-jerk dismissal of international regimes, the realist school was in fact quick to adopt international regimes as a tool to analyse the international system, albeit in a manner of their own.

One of regime analysis' earliest, most outspoken and vigorous critics was Susan Strange (1982). Her attack on the concept of regime analysis had five parts. Her first criticism (now overtaken by events) was that regime analysis was a 'passing fad' adopted by a number of American scholars – a fashion fuelled by perceptions of decreased American power and the 'mystery' associated with America's uneven performance in international organisations. These perceptions, in Strange's opinion, were over-dramatic and misplaced. In other words, her assessment was that regime analysis was an "intellectual reaction to the objective reality" (Strange, 1982, p. 483). Strange also describes the term as 'woolly'. This woolliness she asserted, rather than clarifying and explaining phenomena, led only to confusion and disorientation. She also claimed that even the most fundamental meaning of 'regime' was unclear and was used differently by different academics writing on the subject. Her third criticism

accused regime analysis of distorting reality simply because of the value-loaded word; regime. It implies principles of "regularity, discipline, authority, and purpose" (Strange, 1982, p. 486), principles that are characteristic of national governments but that are not, she argued, the face of the international system.

Her fourth criticism is that the theory views the international system as static and does not recognise – particularly in the case of security – that regimes are neither continuous nor constant over time. She cites technology and markets as two important factors that account for change but which cannot be explained by regime analysis**.** She states that "some of the consequences of technological change on international arrangements are very easily perceived, others less so" (Strange, 1982, p. 490) – so how can one explain changes to or within a regime when the causes of changes in principles, norms, rules or procedures is unclear? If this is so, regime analysis – by focusing entirely on the end product, the regime – ignores the dynamic processes of construction, deconstruction and reconstruction that dictate what the regime is and how it changes; processes influenced by factors such as technical change. Strange's final criticism is that, for all its self-proclaimed independence from state-centric theories, it still remains bound by the limits of the state-centred paradigm (Strange, 1982). Regime analysis allocates too much power to the national governments to decide the international agenda. It also ignores areas in international politics, where there are no such regimes.

Other early criticisms also focused on Krasner's consensus definition, as outlined above, recent criticisms are more rare but they do exist. There is, for example, Lidskog and Sundqvist's remark that because regimes tend to be issue-specific, they falter in their derivations of 'fundamental problems' (Lidskog and Sundqvist, 2002). However, regime analysis has become a widely applied and eclectic branch of international relations with approaches varying from traditional schools of realism to constructivism and cognitivism (Hasenclever et al., 1996).

In my research, I have followed the approach outlined by Hasenclever *et al.* (1996) to describe and categorise the various types of regimes. As Downs (2000) has emphasised, international institutions do not operate in a vacuum but are part of a wider system

which regime analysis is able to account for. Downs argues that "[o]ne salutary aspect of the shift from studying individual treaties to studying international regimes has been the growing appreciation that in many issue-areas, it is difficult to fully analyze one treaty in isolation from the other treaties to which it is "linked"" (Downs *et al.*, 2000. p. 469). In this respect, the analysis of international regimes is inherently flexible in its approach (a characteristic that has attracted both praise and criticism) and is therefore suitable for application in trans- or multi-disciplinary studies.

3.2 The epistemic communities approach to international regimes

One fertile field in the area of IR and one that has been applied in cognitivist, or knowledge-based, studies of regimes is entitled epistemic communities, and has been chiefly propounded by Peter Haas. Taking its name from Burkart Holzner's theory of 'epistemic communities' (1968) and Michel Foucault's 'épistémè'[13], epistemic communities were introduced to the international relations literature as long ago as 1972 (Antoniades, 2003) but it was only during the 1980s and 1990s that they gained popularity through application to international regimes. The literature on epistemic communities focuses heavily on the notion of expert knowledge and the power that can be mobilised by groups of experts with shared interests and meanings. This literature has also drawn more recently from sources in science policy such as Sheila Jasanoff, Bruno Latour, and Brian Wynne but I will propose that it still suffers significant theoretical and empirical gaps. The concept of epistemic communities may not be the only area of IR to delve into the role of scientists, but it is alone, within IR, in placing such importance on the function of expertise. This suggests a comprehensive understanding of the function of experts in international policy coordination, and it thereby provides a potentially informative tool for studying the international system.

[13] The épistémè or episteme, is a set of cultural and historical factors that characterise knowledge during a particular epoch not dissimilar to the paradigms of Thomas Kuhn that define scientific knowledge.

In Peter Haas' widely cited introduction to epistemic communities and international policy coordination (1992), a number of questions highly relevant to the subject and matter of this dissertation are raised: "[i]f decision makers are unfamiliar with the technical aspects of a specific problem, how do they define state interests and develop viable solutions? What factors shape their behaviour? Under conditions of uncertainty, what are the origins of international institutions?" (Haas, 1992, p. 1) To answer these questions, Haas criticises the dominant streams of international relations for ignoring the potential for individual actors to shape or change national interests, and for assuming a systemic approach for the origin of state interests. Instead he proposes that epistemic communities be used to explain how the possession of knowledge and information is in itself a powerful tool to influence policy coordination. Haas defines an epistemic community as a "network of professionals with recognized expertise and competence in a particular domain and an authoritative claim to policy-relevant knowledge within that domain or issue-area" (Haas, 1992, p. 3).

The epistemic community must also fulfil the following four conditions: shared normative values; shared causal values; shared conditions for the validation of information; and a common 'policy enterprise'. What makes epistemic communities of particular interest to scholars is their ability to transcend national politics (although not always), and to influence state views by claiming authority in a specific area (Haas, 1989, 1992, 2004). An epistemic community is differentiated from other groups of scientists or from decision makers as shown below, Figure 1. Some examples included in *International Organization*'s dedicated volume to epistemic communities follow: One was the role of a coalition formed of experts from different professional and national backgrounds in transforming the principles of the international food aid regime. They achieved this by presenting a consensus position for long-term goals and more efficient supply chains, and by rallying support amongst international organisations and states for reform in the principles attached to food aid delivery (Hopkins, 1992). Other examples cite communities of one nationality, for instance, Emmanuel Adler's exploration of how a group of American experts came to shape US policy in the development of the Anti-ballistic Missile regime culminating in a 1972 treaty (Adler, 1992). The concept of epistemic communities has been applied to the

CBW field too; Karen Winzowski has argued that there exists a *latent* epistemic community of bioscientists that may, if convened around the goal of preventing the misuse of disease, be able to influence policy in the biological weapon regime (Winzowski, 2004).

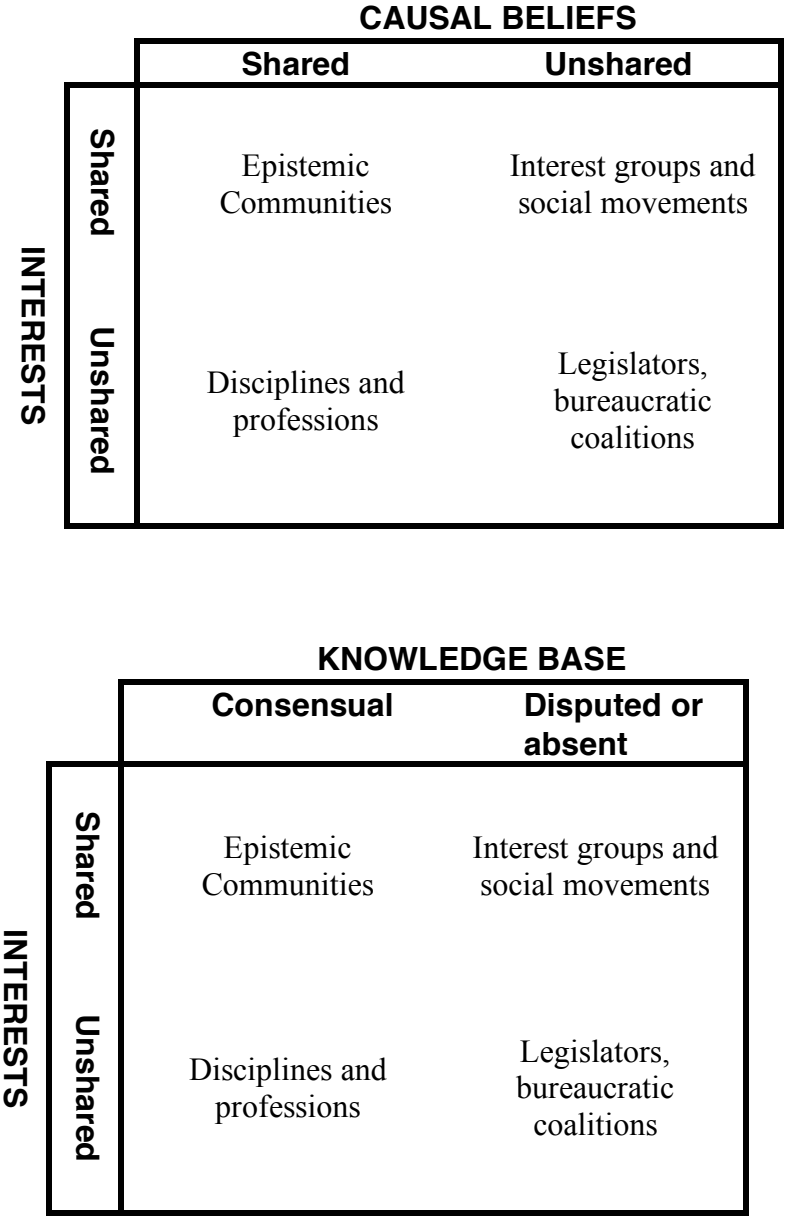

Figure 1 Distinguishing characteristics of epistemic communities (after Haas, 1992)

In contrast to other communities, epistemic communities share both causal beliefs *and* professional interests. Haas (1992) argues that under conditions of political uncertainty, whereby decision-makers are themselves uncertain about the technical complexities of an issue, epistemic communities are able to take on an important role. The motivation for consulting expert advice encompasses the following: epistemic communities can establish causality; they can demonstrate the linkages between different phenomena; they can shape state policy or define state interests; and they can assist in policy formulation. Expert groups are thus able to wield significant political power, but according to the model, this power comes under the strict conditions of scientific consensus and an ability to communicate to decision makers efficiently (Haas, 1992, 2004). Then and only then can experts impose their views upon state policymakers.

This concept has proved highly attractive to many commenting on the international policy arena largely because there is a collective feeling that the topics of international policymaking are increasingly 'technical' in nature (Biermann, 2002) and that analysts of international regimes have become increasingly concerned with the role of science within specific issues or regimes (e.g. Haas, 1992; Lidskog and Sundqvist, 2002; Miller, 2001). But in viewing these notions from a science policy perspective, the approach (although refined since its conception) still has a number of important shortcomings, particularly with respect to its assumptions about science and scientific knowledge. Sebenius (1992) objects to the portrayal of power and knowledge as two analytically distinct variables rather than two factors that are inherently impossible to disentangle both in theory as well as in practice. This criticism closely mirrors the dominant perspectives derived from scholars of STS who claim that any divide between science and politics is artificially constructed, or even co-produced.

Jacobsen states that "public attitudes toward experts are much more ambivalent than Haas suggests – and wisely so, because the historical record on experts does not compare all that well with other citizens with regard to moral courage, prudence, foresight, or civic virtue. In any case, data are usually ambiguous and scientists are usually divided over public issues" (Jacobsen, 1995, pp. 302 - 303). Jacobsen also attacks the concept's assertion that under conditions of uncertainty, epistemic

communities can exert considerable influence on decision-makers, and contends that Haas' preposition may be reversed to state that "if the issue does not matter very much, then experts do" (Jacobsen, 1995, p. 303). Other critics have drawn attention to the manner in which it downplays the ways in which scientific debate can simply add fervour to or polarise political debates and that the epistemic communities model tends to ignore that knowledge is largely controlled by political power (Toke, 1999).

On this point, Antoniades argues that epistemic communities are in fact just another form of political power and should be treated as such rather than a separate influence on decision makers. He asserts that such a perception is misplaced because it "does not accurately describe the nature of the policy process, *as long as many decision makers are themselves "experts"*" (Antoniades, 2003, p. 37, emphasis added). However, are decision makers usually 'experts'? Haas (1992) argues that they are not and that this absence of expertise in the policymaking circles is what allows epistemic communities to exert power in the first place. But if some policymakers can be described as experts, the balance of knowledge would shift significantly, leaving the policymaker with the power to decide when science can legitimise policy decisions, and when it cannot.

The shortcomings of the epistemic communities approach when taken from an STS perspective have been thoroughly examined in a paper by Rolf Lidskog and Göran Sundqvist (2002). Lidskog and Sundqvist use the notions of scientisation and politicisation to inform regime analysis, and more specifically the role of epistemic communities in international policymaking. They assert that although the model of epistemic communities has distanced itself from 'rationalist models'[14] by emphasising the importance of knowledge in shaping actors' attitudes, it still upholds an entirely uncritical view of science. Lidskog and Sundqvist (2002) argue that the rationalist portrayal of science in regimes is *unproblematic* and *exogenous*, and the epistemic community portrayal of science in regimes is *unproblematic* and *endogenous.* According to these authors, both are incorrect.

[14] Rationalist models of science in policy adhere to a linear model whereby scientists provide value-free and objective information that is unproblematically incorporated into policymaking.

More recent contributions from Haas have addressed some of these criticisms, in particular those that have pointed out his technocratic approach to policy, one similar to the technocratic approach upheld by governments and explored in the previous chapter. For instance, Haas concedes that "[w]hile speaking truth to power has long been a major theme in political science and policy studies, commentators are increasingly sceptical about whether modellers and scientists are capable of developing truth, and whether power ever listens to them anyhow" (Haas, 2004, p. 569). But whilst acknowledging that the relationship between knowledge and power is highly complex, Haas' core assumption that groups of experts can generate scientific consensus in an unproblematic manner remains at the forefront of the model. Rather than referring to the large body of science policy literature on scientific consensus and why consensus is rarely attainable, Haas points instead to the importance of effective communication of consensual knowledge from experts to decision makers (Haas, 2004). Although communication is important, the epistemic community approach is left wanting in its understanding of how science and politics are capable of interacting. According to Hisschemöller and Gupta (1999) this might reflect a wider disciplinary bias that strongly favours consensus over dissensus:

> "[t]his implicit value judgement is understandable, given the traditional perspective in international relations: an emphasis on peace and stability. However, from the perspective of solving environmental problems, dissensus may not be that bad, even if the conflict of values, goals and interests may remain unresolved for a considerable period of time." (Hisschemöller and Gupta, 1999, p. 155)

What Hisschemöller and Gupta allude to is the benefit that insights from the policy literature, notably the literature on the issue of consensus, might deliver to the study of regimes. Also that if the discipline of IR is to address science and controversy in a manner that reflects international policy processes, it must move away from a focus on consensus and towards a focus on persuasion, argument, and accountability.

Claudio Radaelli has examined the question of "how can political scientists be fascinated by the positive input of knowledge, and, at the same time, horrified by technocratic policy-making" (Radaelli, 1999a, p. 757). In his analysis of European Union (EU) public policy, he contends that epistemic communities and a qualified technocracy have their place in the policy process under strict conditions. For instance,

epistemic communities achieve most when situated in an uncertain but politically salient environment whereas technocratic approaches take prominence under uncertain scientific and unimportant political conditions. In addition, Radaelli argues against what he calls an 'anthropomorphic' conception of knowledge – one that assigns knowledge to specific actors – and proposes instead that "*knowledge has less to do with specific actors than with the structure in which actors act*" (Radaelli, 1999a, pp. 768 – 769, author's emphasis). He concludes that technical policymaking in the EU is taking place in an increasingly politicised context. Politicisation, he argues, is no bad thing but the consequences of it are that democratic principles of accountability and transparency must take precedence in such processes.

The paragraphs above illustrate that the concept of epistemic communities has gathered momentum across academic disciplines, but not without criticism. The areas of criticism parallel significantly the developments made in the contemporary STS literature, as outlined in chapter 2. Through epistemic communities, IR has opened the 'black box' of science and technology that had for long remained outside of the discipline's range but that its understanding of the area lags behind STS should come as no surprise. It is equally clear that science enters the policy rhetoric as much at the international level as at the national. For this reason, the consequences of perpetuating myths about science, and the role of experts, on the effectiveness of technical policy coordination are serious. It is therefore from this point of departure that my dissertation seeks to contribute to theory.

To do so, it is perhaps important to be reminded of the objectives of achieving better international policy through a more effective accommodation of science. These objectives bring the study back to the notion introduced at the beginning of this chapter, that is to say, the international regime and its sustainability. In the section below, I will argue that effective policymaking is crucial in the maintenance of the effectiveness and the resilience of the regime itself.

3.3 Regime effectiveness and regime robustness

During the mid-1990s, a number of scholars began to examine what regimes could actually achieve and which conditions were necessary for success. This marked a shift from an initial focus on regime design and the conditions for their establishment. As the discipline moved from questioning the value of regimes to questioning *how* they matter, several new lines of research have emerged, principally around two notions: regime effectiveness and resilience (or robustness). As Oran Young states:

> "[w]hile regimes matter, the ways in which they matter, the extent to which they matter, and the conditions under which they matter are variables whose values range widely over the universe of cases. Moreover, the effort to explain variance in these terms is fraught with a number of analytic and methodological problems ensuring that efforts to pin down the consequences of regimes under real-world conditions will remain high on the list of challenges confronting those engaged in research on international regimes for the foreseeable future." (Young, 2004, p. 3)

A *de facto* sub-discipline has formed around the theme of regime effectiveness, most prolifically in the environmental field, with scholars adopting subtly different approaches in their analysis. Regime effectiveness has been interpreted in numerous ways but it has generally been measured in two forms: the extent to which its norms and rules are followed; and/or the extent to which its objectives are achieved (Hasenclever et al., 1996). Assessing the effectiveness of a regime is to IR what project evaluation is to management: a measure which can be used to inform the design of new regimes, or to improve the performance of existing ones (Sprinz, 2000). However the field has not quite achieved academic agreement on the approach required to contrast effectiveness across regimes.

According to Arild Underdal (2004), regime effectiveness is sometimes related only to the regime's direct objectives and not to its tangential consequences or the costs associated with them. Regime effectiveness therefore becomes a gross, rather than a net, measure of success. Hisschemoeller and Gupta (1999) take issue with the widely held assumption that for regimes to be effective they must address straightforward or well-defined issues (see Young, 2004). Using social network theory, Hugh Ward (2006) takes a more systemic approach: he contends that in order to incorporate indirect and

external regime consequences, assessments of effectiveness must look beyond the regime itself to the network of regimes in which it is located.

Because of the numerous interpretations of effectiveness, defining it has been problematic. In Detlef Sprinz's (2000) review of the research on environmental regime effectiveness, he compares the definitions of three prolific scholars in the field: Oran Young's broad definition which encompasses legal compliance, economic efficiency, normative value, and goal achievement; Robert Keohane's which measures the effects of the regime against the impact of no regime; and Underdal's variation on Keohane's which introduces the notion of a "collective optimum", illustrated in Figure 2.

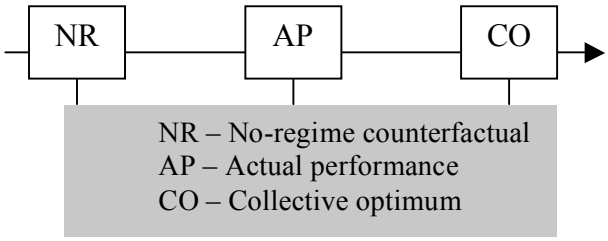

Figure 2 Sprinz's concept of regime effectiveness (Sprinz, 2000) where the arrow indicates increasing effectiveness.

In this approach, Underdal (1992) concentrates on the distance between the actual performance of a regime and the collective optimum, and presents a choice between an absolute standard of no progress (the 'no-regime counterfactual') and a baseline level of relative and incremental progress.

In contrast to effectiveness, the resilience or robustness of a regime refers to its ability to weather external challenges, i.e. its staying power. Although inherently related to effectiveness, it is not the same although Underdal (2004) does contend that robustness is a subset of regime effectiveness, and is intrinsically connected to the regime's level of adaptability to new contexts. He argues that the robustness of a regime depends partly on its effectiveness as well as on its legitimacy; in other words, a regime which is held in high esteem by a large proportion of its membership and which is also seen

as effective can be expected to be robust. Regime robustness has also been related to the concept of institutional history, particularly to the question of whether institutional history actually matters (Hasenclever et al., 1996; Powell, 1994).

These two linked characteristics of a regime, effectiveness and robustness, are its measure of success and despite the lack of agreement on how to quantify them, there remains value in incorporating these concepts into an assessment of a particular regime. The drawback is that any comparison between regimes becomes difficult, although whether international regimes are strictly comparable (or whether such comparisons are indeed desirable) is open to question.

A measure of a regime's effectiveness must also incorporate an assessment of its procedures, or in other words, its policymaking. The policymaking and policy coordinating procedures of a regime are connected to how the regime is employed to fulfil its objectives and to how the regime is perceived as a whole. These procedures therefore influence the regime's legitimacy, and hence also its robustness. If robustness is a regime's capacity to weather change, then technical change represents a formidable challenge, particularly for regimes whose rules and procedures reflect a snapshot of the state-of-the-art. This is true because there is a real danger that science and technology will evolve only to make the regime obsolete in its aims.

So, to echo Charles Darwin, the power of a regime to adapt is therefore crucial to its robustness. Such flexibility is not entirely reflexive but requires vigilance on the part of decision-makers; it also requires efficient policy formulation, coordination and implementation.

3.4 Expertise in international regimes

How does technical knowledge, or expertise, impact on the effectiveness and the robustness of a regime? The epistemic communities model has addressed this question but, as demonstrated earlier in this chapter, it has done so without the benefit of some very important lessons drawn from STS literature. On the other hand, a shortcoming of the STS literature is that it is heavily biased towards state level analyses whilst regulatory issues are increasingly being addressed within international forums (Rakel, 2004). And, although there may be important differences between procedures for setting policy at the national and international levels, international regimes are formed to address policy problems. Therefore, the analysis presented herein is based on the epistemic model outlined by Peter Haas, but it will be heavily informed by the valuable literature on scientific expertise that has been developed through studies of science rather than of international relations.

International policy coordination is made unique by the "loose system of global governance" (Hisschemöller and Gupta, 1999, p. 158) in which it is situated. It incorporates cooperation between states, measures of national interest, participation of non-state actors, and the provision of expertise. Increasingly, national policy is defined and implemented very much as part of, rather than separate from, wider efforts for international policy coordination and for this reason a greater understanding of the role of science and expertise in the international sphere is essential.

In a reductive interpretation, Haas believes that the power of epistemic communities comes from uncertainty because state level negotiators are often ignorant of the technical aspects of the issues at hand. This lack of knowledge leaves them open to influence by epistemic communities and once influenced at the individual level, they are able to redefine (or at least influence) the national position. Hence, there is an important role for epistemic communities in facilitating institutional learning. The main assumption here is that state negotiators lack technical knowledge, but is this always true?

Other scholars such as Oran Young have agreed that decision-maker insecurity exists, but principally in the *establishment* of regimes, and that significant uncertainty in the ways in which various issues relate to others can lead to cooperation and learning of a more open nature (Young, 1994, quoted in Hisschemöller and Gupta, 1999). This implies that throughout the lifetime of a regime, the role that experts are able to play is not constant, that their level of influence might change as the regime changes. For instance, when a regime is formed and the certainty of decision-makers and of government positions is low and open to change, the scope for influence is high. As the regime matures, and as state positions are cemented and the politics (but not necessarily the science) become better understood, the opportunities for expert opinion become more rare. This is a highly simplistic proposition, and one that will be examined further on a theoretical level below, and empirically in following chapters.

In order to assess the conditions under which expert advice can contribute to policymaking, be it national or international, it is useful to reintroduce some of the broader ideas relating to the nature of science and its place in policymaking. In the previous chapter, a number of arguments on the nature of science and its relationship with governments were outlined in the context of science policy literature. Amongst these was the widely held notion that although a technocratic view of science is still widely held in policy circles, such an approach has in practice often failed to yield constructive policy outcomes. In addition, a focus on attaining scientific consensus has tended to undermine any claim to authority that science might have. This suggests that the reliance of epistemic communities on scientific consensus is misplaced, if not dangerous.

At this stage, a necessary distinction should be made between political and scientific consensus. According to Saul Halfon, political consensus can result when multilateral diplomacy accords formal texts the label of ‘consensus document’ to, as he states, “bolster an otherwise contentious outcome” (Halfon, 2006, p. 783). But political consensus can also result from policy shifts that signal something more than just rhetoric, it can signal an effort to bind state behaviour. Halfon argues that political consensus should be viewed as structured disunity (rather than structured unity) which

allows for divergent interpretations of a common goal. This approach to consensus "provides a more fluid picture of how technical practices function in international politics: not as resources for policy making but as sites for co-producing knowledge and political order" (Halfon, 2006, p. 785). Scientific consensus is different in terms of its nature and of its consequences and, whilst widely held as such, is not an effective tool for accelerating progress. The reasons for this are that it cannot be negotiated through the introduction of constructive ambiguities and the quest to achieve scientific consensus can often produce counter-intuitive results, as was discussed in chapter 2. As Collingridge and Reeve have put it, "[i]nstead of scientific research reducing the extent of disagreement over policy, the political conflict generates a persistent technical one" (Collingridge and Reeve, 1986, p. 41). Although substantially different, political consensus among decision-makers and scientific consensus among experts are inextricably linked and influence each other significantly during process of international policy coordination.

This suggestion parallels what was implied in an earlier reference by Saul Halfon; science and policy are co-produced. Halfon was referring to a dynamic and non-linear model of science and policy that has also been developed through some STS literature (Jasanoff, 2004; Lemos and Morehouse, 2005; Lövbrand, 2007; Tuinstra, 2008). If one moves away from a model that sees science and expertise as independent from social, political and institutional factors, one may move towards a model that accommodates divergent technical positions.

3.5 A brief description of the chemical weapon prevention regime

According to Robert Jervis, security regimes are both valuable and difficult to achieve: "valuable because individualistic actions are not only costly but dangerous; difficult to achieve, because the fear that the other is violating or will violate the common

understanding is a potent incentive for each state to strike out on its own even if it would prefer the regime to prosper." (Jervis, 1982, p. 358) The longstanding existence of a regime governing the exploitation of toxicity as a weapon is no accident, nor is it simply a product of circumstance. Rather, it has been propagated through history by waves of prohibition, these waves reflecting a widespread hatred and disgust of poisons. Normative elements have played a significant role in creating the chemical weapon regime and understanding these has helped shed light on how the regime has evolved and how it might evolve in the future.

Jervis (1982) identifies four conditions that must be met for the formation of a security regime; the first is that it the regime must be attractive for the 'great powers'. Secondly, there must be a set of common values that appear to be shared by all actors. The third condition is that the actors must not believe that security is best achieved through expansion, and finally, there must be a significant cost associated with war and the individual pursuit of security. In the case of chemical weapons, it is hard to establish whether these four conditions have been met simply because the regime against the use of chemical weapons has evolved over centuries. Thomas Bernauer's three driving factors for disarmament regimes are perhaps more easily applicable, notably: shared norms; new military developments or innovations; and political drivers for action (Bernauer, 1993). These allow today's chemical weapon regime to be viewed against the background of an ancient taboo against the use of poison in warfare through which the normative condemnation of chemical weapons is derived. Military innovations in the early twentieth century are well known; the gas attacks of the Great War can be regarded as one of the drivers for the international community's renewed effort to ban the use of chemical weapons in 1925 (the Geneva Protocol prohibition).

Chemical weapons have been distinguished from conventional weapons because they have been set against a wide-ranging moral and legal opprobrium (Perry Robinson, 1973), and the source of opprobrium has long been linked with an ancient taboo

against the use of poison as a weapon against mankind. [15] Although not necessarily synonymous, poisons and chemical weapons have been often used for the same purpose: chemical weapons as 'force multipliers' as demonstrated in Saddam Hussein's use of of mustard and nerve agent when faced with a far greater Iranian enemy (Tucker, 2006); poisons as 'equalisers of strength' when used by individuals to compensate for physical weakness (Price, 1995).

Poison weapons were condemned in Ancient India, in the sacred Hindu text of Atharva Veda (ca BC 1500 – 500) and in the Laws of Manu (ca 200BC – 200AD), and other ancient references can be found in Chinese and Greek sources (Perry Robinson, 1998b; Van Courtland Moon, 1993). During the Middle Ages in Europe, further references to the prohibition of poisons can be found in Christian sources: in Saint Augustine's (354 – 430) philosophies of 'just war' and in the works of Saint Thomas Aquinas (1225 – 1274) who condemned the use of various weapons to avoid 'unnecessary suffering'. Other references to the prohibition of poisons to kill women exist in British Celtic sources such as Columba's Law of the Innocents, written in 679AD. During the 17th century, Hugo Grotius (1583 – 1645) noted that "from old times the law of nations – if not all nations then certainly those of the better sort – has been that it is not permissible to kill an enemy by poison" (Van Courtland Moon, 1993). In the 19th century, the norms against poison weapons were codified in the 1868 Declaration of Saint Petersburg, the 1874 Declaration of Brussels (which did not enter into force), and the 1899 Hague Conventions, one of which addressed newer advances made in synthetic and industrial chemistry. But the ancient chemical weapon taboo and the reaffirmation of another of the Hague Conference prohibitions in 1907 failed to prevent the application of innovations in industrial chemistry to solve the battlefield stalemates of the First World War. It was the use of chlorine gas in the trenches of Ypres – first used by the Germans on 22 April 1915 – that marked the end of modern chemical weapon prehistory (Perry Robinson, 1981).

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[15] For a comprehensive application of the concept of taboo to CBW, see Catherine Jefferson's doctoral dissertation (Jefferson, 2009) and Adrienne Mayor's study *Greek Fire, Poison Arrows and Scorpion Bombs* (2003).

Following this application of toxicity to battlefield warfare, the chemical weapon regime attracted significant attention from the international community and the regime has evolved very quickly. Some key events since then have been: the 1925 Geneva Protocol; the use of chemical weapons in some interwar colonial wars and the conspicuous non-use of chemical weapons on the European battlefields of the Second World War; the use of chemical warfare in Yemen during the 1960s; American use of herbicides and other 'non-lethal' chemical weapons in Vietnam during the same period; the entry of chemical and biological weapons onto the international disarmament agenda also in the 1960s; the 1972 Biological Weapons Convention (BWC); chemical weapon use in the Iran-Iraq war; the 1985 formation of the Australia Group; the 1987 Secretary-General's mechanism for investigating instances of alleged use of chemical and biological weapons; and the Chemical Weapons Convention (CWC).

Since the signing of the CWC in 1993, the regime has changed still, having to adapt to important changes taking place in the political, security, and technical landscapes of the twenty-first century. New initiatives both inside the United Nations framework (e.g. UN Security Council Resolutions 1540 (2004), 1673 (2006) and 1810 (2008), and developments of the Secretary General's mechanism to investigate instances of alleged use) and outside (e.g. the 2002 Global Partnership against the spread of WMD and the 2003 Proliferation Security Initiative) have been part of an international effort to adapt disarmament regimes to address 'new' security threats.

Thomas Bernauer (1993) has argued that during the twentieth century, the 'fragmented' chemical weapon regime was transformed into a 'comprehensive' one. He claims that prior to 1993, the regime was based on disparate sets of principles, norms, rules and procedures that were adhered to differently, and only by partly overlapping groups of states. But at the 1993 CWC Signature Conference,[16] the regime was unified under the CWC and its international monitoring organisation, the OPCW. In parallel with this view, my dissertation argues that the CWC both reflects and

[16] The 1993 CWC Signature Conference took place on 11-13 January in Paris. It marked the opening of the CWC for signature and established the Preparatory Commission for the OPCW. Further information can be found within Kenyon and Feakes (2007).

upholds the norms, rules and procedures of the chemical weapon regime as it stands today. Steve Krasner has argued that "changes in rules and decision-making procedures are changes within regimes" and that "changes in principles and norms are changes of the regime itself" (Krasner, 1983, pp. 3 - 4). In 1925, the chemical weapon regime's norm was one of non-use but not of 'non-possession' since the Geneva Protocol did not ban the production or stockpiling of chemical weapons.[17] By contrast, the 1993 Chemical Weapons Convention represented a change in the norms of the regime by introducing the additional norms of 'non-production'; 'non-stockpiling'; and 'non-transfer' (Bernauer, 1993; Perry Robinson, 1985).

According to Bernauer (1993), a regime rests upon sets of principles reflecting their aims, premises and purposes. These regime principles and norms are often laid out in the opening paragraphs of a treaty; for example the 1925 Geneva Protocol states that "the use in war of asphyxiating, poisonous or other gases, and of all analogous liquids, materials or devices, has been justly condemned by the general opinion of the civilised world". Using similar language, the CWC's preamble explains that it is "determined for the sake of all mankind, to exclude completely the possibility of the use of chemical weapons". These two statements by the respective treaties are in effect simply restating the established norms against chemical weapons. Another vital norm reflected in the chemical weapons regime concerns the advance of peaceful science, again as expressed in the preamble of the treaty, the CWC seeks to

> "promote free trade in chemicals as well as international cooperation and exchange of scientific and technical information in the field of chemical activities for purposes not prohibited under this Convention in order to enhance the economic and technological development of all States Parties."

This commitment to development is particularly important as it implies that the pursuit of chemistry is inherently peaceful and only the corruption of science is covered by the regime. Accordingly, the purpose of the chemical weapon regime should not be seen as a barrier to progress in legitimate science, but instead, as a mechanism to reduce the likelihood of its misapplication.

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[17] The 1925 Geneva Protocol was in effect a 'no first-use' contract to which a number of signatory states had longstanding reservations. This, and/or the concept of belligerent reprisal, was viewed by some as a justification for the possession of chemical weapons and for the propagation of the concept of like-with-like 'deterrence' through chemical weapon stockpiling.

The rules of a regime are those specific prescriptions and guidelines which dictate the actions of states (Bernauer, 1993). Again, for the chemical weapon regime, these rules are only present in certain aspects of the regime: the CWC and the Australia Group.[18] Where the CWC prescribes and proscribes actions relating to the production, stockpiling, use and trade of chemical weapons and CW related materials, the Australia Group focuses specifically on supplier controls and discussions involve only a restricted number of states. The last component of the regime is its procedures, many of which are laid out in the extensive annexes of the Treaty text. These procedures, which include the Convention's decision-making procedures, dictate the mechanisms for the network of data collection, routine and non-routine inspections that form the bulk of the activities of the OPCW.

Alexander Kelle (2004), in his description of the chemical weapon regime, states that regime analysis has traditionally focused on three themes: regime formation, an explanation of how and why regimes are formed; an identification of the domestic debates that influence regime formation; and regime effectiveness, whereby the regime can be assessed in terms of such factors as changes in state behaviour. But regime robustness, which is the staying power of a regime in the face of exogenous change (Hasenclever et al., 1997), has received very little attention from scholars in the field and this is especially true of security regime robustness. Those who have reviewed security regimes (Bernauer, 1993; Jervis, 1982; Parker, 2001; Perry Robinson, 1985) have provided great insights into the dynamics of the various regimes, but have made regime formation or regime effectiveness their focal point, with robustness going largely untreated. There are a number of factors that could undermine the robustness of the chemical weapons regime, but for the present dissertation it is technical change in particular that is considered.

[18] The Australia Group is a grouping of states with significant dual-use industries that first met in 1985 to harmonise their export control lists for chemicals and biological products. The Australia Group is viewed negatively by several developing countries as it is perceived as a barrier to technological development.

Insofar as the Chemical Weapons Convention represents the norms, rules and procedures of the chemical weapon regime, it is itself a complex legal document. As argued earlier, the key to its success as a legal construct lies in its ability to be both flexible and robust: flexible enough to maintain its relevance by adapting to meet new requirements or challenges that arise from changes in technology; robust enough to stand fast against attempts to undermine it, and to have sufficient 'teeth' to maintain the compliance of its states party. In attaining this balance of adaptability and rigidity, the important role of the treaty negotiators was critical. The next chapter will discuss their input, as well as the influence of experts working both within formal negotiation frameworks and those working outside them.

This chapter began with a general introduction to international regimes as a tool to describe the international system and ended with some preliminary thoughts about how the literature from science and technology studies might contribute to the analysis of regimes. This is particularly important at the time of writing because although science continues to play an increasing role in current international affairs, science and technical expertise remain largely black-boxed in the discipline of IR, despite the efforts of some to address it.

Throughout this chapter, and based on the contributions from STS literature, I have argued that the influence of expert advice is not dependent on reaching scientific consensus. The process through which experts and international decision-makers interact is highly complex and, compared to the national level, carries the extra burden of multiple national interests, multiple interpretations of science, and many definitions of 'expert'. Keeping up with technical change to ensure that a regime is capable of sustaining itself requires a clear understanding of these issues. The robustness of a regime is closely linked to its effectiveness and with the manner through which decision-making procedures accommodate the need for adaptation. This is particularly true for regimes that operate within changing environments.

The empirical chapters of this dissertation will draw from the theoretical concepts set out in this and the previous chapter and will examine the role expertise has played in

keeping the regime up to date with rapidly evolving science. They will also set the regime in its historical context and assess the extent to which CWC's provisions for accommodating technical change were influenced by the episteme of the time. But first, the next chapter will set out the methods that shaped my research exercise.

4 Research methods used

4.1 An approach

The design of the research undertaken for this dissertation reflects the research environments (multilateral and national security) and the themes that have emerged from previous chapters. Similarly, the design process has evolved and changed to reflect the nature of the research questions. Nevertheless, there are a number of basic assumptions that have influenced the methods used and that underlie the conclusions drawn from the results of empirical data collection. This chapter will make explicit some of the philosophical aspects of my work in order to justify, and explain, the research methods employed.

The examination of the relationship between science and politics in this research takes place within a field that has been subject to less examination than many other science policy areas. The extent to which this field is unique is hard to assess but a number of distinguishing factors are quite noticeable, some of which have influenced (from the very beginning) the way the research has proceeded. One such factor is the ownership

of 'expert knowledge', which is often referenced in this study. In fact, surprisingly few actors even in developed states still retain what many would call 'chemical weapon expertise', and most of those that do are soon retiring.[19] So the nature of expert knowledge is becoming based less on direct experience of the weapons themselves (large-scale production, handling, deployment etc) but more on experience acquired from adjacent areas of science and technology. The immediate implication of this for the research design, and more specifically for the way in which interviews were to be conducted, was that no two individuals appeared to have the same expertise. Another distinctive feature of the area is the non-transparency with which the regime's procedures seem to be implemented. Particularly at the international level, that is to say the OPCW, there are significant restrictions on access to information, including access both to personnel and to documentary sources, due to the implementation of the strict confidentiality regime set out in the CWC. Thus, a substantial period of research fieldwork as an intern at the OPCW allowed extraordinary visibility of routines and decision-making procedures without contravening the Organisation's rules on subject confidentiality.

This dissertation uses a balance of two different theoretical paradigms. The first is drawn from the science and technology studies literature and advances a loosely social constructivist approach to meanings, ideas and procedures, and the second comes from the theoretical discussions of 'knowledge' in the IR cognitivist school. Social constructivism in studies of science and technology has come to refer to studies that highlight the salience of social values, as an independent variable, in shaping and perceiving science and technology (Hess, 1997). This framework for understanding the way in which science and technology interact with society has evolved from earlier frameworks such as those of science sociologist Robert Merton.[20]

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[19] Some argue that chemical weapon expertise has shifted geographically away from states – such as the US or Russia – that were traditionally identified as the holders of chemical weapon expertise, and towards other states that have had more recent offensive programmes, such as Iraq.

[20] Robert Merton described what he called the norms of science which he placed under the abbreviation CUDOS (communalism, universalism, disinterestedness and organised scepticism) (Merton, 1942).

The assumptions on which this dissertation rely have also directed the methods used. First of all, my research assumes that those individuals studied have a common objective, notably, that each interviewee and each member of the OPCW Scientific Advisory Board (SAB) is committed to the health of the chemical weapon prevention regime even though the nature of this health may be perceived in very different terms. Second, it is assumed that scientists' views can impact on decision-makers both in national and international policy arenas but that social factors may affect this, an exploration of these factors will stem from the substance of this dissertation's contribution. A third assumption is that a more efficient involvement of scientists in policymaking would strengthen the robustness of the regime.

Due to the particular characteristics of the chemical weapon prevention regime, and the approach outlined above, a set of methods that addressed social considerations, interests and politics were appropriate for my research. For this reason an immersive ethnography, coupled with the results from interviews and historical sources, are the foundations of my dissertation and these are discussed in more detail below.

4.2 Ethnographical methods

Ethnography has its roots in social anthropology where the common stereotype has an Anglo-Saxon reporter living the life of an exotic tribesman to better understand the social and power relationships. To some extent this stereotype still reflects the very context-based nature of such research today, but, although borrowed from anthropology, ethnographic techniques have been increasingly applied to the social sciences in general and to studies of science, technology and innovation in particular. Hess (1997) has described the application of ethnographies in waves, first through studies of the sociology and philosophy of science and scientists and then through quasi-anthropological studies of scientists themselves (the so-called 'laboratory studies').

4.2.i Ethnography as a research tool

As an immersive and long-term research tool, ethnographies are products of socially focused methods that extend into the analysis of the data. That is to say, rather than a research method, ethnography is the written product. The research methods employed during data collection are highly flexible and vary depending on the research but can include interviews, participant observation, photography, recordings, written observations and document analysis. As will be described below, my research design included participant observation, unstructured interviews, semi-structured interviews and document analysis.

The type of information that ethnographies gather distinguishes them from other research, as they focus on social phenomena within selected groups or communities. They assist researchers in identifying and understanding networks, norms, power flows, meanings and group practices. In the field of science and technology policy, ethnographies shed light on learning, knowledge transfer and on community dynamics but perhaps most importantly they enable the researcher to examine the role of culture in organisations and institutions.[21] According to Michael Genzuk, ethnographic research displays some or all of the following characteristics:

- "People's behavior is studied in everyday contexts, rather than under experimental conditions created by the researcher.
- Data are gathered from a range of sources, but observation and/or relatively informal conversations are usually the main ones.
- The approach to data collection is "unstructured" in the sense that it does not involve following through a detailed plan set up at the beginning; nor are the categories used for interpreting what people say and do, pre-given or fixed. This does not mean that the research is unsystematic, simply that the data are collected in as a raw a form, and on as wide a front, as feasible.
- The focus is usually a single setting or group, of relatively small scale. […]

[21] Culture, as used in anthropology, means the "total learned knowledge, beliefs, and practices, both conscious and unconscious, of a social unit (ranging from multinational regions to microsociological units)." (Hess, 1997, p. 136)

- The analysis of the data involves interpretation of the meanings and functions of human actions and mainly takes the form of verbal descriptions and explanations […].” (Genzuk, 2003, pp. 5 - 6)

Recalling the empirical research questions presented in Chapter 1, the focus of this research is on knowledge (conceptualised as expertise) and its use in chemical weapons related policy. Embedded within this are various social phenomena that a quantitative method would not be capable of identifying. My dissertation will discuss in detail the procedures for incorporating the advice of scientists into international chemical weapon policy, and will examine these procedures through the relationships that scientists have with each other and with other actors in the regime. Therefore, a qualitative approach that supports the research questions’ emphasis on social, cultural and political factors is appropriate and can be drawn from ethnography.

4.2.ii Ethnography in this research

In addition to introducing a new method to the field of chemical weapons, an ethnographic approach brings with it a number of benefits. The first is access to information, both through individuals and through documents. As suggested above, the closed nature of the OPCW’s activities means that robust data are hard to come by without having direct access to the Organisation’s meetings and documentary sources.

Ethnography allowed, through the Organisation’s internship scheme and its strong research links with the Harvard Sussex Program (HSP), a unique insight into the role of scientists in an international organisation. In this respect, an ethnographic approach generated a reflexive quality (Hammersley and Atkinson, 1983) to my research enabling me to shape the research problem during the fieldwork stage. Other advantages came from the length and timing of the ethnography – in this case three three-month periods spread over one year – which allowed the data collection to follow the evolution of discussions within the Organisation, and the months between fieldwork *in situ* were essential periods for reflection, reassessment and preparation. The ethnographic fieldwork took place during the following periods:

- 2 April – 29 June 2007
- 3 September – 30 November 2007
- 4 February – 30 April 2008

With the problem of access facilitated through the links between HSP researchers[22] and the OPCW, another essential condition for a successful ethnography is the acceptance of the researcher within the environment under study. Relative to other ethnographic studies where the researcher might stand out (visibly or otherwise), there was no reason to expect that my presence would alter the proceedings of the Organisation's work. I was already familiar with the rhetoric used within the OPCW and the Organisation is itself used to the presence of young scholars, both through its own internship programme and through the presence of previous HSP researchers. A temporal motive also existed to use ethnography in this research. My dissertation, as subsequent chapters will illustrate, tackles the manner in which science and scientists have interacted with international policy over time. Empirical results of the research will focus on the build-up to the Second CWC Review Conference that took place over approximately a year and a half up to April 2008. A 'long-stay' research method was therefore suitable as it allowed for the evolution of issues to be followed over a longer period than other qualitative field methods.

Prior to leaving the UK for overseas fieldwork, terms for the placement were negotiated between HSP and the OPCW. These discussions stipulated that the assignments carried out at the Organisation would be relevant to the dissertation, that I would have time to conduct interviews with staff members and that I would have access to the Organisation's documents and library. In this respect, the placement and the timing was ideal: working under the Senior Planning Officer, I had direct access to most meetings in preparation of the Second CWC Review Conference and to the Scientific Advisory Board. This meant that day-to-day work involved interacting with individuals and groups that were directly relevant to my research questions: senior

[22] In 1993, shortly after the Chemical Weapons Convention opened for signature, the Harvard Sussex Program negotiated the secondment of an HSP researcher to work at OPCW headquarters in The Hague. A total of seven individuals occupied this position from 1993 to 2005.

Technical Secretariat staff, diplomats and experts. The specific timing of my fieldwork, which was designed around various processes for reviewing the Convention, made it possible for me to conduct my research at a time when questions about technical change would not seem 'out of the blue' but relevant and necessary in the context of an impending Review Conference.

In order to help me prepare for this part of my fieldwork, I attended an Advanced Institute of Management Research (AIM) workshop entitled *Rolled-up Sleeves and Dirty Hands: What can be Learned by getting Inside Organisations and How to go about it!*[23] This workshop addressed how ethnographies are applied to fields outside anthropology, particularly to the field of organisational management.

In relation to the presentation of my empirical results, ethnographic data are sometimes written-up in a narrative style akin to 'classic' ethnographies in order to support theoretical arguments, but for the most part, my writing has adopted an analytical tone that has addressed findings from a thematic perspective. However, many of these themes overlap and are addressed from different angles – such as the international and national perspectives – thus adding depth to the analysis.

The limitations and criticisms associated with ethnographies are well known, and not dissimilar to those levelled against other methods for qualitative research (Hammersley and Atkinson, 1983). Ethnographies are intrinsically subjective because becoming an insider carries with it the risk of forming normative opinions and taking sides. The problem of bias is very real and for this reason, ethnographies cannot present findings as authoritative, nor can they be presented as general. For the same reason, narratives drawn from such studies may also be inaccurate. Another difficulty arises from deciding to what extent the researcher can actively participate in the study. In the present research, the answer to this question was decided for me, as active engagement (through an internship) was the only way to access the Organisation. This translates to a method commonly used in the social sciences, participant observation.

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[23] This course was held at the London Business School on Monday 12th March 2007.

4.3 Participant observation

As a complementary method to ethnography, participant observation involves becoming an active part of the environment that is being studied. This allows the researcher to see the issues from the same perspective as individuals within that environment, whilst participating in some manner in the activities of the group or community. This research method was applied in a transparent manner (that is to say, the OPCW was aware that I was conducting research on the Organisation) even though not all participants will have been aware of this.

During fieldwork at the OPCW as an employee, there were several forums where this method was employed and where data collection took place. For the meetings of the *Open-Ended Working Group for the preparation of the Second Review Conference (OEWG)* I worked under its Secretary and compiled and wrote-up the informal records of the group. The OEWG was chaired by the Permanent Representative of the United Kingdom and was fairly well attended by national delegations to the Organisation, although participation increased markedly during the final months in the run-up to the Conference. The meetings were structured thematically around the issues most likely to be discussed at the Review Conference itself and took place monthly, then weekly, then daily as the Conference drew closer. Whilst in residence, I also attended the *Tenth* and *Eleventh Sessions of the Scientific Advisory Board* which are the annual meetings of the SAB. Within these I participated directly as part of the drafting committee that produced the Board's report. Before and after the meetings I was involved in preparatory work (such as the publication of the meeting's agenda) and follow-up activities subsequent to the meeting (such as the finalisation of the SAB's report and the preparation of intersessional work). My third significant role during my time at the Technical Secretariat was participation in small *high-level meetings* (that included Secretariat and Delegation staff) for which reports or political analyses were prepared

and discussed. Participation in these was restricted and the agendas were dominated by organisational and policy issues.

During the entirety of fieldwork at the OPCW, field notes were taken to record observations in real time. These focused mainly on what was being said by individuals at the time, but noted also the atmosphere of the discussions as they took place and any implications of such discussions for my research. In some cases when I was not able take notes at the time, I did so as soon as possible after the event; the relevant record of the meeting would be analysed and field notes taken. However, what was noted will not be specifically assigned to named individuals in order to respect the confidentiality of my access to the work of the OPCW. As a member of the Technical Secretariat staff, there were times when I was in a position to exert some influence. However, in none of these situations was I placed in a position that would affect or compromise the findings of the research. This is important to note because whilst participatory methods allow the researcher to better understand the dynamics and pressures of the research environment, if the researcher's influence is clearly visible in the results the research itself is undermined. However, a certain level of influence can indicate that the researcher has been accepted as a part of the community being studied.

Participative observation is fun and an engaging research method that can yield a unique understanding of the social processes and routines present in such organisations as the OPCW. This was especially valuable in this research as scholars of chemical weapon policy very rarely achieve the level of access achieved in this study. Taking advantage of this ability to speak freely with Technical Secretariat staff and to consult documentary sources, the participatory research methods outlined above were supplemented by interviews and by analyses of primary documents. These are discussed further below.

4.4 Interviews

Interviews, along with surveys, are a standard qualitative research method. Interviews take various forms and can provide a wide variety of information depending on who is interviewed and how the interview is designed. The selection of interviewees, the style of the questions, and the structure of the interview all shape the results of the technique. Interviews can be conducted in either a deliberately biased, or neutral manner, they can adopt an adversarial or empathetic approach, they can be face-to-face or over the telephone, and they can be one-to-one or held with a group of interviewees (Fontana and Frey, 2005). Interviews can fulfil a similar role to surveys if identical questions are put to a number of interviewees with similar areas of expertise. Using such a method it is possible to identify, very specifically, the differences in views held by individuals interviewed. When an issue is explored for the first time, the interview can adopt an informal and unstructured approach to facilitate the dialogue and allow the interviewee to bring salient information to the foreground.

Interviews were most often used in my research during exploration at the national level but a number of interviews were also carried out at the OPCW's Technical Secretariat with staff and members of the Scientific Advisory Board.

Although my research has not engaged with highly sensitive material, I have already noted that the field of chemical weapons is known for its concern for confidentiality. Because of this, the use of questionnaires and surveys was inappropriate and all interviews were conducted under the following conditions: the names of interviewees would not appear in the text of the dissertation but could be listed as interviewees next to their affiliation in an annex.[24] To keep conditions as standard as possible, none of the interviews were recorded because some interviewees would have refused to be

[24] To maintain the conditions stated to interviewees whilst recognising the need for academic rigour, further information has been supplied to my supervisors on a private basis. This information comprises a list of interviewees that includes their exact positions within affiliated institutions and the interview citations to which they are associated.

recorded; and, consequently, notes taken from all interviews were written-up in report form within 24 hours of the interview. Interview reports were sent to the interviewees for factual correction and to allow further explanations to be given if required. Most interviews were conducted in English, with the exception of some ethnographic interviews which were carried out in French. In all interviews, the source was asked to speak on a personal basis and informed that the information they provided would be used in academic research. Prior to interview, with the exception of opportunistic interviews, the interviewees were sent a short one-page brief outlining the research topic, research questions, and details of the empirical research conducted up to that point. Although the interview questions were not sent beforehand, the short briefing paper allowed the interviewees to familiarise themselves with the research topic and the approach employed.

The selection of interviews took place on an iterative basis. Identification of key sources took place prior to the fieldwork and was followed by significant snowballing, whereby interviewees suggested future contacts. This process had the advantage of facilitating access through the names of previous sources and interviewees were not selected solely for their current professional responsibilities but also for their accumulated experience. Interviewees were drawn from the following areas and professions:

- Policy-level officials, mainly in the United Kingdom and the United States;
- Individuals on national delegations to the OPCW;
- Members and former members of the OPCW's Technical Secretariat (including the Organisation's Inspectorate);
- Members of the OPCW's Scientific Advisory Board;
- Individuals involved in the negotiation of the CWC;
- Current and former chemical industry officials; and,
- Individuals working in peripheral policy roles in think tanks, non-governmental organisations, and as private consultants.

Supportive interview data contained in this dissertation are based upon sixteen semi-structured, four unstructured, and ethnographic interviews. A table containing the

names and affiliations of interview sources is contained in Appendix 2. Interviews are referenced in the text of this dissertation as footnotes without identifying the individuals. Some group interviews were also held. Not all interviews conducted provided data that were used for the dissertation; however, they remain listed in the appendices of the present dissertation for information and supportive purposes.

4.4.i. Ethnographic interviews

The interviews undertaken at the Technical Secretariat served a number of purposes: they enabled data from participative observation to be triangulated, thereby making the observations more robust; and they served to clarify and explore the context of certain observations. For instance, when a meeting intervention was made that seemed either out of place or more aggressive than expected, a one-to-one interview provided the privacy and opportunity to delve further into the context and background of the issue.

The interviews undertaken during the ethnographic fieldwork can be separated into two categories: those that were planned in advance and those that were carried opportunistically. The factor that separated the two was the availability of the interviewees, i.e. whether they were either permanently or rarely available to offer their time and knowledge. Opportunistic interviews were usually shorter and ranged from 10 to 30 minutes – because of the difference in length, they were also usually more focused on a specific issue rather than a broader discussion.

4.4.ii. Semi-structured interviews

Most planned interviews were ‘semi-structured’ for which a set of questions were prepared in advance and used to guide the interview, but when the interviewee introduced new data the interview could change course to accommodate it. This method differs from ‘structured’ interviews or questionnaires where a rigid structure dictates the topics discussed as well as the order in which they are addressed. A semi-

structured approach provided the necessary flexibility to incorporate views that had yet to be articulated as well as providing sufficient structure to keep to the topic.

Another advantage in the use of semi-structured interviews lay in the difference in backgrounds of many of the individuals interviewed. This led to situations where the interviewees' knowledge varied significantly from expectation – either in their knowing far more or far less about specific issues under discussion. One example was newly appointed officials to relevant posts who had not yet fully mastered their subject, another was individuals with significant and unexpected past experience in another area very relevant to the dissertation. The knowledge base from which interviewees were selected was not homogenous but represented a variety of views and backgrounds.

4.4.iii. Unstructured interviews

This dissertation presents, in chapter 5, an exploratory chapter on the perceptions of science and experts during the diplomatic discussions culminating in the CWC. During interviews with individuals who had participated in some way in this process, unstructured interviews were carried out. These consisted of a number of leading questions that were prepared to allow the interviewees to recount their perceptions and provide their own interpretation to preliminary findings from other historical sources.

As several sources interviewed were either retired or had been out of the field for a significant time, a number of prompts were also used as memory aides. These prompts were usually events judged to be salient from documentary sources or were highlighted through other interviews or discussions. These interviews tended to be significantly longer than others, sometimes lasting several hours.

4.5 Other data sources

A number of additional data sources were used for the empirical chapters of this dissertation, most notably in the historical discussion of the CWC's construction in chapter 5, and in examples of nationally used experts given in chapter 7.

As an exploratory chapter to set the context for the following two, chapter 5 employs empirical data from interviews, primary source material, and secondary data. Primary source material that was available through the HSP's extensive archives includes the discussion and negotiation records of the multilateral Geneva disarmament conference, notably:

- The *rolling texts* of the Convention: these texts originated in the early 1980s with the *Ad Hoc* Working Group (later, Committee) on Chemical Weapons, charged with directing the multilateral consultations and, later, negotiations at the Geneva disarmament conference. The format of the rolling texts enables one to follow the evolution of the text through the latter stages of the negotiations: the text contains not only the sections of the Convention that had been agreed, but also those that had not, and it also stipulated that those parts that *had* been decided were not necessarily set in stone, i.e. they could still be changed. The rolling texts also help explain why certain sections took longer than others to write because negotiator reservations as footnotes in the documents.
- The *procès-verbal* of the Conference on Disarmament and its preceding institutions. These were written records of the proceedings at the plenary sessions of the multilateral discussions leading to the Convention.
- Other formal and informal documents from the Conference on Disarmament and its preceding institutions.

In chapter 7, the United Kingdom and the United States have been used as examples to illustrate the similarities and differences in sourcing and incorporating expert advice in national policymaking. These two countries were chosen for a number of reasons. From an exploratory perspective, two governments with similar positions at the OPCW

provided a sounder basis for initial research than two countries that have quite different political priorities, by enabling the subtler aspects of the science/politics relationship to be addressed. Access also played a role as I had already established a network of contacts within these two countries, access also contributed to me dropping a third case, as described below. In addition, the UK and the US both have well-documented and high levels of participation in the CWC, and this made their positions in relevant discussions easier to ascertain and follow.

During my research design, the case of India – as an example of a country with different political interests – was contemplated, however, the reluctance of Indian officials to grant interviews precluded access to a necessary array of views. A different approach to academics researching chemical weapon issues, as well as a high staff turnover at its Permanent Representation to the OPCW, may have contributed to an unwillingness to be interviewed. Nevertheless, presenting the views of a government, such as the Indian one, whose stance on technical issues is at odds with the examples presented herein would be of significant value as further research, especially when taken in context of the thesis presented in later chapters.

4.6 Ethics and Confidentiality

Using a range of research methods for this dissertation has led to a number of ethical and confidentiality concerns as each method brought with it its own set of general and specific concerns.

As described above, my data collection included nine months of participative observation within an international organisation's secretariat. One immediate ethical issue could have been whether or not I should reveal to the Organisation the complete nature and purpose of my research. However, this question was resolved even before preliminary contact had been made with the OPCW – the research objectives were

made explicit to the Organisation from the very beginning, and throughout my time spent at OPCW Headquarters.

During this period with the OPCW, in common with all Technical Secretariat staff, I was bound contractually and am subject still to a confidentiality agreement stating that at no point may I reveal the substantive discussions experienced during my contract. This has been a challenge in my research and has resulted in unused material where the data could not be triangulated through interviews. What is covered in detail is the structure and organisational aspects of the Organisation's activities, and especially those that shed light on how the institution functions rather than what information it uses.

As stated above, all interviewees are made anonymous in the empirical chapters that follow. This important consideration reflects the sensitivity associated with the field of security in general and of chemical weapon policy in particular. Although the work atmosphere within the Organisation is more open now than it might have been in continued Cold War context, a veil of secrecy still shrouds many of the activities of the OPCW. As a result, those interviewed felt far more confident speaking under the protection of quasi anonymity – and since this improved the quality of the data, this consideration was applied across all interviews. This could have had implications for the reliability of the data found within the text, but this problem has been covered by inclusion of the list of sources in Appendix 2.

4.7 Funding

My research was funded entirely through a 1+3 Economic and Social Research Council (ESRC) scholarship. This scholarship provided additional funding for overseas fieldwork, which allowed significant time and resources to be devoted to collecting data abroad. As previously stated, nine months were spent in The Hague (The

Netherlands) with six months funded as overseas fieldwork and three months as an Overseas Institutional Visit (OIV). In addition, one month (June 2008) was spent as overseas fieldwork in Washington DC meeting and interviewing decision-makers and scholars.

5 The negotiation of the Chemical Weapons Convention and the role of experts.

The Chemical Weapons Convention (CWC), like any treaty, is a product of its time. The conditions under which it was negotiated are the same conditions essential for its existence: the notion that such a treaty was necessary and in states' interest; a gap in the disarmament agenda; and the onset of urgency (especially during the latter stages of the negotiations). Although it is both incorrect and imprudent to identify the CWC as a 'relic' of the Cold War – such a description belittles the achievements in chemical weapon disarmament and the sustained relevance it presents today – it is a treaty text through which the spirit of the Cold War has been tightly interwoven. But although the Cold War was of great significance in the design of the Convention, it would be a mistake to isolate it as the only factor having influenced the treaty's text. This chapter will identify how certain sections of the Convention came about and how they were influenced by views on science and technology that were prevalent at the time.

The chapter is organised as follows. It will begin with a short narrative foray into the discussions and negotiations for the Convention, with special attention given to the structures in which they took place and roles of the respective actors in that process. Drawing from the negotiation literature, it will then examine those provisions of the Convention that relate to technical change paying special attention to how they were negotiated.

5.1 The structure and content of the CWC negotiations

The discussions and negotiations for the CWC took place over two decades. For the most part the exploratory talks and, then, the negotiations were split between bilateral and multilateral forums.

Multilateral talks were held under the patronage of the UN General Assembly, and more specifically, within the framework of the Geneva disarmament conference. These various permutations of the Geneva conference included the Eighteen Nation Disarmament Committee (ENDC) – established in 1962, renamed the Conference of the Committee on Disarmament (CCD) in 1969, and subsequently the Conference on Disarmament (CD) from 1978. Changes in the name of the Geneva disarmament conference reflected changes in composition and procedures for chairing the body, usually indicating wider state-level participation. Bilateral negotiations took place between the United States of America and the Soviet Union (the Russian Federation in the post-Cold War period). The timing of these was highly irregular but in the context of the Cold War, bilateral discussions were essential in assuring each superpower that the other was fully committed to arms limitation. Outside the two main arenas for negotiations, individual states held discussions with non-governmental organisations and with the chemical industry, particularly during the design of the Convention's extensive procedures for verification. The particular role of the chemical industry and NGOs in the CWC negotiations will be discussed further later.

During the late 1960s and after the conclusion of negotiations on the adoption of a treaty to curb the proliferation of nuclear weapons, the ENDC – itself the successor of the Ten Nation Disarmament Committee – accepted a 1968 Swedish proposal to adopt the abolition of Chemical and Biological Weapons (CBW) onto its permanent agenda.

The timing of the adoption of chemical and biological weapons onto the disarmament agenda in Geneva was significant. As well as the appearance of a gap in the agenda of the Geneva disarmament forum, the international community had been confronted by serious violations of the 1925 Geneva Protocol during the 1960s: the use of chemical herbicides and tear gas by the United States in Vietnam;[25] and the use of chemical weapons during Egyptian interventions in the Yemen Civil War. This increased the availability of information on chemical weapons in the public domain and led to serious international concern that the norms established by the Geneva Protocol were being eroded (Stockholm International Peace Research Institute, 1970).

In 1969, the talks continued to deal with chemical and biological weapons together but two factors led to the discussion on banning chemical weapons being considered more problematic: chemical weapons had been far more extensively stockpiled and integrated into military arsenals; and the existence of 'non-lethal' chemical weapons such as tear gas and herbicides had sparked a difficult debate on the scope of the proposed ban on chemical weapons, i.e. whether or not the definition of chemical weapons included herbicides, defoliants and so-called 'non-lethal' chemicals.

In July 1969, the United Kingdom therefore tabled a draft convention dealing only with biological weapons (United Kingdom, 1969) aimed at attracting US support (which it succeeded in doing and which was important because hitherto, the US had refused to discuss a ban on chemical and biological weapons), but it generated strong opposition from the Neutral and Non-Allied (NNA) and the Group of Socialist States (GSS) geo-

[25] Although the US did not become party to the Geneva Protocol until 1975, whether or not the US use of herbicides in Vietnam would have contravened the Geneva Protocol was itself the subject of significant controversy, for a detailed account of the positions adopted during this debate (see Stockholm International Peace Research Institute, 1970).

political groups.[26] In response, the GSS proposed a combined treaty which highlighted the need for legislative and administrative systems at state level (Stockholm International Peace Research Institute, 1970) and not necessarily at the international level. Their draft also called for a review process for the convention to stay up to date with future developments in science and technology. Extensive discussion on the merits and disadvantages of separating the two types of weapons took place within the CCD but after a volte-face in 1971, the GSS submitted another draft treaty, this time treating biological weapons only (Trapp, 1985).

In 1971, negotiations for the 1972 Biological Weapons Convention (BWC) were concluded and discussions on the prohibition of chemical weapons had begun slowly. However and perhaps to satisfy those states who opposed the separation of CBW, Article IX of the BWC included a mandate for each state party to affirm

> "the recognized objective of effective prohibition of chemical weapons and, to this end, undertakes to continue negotiations in good faith with a view to reaching early agreement on effective measures for the prohibition of their development, production and stockpiling and for their destruction, and on appropriate measures concerning equipment and means of delivery specifically designed for the production or use of chemical agents for weapons purposes."

So the multilateral disarmament conference retained the topic of chemical weapons disarmament on its agenda and efforts over the next twenty years would focus on developing an international convention to abolish these weapons.

The Neutral and Non-Allied grouping submitted to the Geneva disarmament conference a draft outline convention in 1973 (Argentina *et al.*, 1973) and the next year saw a shift in the structure of the exploratory talks, which took the form of a separation at the multilateral and bilateral levels initiated by the joint Communiqué from the Soviet and American governments. The 1974 Nixon-Brezhnev Communiqué stated that the two states would consider a joint initiative to achieve a ban on chemical

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[26] These geo-political or regional groups, alongside the Western Group, reflected the voting blocs present within the UN system during the Cold War. At present there are five geo-political groupings / voting blocs represented in the UN also active within OPCW frameworks: the African Group; the Asian Group; the Eastern European Group; the Latin American and Caribbean Group (GRULAC); the Non-Aligned Movement (NAM); and the Western and Others Group (WEOG).

weapons, thereby reinforcing their leadership on the project. It stipulated that the "most dangerous, lethal means of chemical warfare" would be those to be dealt with first and foremost. The substance of the multilateral discussions in 1974 focused on a draft convention submitted by Japan (1974) and not on the bilateral Communiqué which saw little further development in the hands of the superpowers.

Incidentally, although peripheral to the discussions for the CWC, and from a speech delivered at the UN General Assembly in 1974, the Soviet delegation proposed a new convention on *New types of Weapon of Mass Destruction (WMD)*. Article I of this draft agreement stated that no state should develop or manufacture new types of WMD "including those utilizing the latest achievements in modern science and technology" (UN Document A/10243 quoted in Stockholm International Peace Research Institute, 1976, p. 311). The discussion of the draft highlighted the problems of defining what was 'new'; the distinction between an entirely new weapon and a substantial improvement to existing weapons being unclear. At this time the main technological concerns cited by the Soviets for chemical weapons were binary weapons, gene engineering, environmental modification techniques, and other 'unspecified' systems of strategic armament. (Stockholm International Peace Research Institute, 1976)

In April 1975, the United States not only signed and ratified the BWC but it also formally ratified the fifty-year-old Geneva Protocol. Yet, insignificant progress was made on the basis of the Soviet-US Communiqué or in the multilateral talks within the CCD. Bilateral talks had been prompted in 1976 by a British draft treaty (United Kingdom, 1976) timed for the incoming American administration (Perry Robinson, 1993). This draft treaty was, in retrospect, important. Not only was it a factor in spurring the bilateral talks into action, but the British draft also introduced a number of concepts that were adopted in later drafts (Kenyon, 2006). These concepts included: initial declarations; a general purpose criterion based definition;[27] a national 'authority'; non-transfer provisions; and an early incarnation of challenge inspections.

[27] As will be demonstrated later, the general purpose criterion had, in fact, appeared in the Neutral and Non-Aligned countries draft Convention of 1973 (Argentina *et al.*, 1973).

As bilateral discussions got underway in 1976 (Stockholm International Peace Research Institute, 1977, p. 365), they increasingly focused attention towards the practicalities of effective verification and by 1979 the bilateral talks had achieved agreement on the following: a comprehensive ban; the use of a general purpose criterion to define chemical weapons; means of warfare and means of production would be declared and destroyed within a ten-year period; an international organisation would be created for verification purposes; and 'challenge' inspections would be possible under certain conditions (Stockholm International Peace Research Institute, 1980).

During the period 1977–1979 the intensive bilateral negotiations between the United States and the Soviet Union created increasing frustration within the multilateral forum in Geneva, a frustration further compounded by the Soviet refusal to accept an intrusive on-site inspection system, except on a voluntary basis (United Kingdom of Great Britain and Northern Ireland, 1993). But as the war in Afghanistan provoked a cooling in the relationship between the superpowers, the bilateral talks stalled (Stockholm International Peace Research Institute, 1982). Renewed energy was brought to the Geneva forum after a Dutch questionnaire, distributed in 1979, collected views on the prospective treaty. In 1980 the *Ad Hoc* Working Group on chemical weapons (later reorganised to become the "Committee") was established to overcome stagnation. The *Ad Hoc* working group then became the dominant forum in which the Convention's exploratory talks were held and later, in 1982, it was charged with the elaboration of the CWC, excepting its final drafting (United Kingdom of Great Britain and Northern Ireland, 1993).

Progress within the *Ad Hoc* Committee initially took place on four separate levels:

- Full Committee sessions;
- Sub-group sessions covering such substantive issues as definitions;
- Technical expert sessions or 'Chairman's Consultations';
- Other informal meetings of contact groups. (Trapp, 1985)

In 1982 the progress remained slow but the talks tackled some of the more contentious areas such as verification. And in an important shift in policy, the Soviet Union

adjusted its negative position against an international verification system to allow international on-site verification to take place under certain conditions, specifically under instances of suspected violation.

Bilateral Soviet-US negotiations resumed in 1984 and multilateral negotiations entered their final stage as the *Ad Hoc* Committee's mandate was adjusted to complete the process of negotiations for the CWC except for its final drafting (United Kingdom of Great Britain and Northern Ireland, 1993). The *Ad Hoc* Committee set-up three new working groups to fulfil this mandate, each group being allocated to a specific subject area. These areas were: the scope of the Convention; the elimination of weapon stocks and production facilities; and issues of compliance. The annual chairmanship of the Committee rotated in turn between the Western, the Socialist, and the Non-Aligned Groups. The Conference on Disarmament met for spring and summer Sessions, but extended intersessional consultations were also the norm (United Kingdom of Great Britain and Northern Ireland, 1993). The general structure of the negotiations is shown below, Figure 3.

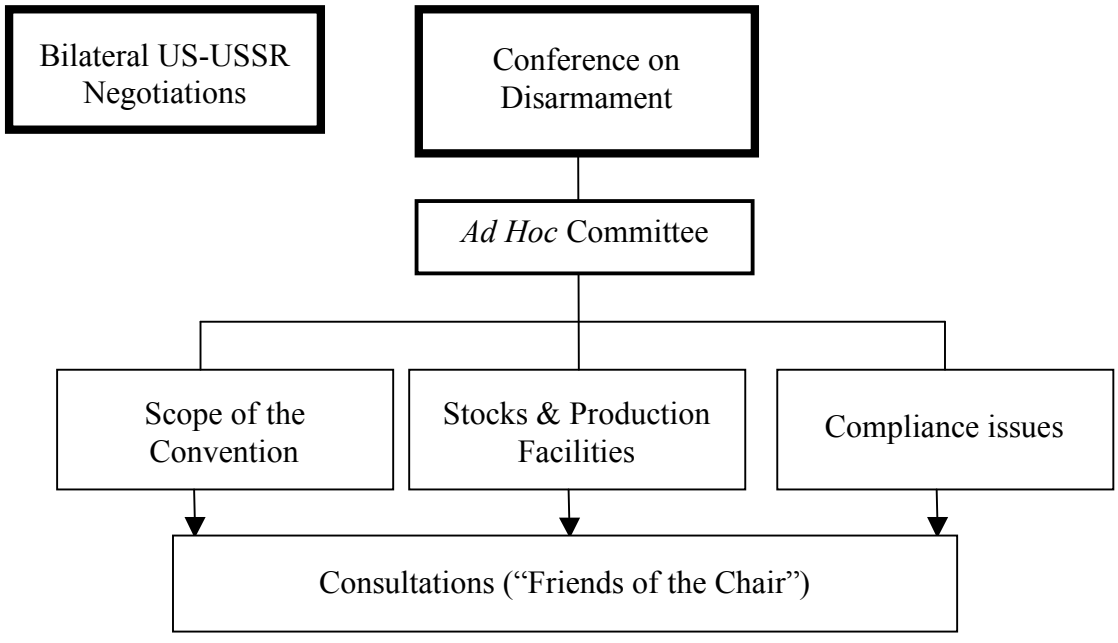

Figure 3 The Structure of the Chemical Weapons Convention negotiations in 1984.

Negotiations during this period concentrated on practical issues including which dual-use chemicals should be explicitly addressed by the Convention, what timescales should be adopted for the initial declarations to be made by signatory states and the contentious issue of on-site inspections. On the latter subject, further progress was made as the Soviet Union showed itself willing to accommodate international inspectors at its destruction facilities. At regular intervals at the end of each year, in conjunction with each outgoing Chair, the Committee issued an updated draft of the Convention which came to be known as the 'rolling text'. Halfway through the 1984 multilateral negotiations, the United States tabled a draft treaty in Geneva (United States of America, 1984) that became well known as 'CD/500'. CD/500 was introduced by President Reagan's Vice-President, George H.W. Bush, and significantly, it proposed 'anytime, anywhere' inspections with no right of refusal, a proposal that the US was sure the Soviets would not accept. The tabling of the American draft treaty was highly significant in the context of US chemical weapon policy, its objectives were not so much to advance negotiations on the CWC but to advance the Reagan administration's chemical weapon 'modernisation' policy, it demonstrated the United State's 'twin-track' approach policy (Perry Robinson, 1998b). Soviet rejection of CD/500 would provide the Reagan administration with the justification to push for legislation to cover the funding and development of binary weapons through the US Congress (Mahley, 2009).

As increasing speculation over the extent of chemical weapon production and stockpiling in the Soviet Union took place, the negotiations of 1986 continued to build up speed, and centred on on-site inspections and procedures to be taken in the event of an alleged violation. The Soviet Union begun to open up their weapon facilities to the outside world, as demonstrated by US and British visits to Shikhany in 1987 and 1988. A number of trial inspections were also carried out in national chemical industries, some of which were organised through non-governmental organisations such as Pugwash (more on this later). The Soviet announcement that they would cease chemical weapon production by 1987, its calling of America's bluff by accepting the US's proposal of 'anytime, anywhere' challenge inspection, and its declaration that the USSR held no more than 50,000 tonnes of agents signalled a change in Soviet

approach. This forced the United States to about-face on the conditions it had wished to apply to the verification provisions of the Convention to accommodate the Soviet position in a process that took two years. The negotiations then gained speed significantly in 1989.

By 1986, there had been independent confirmation that Iraq had been carrying out repeated attacks with chemical weapons against Iran (United Nations Security Council, 1986). The use of nerve gas on the battlefield for the first time served to demonstrate the fundamental importance of completing the treaty and acted as significant catalyst for that very purpose. But in 1987, a number of important issues remained unresolved, including the order of destruction of chemical weapons, the details of the definition of a chemical weapon, procedures for systematic inspections with respect to the protection of industrial information, challenge inspections, the dates of entry into force of the convention, and the handling of withdrawals from the convention (Stockholm International Peace Research Institute, 1988).

With the negotiation's emphasis focused more and more on the political and technical details of the Convention, progress over the next few years was constant but finalisation of the text remained elusive. One of the Working Groups[28] focused on the issue of chemical industry confidentiality, and together with the 1989 Canberra conference – which brought together CWC negotiators and industry officials – the involvement of industry in the negotiation of the Convention was discussed. Although no official agreement had been made at this stage regarding official conduct in the context of the protection of industry data, industry did pledge to play a more active role in the Geneva negotiations. Their influence on individual state policy, however, had been visible at an earlier stage, for instance, in the United States where the chemical industry had exerted some influence on the government's mid-eighties 'walk back' position.

[28] The *Ad Hoc* Committee established a technical working group (Working Group 4) in 1989 that met three times and reported their results in January 1990.

In 1990, the improvement in the relations between the USA and the Soviet Union facilitated progress in the bilateral talks and an agreement was reached on cutting the stockpiles in both states to 20% of existing US stockpiles. Destruction was to begin in 1992 and continue through to the entry into force of the Convention so that neither state would hold more than 5,000 tonnes by 2002 (Perry Robinson, 1998b). Again in 1990, the UN General Assembly mandated the *Ad Hoc* Committee to elaborate a final draft of the CWC. Although this did not occur during that year, vital progress was made in resolving some of the most complex legal aspects of the treaty and other practical issues such as the size and budget of the Convention's future international organisation, the OPCW.

The collapse of the Soviet Union had a significant impact on the negotiations for the projected CWC. The end of the Cold War left the United States as the one triumphant superpower and left Russia weakened with a crippled economy and serious security concerns for stocks of weapons as states succeeded from the USSR. Fear of proliferation also increased as Soviet defence scientists found themselves without jobs as defence research and development budgets were slashed.

In 1991, negotiations entered their endgame: three new Working Groups were created to tackle security, verification, and legal and institutional affairs. As well as three formal *Ad Hoc* Committee sessions, many informal meetings of the various working groups were held over the year to discuss specific areas ranging from analytical techniques to industry involvement. During 1991, a number of trial inspections were also carried out to examine the projected routine inspection system. Bilateral negotiations between the US and Russia were also sustained. Also in this year, a one-year deadline was proposed by the United States under President Bush for the conclusion of negotiations by May 1992. Ambassador Adolf von Wagner, the German chair of the *Ad Hoc* Committee for that year, led the negotiations on the 'rolling text' through to completion on deadline and many compromises were made to agree on unresolved issues, some of which still remain unresolved. At this point, von Wagner appointed a group of 'Friends of the Chair' to resolve outstanding issues pertaining to

legal issues, economic and technological development, technical issues, old and abandoned weapons, and the OPCW.

In March 1992, Australia tabled a draft Convention (Australia, 1992) based on the rolling text (where consensus already existed) and on Australia's own solutions for areas of difficulty. The Australian draft drew a mixed response and although it was not used as a formal basis for negotiation it had a strong influence on the final text (Mashhadi, 1992). Von Wagner then also produced his own 'vision text' and following further negotiation and working papers, a final version was produced on 10 August 1992 as WP.400/Rev.2 (Conference on Disarmament, 1992b). This final text was later submitted to the *Ad Hoc* Committee and the CD to be formally adopted, and was subsequently transmitted to the UN General Assembly on 3 September 1992. The Convention on the Prohibition of the Development, Production, Stockpiling and Use of Chemical Weapons and on their Destruction was recommended to signature by the First Committee of the UN in November 1992 and opened for signature on 13 January 1993.

The structure of the negotiations mirrored the types of issues discussed by the negotiators of the Convention. The 'open' talks (the 'exploratory discussions') up until 1980 - when the *Ad Hoc* group was established - seemed to concentrate on conceptual issues, such as the nature and scope of the treaty. But when 'official' negotiations began in 1984 and the possibility that they might actually lead to something substantially increased, the structure of the negotiations became more focused and complex through the formation of the *Ad Hoc* Committee and its subordinate working groups. With this specialisation in structure, so the negotiations themselves became more specialised and the topics they addressed took on a strongly functional dimension, with routine inspections and the destruction of existing chemical weapons being the main discussion points. As the negotiations became more focused, the active involvement of the chemical industry became increasingly important, especially as national trial inspections were conducted and as the procedures for the verification of non-production took shape. The following paragraphs will outline industry involvement in terms of how, why, and by whom the chemical industry was brought

into the negotiation process. It does so to describe how and when experts on the chemical industry became involved in the proposed ban on the existence of chemical weapons.

5.2 The CWC negotiations and the chemical industry

5.2.i. The Chemical Industry and Chemical Warfare

During talks and negotiations for the CWC, the chemical industry in industrialised countries was already becoming accustomed to a number of regulatory regimes that it had never before been required to implement. These controls on industry varied immensely by location: industrialised countries generally enforcing more rigorous regulations than was the case in less developed counterparts. In much of the Western world, concerns that the chemical industry was contributing to environmental damage meant that stringent regulatory processes were being developed to monitor industrial practices, these included: controls on water pollution; air pollution; the disposal of chemical waste; toxic chemical production; pesticide production; and occupational health and safety requirements (Carpenter, 1986).

The chemical industry had become viewed by western society in a rather negative light; an industry associated with pollution and disaster contrasted with the high regard in which it had been held in early parts of the twentieth century. Adding to this were the industry's linkages with chemical weapons. American chemical firms had manufactured and supplied chemicals on a large scale to the US military which used them as herbicides during the Vietnam War between the early 1960s and early 1970s. One of these chemicals in particular, Agent Orange, was found to be extremely harmful to humans[29] due to a toxic dioxin impurity present within it, and it was the American chemical industry that was held accountable for the results (Winzowski, 2005). This perception of a link between chemical weapons and the chemical industry

[29] The dioxin impurity – 2,3,7,8-tetrachlorodibenzo-para-dioxin (TCDD) – is extremely carcinogenic and demonstrated severe teratogenic effects in exposed individuals.

was not limited to the United States and the industry developed a very bad public image. Placing the chemical industry's weight behind a comprehensive prohibition of the weapons would, according to the Chemical Manufacturers Association at the time, "put to bed the notion that the chemical industry harbours a merchant-of-death mentality" (Ember, 1989 as quoted in Winzowski, 2005, p. 7).

One important area of change in the post-World War II period has been the balance of power between state and industry. According to a SIPRI publication, an official ordinance of 1935 in Nazi Germany required "all new discoveries and patents of potential military significance were to be reported to the War Office, which was empowered to classify any invention that might be useful for the nation's defense." (Perry Robinson and Leitenberg, 1971) This offers a powerful contrast to the more recent situation in the United States. When the US government, in its final attempt to produce binary chemical weapons, approached various chemical firms in 1990 to produce thionyl chloride, the request was adamantly rejected by all on the grounds of company policy and corporate responsibility (Winzowski, 2005). This comparison illustrates both a change in industry attitude, and also industry's eventual capability to dictate government policy through its actions.

5.2.ii. The Geneva CWC Negotiations and the Chemical Industry

As the Geneva negotiations on the CWC proceeded in 1984, progress was made on how verification of chemical weapon non-production was going to take place. It had been long established that if the CWC was to be a serious arms control and disarmament instrument, it would require some degree of intrusion into the chemical industry. Informal contact between the Geneva diplomats and members of the chemical industry had been going on since the 1970s, but in the early years it only involved a small number of firms engaged in organophosphorus production and mainly located in the US (Olson, 1988).[30] During the 1970s and early 1980s industrial contributions from the American chemicals sector were restricted to giving technical advice to

[30] Although located in the United States, many of these companies were in fact subsidiaries of large (West) German companies.

government, further details of the involvement of British and American industry involvement with government will be discussed in chapter 7.

Outside the Geneva disarmament environment, and particularly in the activities of NGOs such as the Pugwash Conferences on Science and World Affairs (through their chemical weapon Study Group) and the Stockholm International Peace Research Institute (SIPRI), concerted efforts to establish further linkages between diplomats and industry representatives had been underway since the 1970s. One example of this effort was a conference jointly convened by Pugwash and SIPRI in October 1985 on *The Chemical Industry and the Projected Chemical Weapons Convention* (Stockholm International Peace Research Institute, 1986). This conference, which followed years of informal groundwork, brought negotiators, industrialists, academics and arms-control specialists together to establish transnational channels of communication between the separate parties. These linkages could then be built upon, as they were during a 1986 seminar organised by the Dutch government in Rotterdam (Tuerlings and Perry Robinson, 1999), and hopefully incorporated into the Geneva disarmament conference (Stockholm International Peace Research Institute, 1986).

The facilitating role of NGOs was seen as 'essential' in bringing negotiators and industry representatives together, particularly because Geneva delegations had such a poor understanding of the industry structure.[31] These deliberations certainly contributed to industry involvement assuming a much more generic role in 1988 and this was indicated by a statement from the US Chemical Manufacturers Association[32] (CMA) voicing the need for a 'strong, effective international treaty' outlawing all chemical weapons (Conference on Disarmament, 1988c).

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[31] Interview, Independent Consultant, 21 March 2007.

[32] The CMA, now the American Chemical Council (ACC), was a trade association that represented over 90% of the basic chemical production in the United States (Olson, 1988), and in their statement they indicated collaboration with other trade associations, notably those in Canada, Japan, and Western Europe.

The active role played by the chemical industry in the final elaboration of the CWC can be explained by several factors but in truth, the chemical industry needed to be part of the CWC as much as the CWC negotiators needed the cooperation of industry. First of all, the chemical industry wanted to restore its public image. As noted above, chemical firms were being labelled as profit-making machines with very little regard for human safety or for the environment. One way to increase public credibility and approval was to take a stand against a type of weapon commonly regarded as abhorrent. Secondly, the industry had an interest in being involved in the design of new regulations that were soon to be applied to them. Worried about the consequences that industrial inspections might have on commercial secrecy, the chemical industry placed immense importance on the protection of sensitive information and was wary of regulatory structures that might compromise secrecy. Another concern was how disruptive to normal practice the inspections were going to be. Winzowski (2005) has argued that the (American) chemical industry had resented the implementation of the environmental and health and safety regulations because they had been created "with no attempt to incorporate industry input." (Winzowski, 2005, p. 7) These regulations, according to the US chemical industry, had been badly designed and stifled R&D.

5.2.iii. The Canberra Conference

The Government-Industry Conference against Chemical Weapons (GICCW) was held during 18 – 22 September 1989 in Canberra, Australia, and brought together national delegations and industry officials from all over the world to discuss the CWC and the involvement of industry in its negotiation and implementation. For this reason and others, the conference was groundbreaking. The conference consisted of an opening address by Gareth Evans, Australian Minister for Foreign Affairs and Trade; a keynote address from Tom Reynolds, President of the Chemical Confederation of Australia; a first workshop entitled *Concluding the Chemical Weapons Convention: Government-Industry Cooperation*; another workshop on *Implementing the Convention*; an Industry Forum through which a consensus statement from the chemical industry was made; plenary statements; and finally, the Chairman's (Gareth Evans) summary statement.

But the conference did not take place without its fair share of scepticism: at the time, the conference was initially announced by American and Australian politicians, their references were not to the future CWC but to the already established Australia Group (Perry Robinson, 1989). This inevitably led to a belief that the hidden agenda of the Canberra conference was to consolidate the Australia Group and maintain a North-South development gap through the control of technology transfers. This caused the Australian government to restate the aims of the conference, and this time the emphasis was on the CWC, stating that the Canberra conference was to "encourage the universal support which the [Chemical Weapons] Convention must secure and which Australia is intent upon generating" (Perry Robinson, 1989, p. 18).

The conference was important in three respects: firstly, it enabled the chemical industry in its various manifestations to establish itself as strongly supporting the negotiations for the CWC, and this alone was important for their public image; secondly, in formalising industry support, states could no longer use industry resistance as an excuse for slow progress in negotiations; and last, it was no less important for the negotiators to get the chemical industry on board as a number of industrial issues remained untested in industrial environments. The Canberra Conference also maintained and strengthened alliances that had been set earlier in the year, at the Paris Conference (7 – 11 January 1988).[33]

5.2.iv. Industry Perspectives

The chemical industry was represented through trade associations rather than through the presence of individual firms; some of these trade associations were international (CEFIC, for example) and others represented the industry sector in individual countries, such as the US Chemical Manufacturers Association (CMA). The no-show of certain, very large, chemical firms might also be explained through their reluctance to be publicly associated in any way to chemical weapons, even in a disarmament context.

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[33] This conference brought together states party to the 1925 Geneva Protocol and other interested states under the Conference on the Prohibition of Chemical Weapons.

Trade associations – with a more neutral alignment and less of an image to uphold – were seen as more appropriate vehicles for voicing industry perspectives.

Obtaining consensus from the chemical industry was no easy feat. It is sometimes said of inter-governmental statements, that under the appearance of consensus there are as many positions as there are governments, and separate position for the consensus. But in this context, although there were obviously differences in opinion, there was broad agreement on the major issues: confidentiality; equality of regulations across countries; and the level of intrusiveness of inspections. But differences appeared in the details of the individual industry statements, for instance, where CEFIC expressed their view that the "extension of the scope of the Convention to products not specifically designated as precursors of chemical weapons as counterproductive"[34] (Snichelotto in Perry Robinson, 1989), other industry representatives made very few references to the subject. An exception was the British industry, which stated that it would provide "input from industry on the content of the schedules" (Posner in Perry Robinson, 1989). This could suggest that there was a difference in opinion between trade associations and the firms. The final consensus statement from the chemical industry affirmed its support to the CWC negotiations; expressed a willingness to work with governments; supported cooperation in the legitimate trade of chemicals; and called for urgency in the completion of negotiations for the CWC.

The final record of the Canberra Conference proposed that industry should participate further in the following areas:

- "in those countries where the chemical industry was not already in active cooperation with government;
- in countries where there is such cooperation, there should be more dialogue, involving more people from government and industry;
- improving communications within industry on a global basis;
- in relation to new areas which would come up, industry should be prepared to assist." (Perry Robinson, 1989)

[34] During this conference, there was a complementary discussion at the Conference on Disarmament on the content of the lists of scheduled chemicals; this particular debate centred on whether families of chemicals should be placed in the schedules, or not (and therefore revealing possible loopholes).

The Canberra Conference was successful in bringing industry up to date with the state of the negotiations and, most importantly, in establishing a precedent for further contact between the chemical industry (in its various permutations) and the treaty negotiators in Geneva. This essential contact continued throughout the work of the OPCW Preparatory Commission[35] (1993–97) but has since declined. This narrative has demonstrated how industry experts, beyond those working in national governments, came to be involved with the Convention. Many of these individuals maintained very close links with the Convention into its implementation; some even joined the Scientific Advisory Board within the OPCW itself. Their role as experts is no less important now, as will be discussed in later chapters. The next section will discuss the role of other experts in facilitating the negotiation of the Convention and in formulating policy.

5.3 The role of experts in the talks and negotiations for the CWC

From the very beginning of the discussions on a treaty to ban chemical weapons, technical experts became involved in the Convention's design through a variety of mechanisms. The very different roles played by scientists and other experts will now be illustrated. An immediate distinction can be made: chemical weapons experts operated either through their national governments, as technical advisers, or through a network of non-governmental organisations. Some of those experts were closely involved with the negotiations, and some remained on the fringes of bilateral and multilateral discussions and assumed a very different role (but one that was no less important); they took on the public role of political advocate as well as that of expert. Interestingly, these disparate roles for experts often overlapped in terms of

[35] The Prep Com was mandated by the Paris Resolution to prepare for the treaty's entry into force, including the building of the OPCW, and for the implementation of the Convention's verification system.

participation. For instance, some government experts simultaneously held extra-mural positions within non-governmental organisations.

5.3.i. The Pugwash movement

The Pugwash Conferences on Science and World Affairs (known colloquially as Pugwash) emanated from what Nobel laureate Joseph Rotblat, ten years after the movement's inception, termed "a new type of activity by scientists, the fulfilment of their social responsibilities" (Rotblat, 1967, p. 7). Inspired by the shocking aftermath of nuclear weapon use at the end of the Second World War, communities of scientists had already began to organise themselves into socially aware groups when Bertrand Russell wrote his manifesto.[36] Russell made contact with a number of eminent scientists, including Albert Einstein who is said to have signed the manifesto on his deathbed, to sign and support his manifesto and presented it in London on 9 July 1955.[37] The Russell-Einstein Manifesto as it came to be known, called for scientists to "assemble in conference to appraise the perils that have arisen as a result of the development of weapons of mass destruction".

It was with the financial support of a Canadian industrialist and philanthropist, Cyrus Eaton, that the first Pugwash Conference met near to his birthplace in 1957, in Pugwash, Nova Scotia. The Conference dealt predominantly with nuclear weapons issues, and it was only at the Fifth Conference – held in 1959 – that biological and chemical warfare were specifically addressed. This meeting and the subsequent involvement of Pugwash in the field of chemical and biological weapons (CBW) has been referred to by other studies (Rotblat, 1967; Perry Robinson, 1998a). Perry Robinson argues that the individuals who made up the Pugwash movement were motivated by the belief that a scientific approach to discourse might "illuminate the

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[36] The full text of the Russell-Einstein Manifesto can be read at http://www.pugwash.org/about/manifesto.htm .

[37] As well as Einstein, other notable signatories included Max Born, Percy Bridgman, Leopold Infeld, Frederic Joliot-Curie, Herman Muller, Linus Pauling, Cecil Powell, Joseph Rotblat, and Hideki Yukawa.

options open to policymakers for resolving East-West conflict" (Perry Robinson, 1998a).

Perry Robinson's analysis of the involvement of Pugwash in chemical and biological weapon matters dwells importantly on the movement's strategy for exerting influence. He notes that although the study groups intended to influence both state and civil society behaviour, some in the group favoured its original bias of exerting influence at elite levels (Perry Robinson, 1998a). Perry Robinson implies that the movement has demonstrated an ability to bring issues to the policy agenda through direct action on salient policy matters. He states that

> "[w]hen 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 nongovernmental world." (Perry Robinson, 1998a, p. 244)

This line of communication between concerned experts and government officials was especially valuable because of the participation of experts from the Cold War powers, i.e. actors pushing both the East and West agenda were involved. The limited participation and private nature of the meetings contributed to confidence building between the participants and to candid discussions of sensitive policy matters, although Perry Robinson is reluctant to draw causal connections between the Pugwash discussions and the success of the negotiations for the CWC.

Others, however, have not demonstrated such reticence. Bernd Kubbig in particular has characterised Pugwash as an epistemic community (Kubbig, 1996) and has argued that the chief success of the movement was indeed in facilitating informal contact between the East and the West. Speaking of the nuclear field, Kubbig states that Pugwash did "much to lay the intellectual, conceptual, and political foundations for the policy of cooperative regulation of armaments between the US and the USSR" (Kubbig, 1996, p. 1). Kai-Henrik Barth (2006), also speaking of the nuclear field, has argued that Pugwash acted as a powerful epistemic community during periods of the Cold War.

The reason for their influence was that the Pugwash movement was able, through small high-level meetings, to forge relationships between scientists and policy-level officials of the rival superpowers (Barth, 2006). Although not specifically addressing the field of chemical and biological weapons, the high-level actors that Kubbig and Barth cite – Henry Kissinger being one such example – were also active in CBW discussions and thus, it might be assumed, involved in similar interactions.

Found within the narrative accounts of Perry Robinson and Barth is a clear indication that the Pugwash Conferences – although they were convened and led by scientists – were not conferences *about* science but conferences about world affairs. Pugwash's major success has been recognised and stated in the studies referred to above: it succeeded in opening and maintaining open, important channels of communication between the East and the West in the tense bipolar climate of the Cold War. Another aspect to the movement's work was that, contrary to the current trends in science policy, the group did not shy away from politics; on the contrary, it tackled political issues head-on. Scientists in Pugwash were not undermined by their subjectivity because they did not claim to be objective, they did not lose their cognitive authority because they spoke on political issues to which their authority might not have applied.

The obvious question is therefore; was this influence only achievable through a scientifically led endeavour or were the scientists lucky? Is this success attributable to the existence of Pugwash as an epistemic community? After all, as the authors above note, although the initial membership of Pugwash was predominantly scientists, this quickly changed to an eclectic mix of participants. Perhaps the success of Pugwash lay more with the structure of its meetings than with the distinguishing features of its leadership? These questions will not be resolved in this dissertation but it will argue that there is one feature of science, and of scientists, that may shed light on why Pugwash managed so naturally to foster a political dialogue between the superpowers. This facet of science is its international component. Scientists during that era, more than any other profession (save perhaps diplomats themselves), were very much used to discussing their work and presenting ideas to an international audience. Perhaps then the engagement of scientists with one another set out a model that non-scientists were

then able to follow. Should this argument have any significance, it would imply that the influence of scientists came not so much from cognitive factors as argued for epistemic communities, but instead from a combination of scientific culture and private conditions compatible with dialogue.

5.3.ii. National experts

Open information on the dynamics between experts operating within the formal confines of the negotiating table is scarce, but data gathered from interview suggest that conditions within the formal context were very different from those that prevailed within Pugwash.

One interviewee who served as a government expert for the British delegation in Geneva stated that the expert community was strongly divided along regional / political lines.[38] For instance, most formal expert meetings took place between experts of the same regional groups, and some diplomats were always present (usually those diplomats who thought they could follow the discussions). Interaction between experts from different regional groups was very rare, even on an informal level, whereas the contrary was true of experts within regional groupings. Language barriers partly accounted for this, but political factors were just as salient. There were naturally exceptions though, and worth noting here is the Dutch expert A.J.J Ooms, who became a highly valued source of technical advice across political divides.

The same interviewee above argued that even within regional group expert meetings, there was rarely any consensus on technical issues and particularly controversial discussions on the future monitoring activities of the OPCW. In one instance, an expert conference was organised to produce a consensus document, but what came out of it was presented as a result, but in fact, the conference had absolutely failed in producing one. In this context, experts were not perceived as neutral scientists but as political

[38] Interview, British technical expert and diplomat (retired), 23 October 2008.

agents. There was great distrust between the Western and Eastern bloc experts, and some were even assumed to be spies for their governments. This interviewee felt that no expert was 'independent', as all were brought in to work for their governments and were expected to fall in line with government policy.

Although the views presented above are attributable only to one individual, and detailed triangulation of them has not been possible, evidently some distrust did exist and such feelings do not exist in isolation. This lends further credibility to such views. What remains interesting are the apparent discrepancies that existed between the formal and informal environments of discussion. Perhaps this can be ascribed to the 'division of labour' between scientists and diplomats in Geneva: technical experts were present only to comment on technical issues and were expected to remain silent on the political characteristics of a matter. In contrast to discussions within the Pugwash framework, only the science was on the agenda when dealing with issues that quite clearly had broader implications; and the adversarial nature of the discussions may have cemented a notion that experts were present simply as tools to legitimise policy.

5.4 Pertinent parts of the CWC and their historical sources

This section serves to identify specific parts of the CWC that are relevant to technical change and to provide an insight into how and why they became provisions of the Convention. Within the text of the CWC, there are several references to developments in technology and these usually occur in one of two contexts: the first is where the Convention addresses peaceful uses of chemistry and the relevance of technological change to the economic and technological development of states party to the CWC. Such references to technological development occur throughout the Convention and are particularly valued by developing countries. The second use of references to science and technology, and the use to which this section is devoted, refers to changes that might have special relevance to chemical warfare. These are usually expressed in general rather than specific terms: as 'future developments in science and technology'

or ‘scientific and technological development’. How these aspects of the Convention came into being helps illuminate two separate but linked questions: how was the subject of technological change perceived and thus approached by those groups of people writing the Convention? And how has the Convention has been equipped to stay up to date with an increasingly fast pace of technical change?

Issues relating to technical change were discussed on a conceptual level from the very beginning of discussions on the Convention, but as the exploratory discussions advanced into formal negotiations, they increasingly focused on subjects more pertinent to the practical implementation of the CWC’s procedures. Primary focus was given to the Convention’s extensive system of routine inspections and its sensitive political procedures for addressing suspected non-compliance. What is unclear however, is the extent to which the more abstract, hard-to-grasp notions associated with technical change that were discussed early in the ‘exploratory talks’ phase continued to underpin the negotiation of the Convention’s rules and procedures. Technical change implies inherent uncertainty and the need to discuss what is not yet known. Nevertheless, the number of references to future developments in science and technology present in the Convention is testimony to a willingness to accommodate the issue of technical change within the treaty text. The means by which this was achieved is addressed below.

With an array of relationships between the CWC and developments in science and technology, what must be stated upfront is that technical change cannot be cast solely as a challenge to the Convention. For instance, changes in technology can also be seen as new means to an end (through the application of new equipment to achieve the goals of the Convention), and as an objective of the Convention in itself (in the promotion of technological development). The Convention explicitly addresses the issue of scientific and technological development on seven separate occasions, which suggests that the issue was deemed important but very little detail is given on the practical implications of scientific and technological change for the Convention.

In order to track the negotiation of the Convention, I have used three types of source: secondary literature on substantive discussions held during the design of the treaty; interview data from former negotiators and other individuals involved in the negotiations; and the Convention's 'rolling texts'. There are of course limitations to the use of such documents. One such limitation is that these documents are simply codified products of a highly complex system of multilateral diplomacy where pertinent issues are not always visible from the rolling texts. Related to this is the possibility of assigning causality where it might not exist, due to the process of analysis which is in large part deductive. For this reason, interviews were conducted to verify the analysis and to probe further into what may have gone unsaid, or more accurately, gone unwritten.

5.4.i. The definition of a chemical weapon

The CWC's definition of a chemical weapon marked a significant departure from that used in previous ventures in chemical weapon disarmament. Whereas the 1925 Geneva Protocol defined a chemical weapon as "the use in war of asphyxiating, poisonous or other gases, and of all analogous liquids, materials or devices", the CWC uses intent as its primary defining standard. This General Purpose Criterion (sometimes abbreviated to GPC) had previously appeared in the 1972 BWC which defines biological weapons as "microbial or other biological agents, or toxins whatever their origin or method of production, of types and in quantities that have no justification for prophylactic, protective or other peaceful purposes". But the transfer of this central concept to the context of chemical weapons was not a straightforward process.

Article II of the CWC's final text defines chemical weapons in the following manner:

> "Chemical Weapons" means the following, together or separately:
> (a) Toxic chemicals and their precursors, except where intended for purposes not prohibited under this Convention, as long as the types and quantities are consistent with such purposes;
> (b) Munitions and devices, specifically designed to cause death or other harm through the toxic properties of those toxic chemicals specified in subparagraph (a), which would be released as a result of the employment of such munitions and devices;

> (c) Any equipment specifically designed for use directly in connection with the employment of munitions and devices specified in subparagraph (b)."

Following this explanation, the Convention further defines toxic chemicals as "[a]ny chemical which through its chemical action on life processes can cause death, temporary incapacitation or permanent harm to humans or animals. This includes all such chemicals, regardless of their origin or of their method of production, and regardless of whether they are produced in facilities, munitions or elsewhere." Article II, paragraph 9, specifies the 'purposes not prohibited', by stating that:

> "Purposes Not Prohibited Under this Convention" means:
> (a) Industrial, agricultural, research, medical, pharmaceutical or other peaceful purposes;
> (b) Protective purposes, namely those purposes directly related to protection against toxic chemicals and to protection against chemical weapons;
> (c) Military purposes not connected with the use of chemical weapons and not dependent on the use of the toxic properties of chemicals as a method of warfare;
> (d) Law enforcement including domestic riot control purposes."

Although the scope of the CWC is immensely broad, it is restricted to chemicals that affect humans or animals, but not to plant life. By examining the evolution of the definition through the rolling texts it is possible to derive some idea of how the definition was constrained, pushed and constructed to what it is today.

The suitability of the GPC was discussed in both the multilateral and bilateral talks of the 1970s. According to the *SIPRI Yearbook* (Goldblat, 1973), a controversial discussion point during 1972 centred on the scope of the projected chemical weapons ban. Within the discussions of the CCD, a number of alternatives were presented: general structural formulae for super-toxic chemicals (thereby implying a non-comprehensive ban); the listing of warfare agents (but military secrecy would make this more difficult); and what would yield a final outcome, a broad definition that encompassed the notion of intent. As stated in the 1973 SIPRI yearbook,

> "a general ban on chemical warfare agents requires a broad definition. Detailed characteristics of chemical warfare agents were provided in the CCD, taking account of the manner and conditions of their application, or aimed at preventing misuse of chemical compounds not classified as chemical warfare agents, and of those which may be synthesised in the future.
> But the prevailing option seems to be that a criterion based on the purpose which the agents are intended to serve, with reference to qualitative

> characteristics and to qualitative factors, would provide the simplest solution." (Goldblat, 1973, p. 386)

By 1972 the General Purpose Criterion had been recognised as the preferred solution to three separate problems: how to accommodate technical change and the likelihood that new chemicals of military utility would be discovered; how implicitly, to address the problem of military secrecy, that not all the existing agents would be discussed in the context of the Convention under discussion; and how to accommodate industry's concern that the dual use of chemicals it produced would associate chemical firms with chemical warfare agents, an association which the industry worked hard to avoid.

In 1973, the GPC was again identified as a possible route to the ban on chemical weapons (Goldblat, 1974). This approach was supported by a group of ten non-aligned countries that submitted a working paper in 1973 which advocated the use of the GPC alongside additional criteria; it stated that "a comprehensive ban could deal with the problem of scope by a general purpose criterion while more detailed provisions could be elaborated in the annexes of the Treaty. These agreed provisions could be revised and updated by the international control organ (…)" (Argentina *et al.*, 1973, para. 10). It also suggested the use of parallel national and international measures to put in place a system for the verification of non-production and destruction (Trapp, 1985). In the same year, Japan (1973) proposed that the general purpose criterion be used, but only for agents that would be comprehensively banned. Other agents would be subject to a partial ban, and these would be defined by 'objective criteria', such as quantitative toxicity criteria. After 1974, discussions on the issue continued and agreement was achieved on the use of the GPC, but for it to be practical, it was then thought necessary to supplement it with quantitative toxicity criteria (SIPRI, 1975).

In 1976, the UK's draft Convention used the GPC as its basis for defining chemical weapons and by 1979 this approach also seemed to have been adopted by the two superpowers. In a joint letter to the Chairman of the Committee on Disarmament, the USSR and the US stated that the "scope of the prohibition should be determined on the basis of a general purpose criterion" adding that to enable verification "it would be appropriate to use, in addition to the general purpose criterion, toxicity criteria and

other certain provisions" (Union of Soviet Socialist Republics and United States of America, 1979, paras. 1 - 3).

So by the time the negotiations got underway and the rolling texts came into existence, there was already much support for a prohibition that moved away from 'chemical warfare agents' based definition which could implicate manufacturers of industrial chemicals. Nevertheless, the intent based definition contained in many of the rolling texts was supplemented by another concept, 'categories of harmfulness', which set it apart from the definition retained in the final treaty. The precise definition was a difficult issue until the very last stages of the negotiations on the Convention. In 1983 the proposed definition relied heavily on the notion of 'chemical warfare agents' which were categorised into separate toxicity criteria (Committee on Disarmament, 1983), but this notion vanished completely by the time of the final CWC text. The 1983 rolling text states that chemical warfare agents were "super-toxic lethal, other lethal, or other harmful chemicals, and their precursors, regardless of the method of production; (…)" (Committee on Disarmament, 1983, p. 2).

Here there are number of points worth noting. Firstly, super-toxic lethal, lethal and harmful chemicals were differentiated according to quantifiable and objective windows of toxicity[39] and undermined the comprehensive quality of a general purpose criterion that stipulated that *all* toxic chemicals, regardless of their lethality, were potentially chemical weapons. In addition, as was more recently demonstrated in the 2002 Moscow theatre siege, 'objective toxicity criteria' are not in fact objective and do not reliably predict levels of lethality.[40]

In addition to this, what were the negotiators to do about proven chemical weapons that have had battlefield use (such as chlorine, phosgene and mustard gas) but did not even

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[39] According to the rolling text (Committee on Disarmament, 1983), a super-toxic lethal chemical has a lethal median dose at a quantity less than or equal to $0.5 mgkg^{-1}$ for subcutaneous administration, lethal and other harmful chemicals are between 0.5 and 10 $mgkg^{-1}$ and above 10 $mgkg^{-1}$ respectively.

[40] In October 2002, Russian military forces used an undisclosed fentanyl-type incapacitant in response to a mass hostage situation in a Moscow theatre. Pumped through the ventilation system, rather than subdue the hostage-takers, the chemical also claimed the lives of over 120 of the hostages as well as the terrorists.

fit into the category of 'super-toxic, lethal'? This group of chemicals accounts for the progressive widening of the definition that took place through the use of ever more general terms such as 'harmful'. So although this 'supertoxic' clause remained in the rolling text until late in the negotiations, it became increasingly clear that such an approach was not feasible. By early 1992 the following definition had been drafted, as part of Article II:

> "Toxic chemicals [, including super-toxic lethal chemicals, other lethal chemicals and harmful chemicals] and their precursors [(including key precursors and key components of binary and/or multicomponent chemical systems for chemical weapons),] [as well as other chemicals intended to enhance the effects of the use of those weapons] except such chemicals intended for purposes not prohibited by the Convention as long as the types and quantities are consistent with such purposes." (Conference on Disarmament, 1992a)

Evidence from the rolling texts (Conference on Disarmament, 1985, 1986, 1991, 1992) suggests increasing concern at the current state of the art in chemical weapon technology and notably with respect to multi-component chemical weapon systems, or 'binary' weapons. These new weapons, the development of which was pursued by the United States' Reagan administration, heavily influenced the debate on what should constitute a chemical weapon. So, although the general purpose criterion underpinned the talks in theory, the practical problems of newly discovered threats were the priority for concerned diplomats.

5.4.ii. The Schedules of Chemicals

Discussions on what eventually became the lists of Schedules contained in the Annex on Chemicals of the CWC initially began as discussions to list precursors and to identify the key precursors of known chemical warfare agents. And because early proposals for definitions involved listing chemical warfare agents and their precursors, the history of the Schedules is strongly linked to that of the definition of chemical weapons (see SIPRI, 1973). When early proposals for a 'chemical warfare agent' based definition for chemical weapons were made, they were complemented by proposals for lists of agents and their precursors. This list of chemicals was largely based on toxicity criteria "that could be revised when scientific or other development so require"

(Committee on Disarmament, 1983, Annex II, p. 29) and the list would be "reviewed periodically and revised, if necessary, with the aim of adding chemical substances or deleting those which no longer meet all the agreed criteria, or no longer need to be included as exceptions" (Committee on Disarmament, 1983, Annex II, p. 30). Drawing from these statements, it is evident that from the very beginning of the negotiations, any accompanying lists were expected to evolve with the state-of-the-art in technology. But as the basis for a definition became the intention to use the toxic properties of chemicals as weapons, as discussions on routine inspections took shape, and as concerns regarding the development and potential use of binary chemical weapons grew, the precise purpose of the lists of chemicals evolved.

By 1986 (Conference on Disarmament, 1986) the rolling text had established three lists to contain the names of chemicals fulfilling criteria (yet to be set) that would subject them to routine inspection and monitoring. The text stated that "[t]oxic chemicals and their precursors considered in Annexes 1, 2 and 3, which could be used for purposes prohibited by the Convention, as well as facilities which produce, process or consume these toxic chemicals or precursors, shall be subject to international monitoring as provided in those Annexes" (Conference on Disarmament, 1986, p. 33). The three lists were to be organised along the following lines:

Annex VI.1	Super-toxic lethal chemicals and [especially dangerous key precursors][key components of chemical weapon systems]
Annex VI.2	Key precursors.
Annex VI.3	Chemicals produced in large commercial quantities and which could be used for chemical weapons purposes.

At this time, the chemicals were by and large still organised around quantitative assessments of toxicity and allowed for revisions, including additions and deletions.

This approach began to change in 1987 when the Working Group on technical issues undertook to establish guidelines for deciding whether certain super-toxic lethal chemicals that had not been used as weapons should nonetheless be included in lists

(Conference on Disarmament, 1987a). In discussing this issue, the Working Group considered:

(i) Criteria for determining risk of diversion

(ii) Possible inclusion of "near super-toxic lethal chemicals" which could have applications as chemical weapons

(iii) Possible exclusion of some super-toxic lethal chemicals or classes of super-toxic lethal chemicals with no application as chemical weapons

(iv) Should super-toxic lethal chemicals which pose a high risk be listed?

At the time of the next rolling text (Conference on Disarmament, 1987b) the lists of chemicals were now called the Schedules of Chemicals and a new annex for Article VI had appeared in the treaty text which would account for the "commercial production of toxic chemicals *not listed in Schedules [1], [2], or [3]* that might be relevant to the Convention" (Conference on Disarmament, 1987b). The phrasing of this annex changed over the next two publications of the rolling text (Conference on Disarmament, 1988a, 1988b) to "the production of super-toxic lethal chemicals not listed in Schedule [1]". But by 1989 the draft Convention had set out individual guidelines for the three sets of Schedules and for the first time, the reference to toxic / super-toxic lethal chemicals had disappeared (Conference on Disarmament, 1989a). The reasons for this are unclear.

As the Schedules began to expand in scope to consider the addition of toxic chemicals that had had no former application as chemical weapons, the United Kingdom tabled a Working Paper on the challenges posed by new toxic chemicals (United Kingdom of Great Britain and Northern Ireland, 1989). This paper took the example of PFIB,[41] a toxic chemical that had so far not been added to the lists of chemicals. This paper drew special attention to technical change, arguing that

> "[t]here have been major advances in the chemical industry since [the World War II]. Such advances need to be embraced within the chemical weapon negotiations. […] The case of PFIB illustrated the difficulties of bringing such

[41] PFIB is Perfluoroisobutene.

> a chemical into these Schedules as they are currently formulated in the rolling texts." (United Kingdom of Great Britain and Northern Ireland, 1989, p. 10)

The tabling of this paper also constituted a political and tactical move that led to a number of 'marker' chemicals being added to the Schedules.[42] One of these chemicals, PFIB, was placed in Schedule 2A as a marker for potential new chemical weapons known as 'mask breakers'. These chemicals risked breaking through the state-of-the-art protection against chemical weapons and had earlier been identified as a potential route for innovation in chemical warfare technology (Perry Robinson, 1986). Another chemical, saxitoxin, was entered into the schedules as a marker for toxins.

During the 506th plenary meeting of the Conference on Disarmament, Sweden stated that procedures for routine inspections "must be supplemented by further work on the Schedules, not least on Schedule [2], part B, and a consideration of new agents. In this context a "waiting and warning list" constitutes an interesting approach." (Conference on Disarmament, 1989c). Sweden's proposal for a 'Schedule 4' list was joined by other similar suggestions, and although it subsequently fell by the wayside, significant discussion took place on possible mechanisms to revise the Schedules.

By early 1992, the content of the Schedules had been largely agreed and alongside the lists of chemicals was an extensive section on toxicity criteria that was later dropped. As this draft Convention included provisions on the revision of the Schedules, stating that "[t]he Schedules of chemicals may be revised according to section IV on the Annex of Chemicals" (Conference on Disarmament, 1992a), it is likely that the toxicity criteria related to this. The section quoted above itself contains a footnote implying that guidelines for the revision of the Schedules would be deleted once there was agreement on a simplified amendment procedure in the Convention. This clause was agreed in the final draft and Article XV, Paragraph 4, reads as follows:

> "In order to ensure the validity and the effectiveness of this Convention, provisions in the Annexes shall be subject to changes in accordance with paragraph 5, if proposed changes are related only to matters of an administrative or technical nature."

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[42] Interview, official at the Foreign and Commonwealth Office, 17 November 2008.

It is widely acknowledged that the revision of the Schedules remains a possible course of future action to prevent the schedules from becoming out of date and redundant, a development which would seriously undermine the legitimacy (and hence the robustness) of the Convention and regime in the minds of the states party. However, this important mechanism has yet to be applied and many questions remain on the practical, no to mention the political, constraints in actually doing so. These questions take on more importance knowing that there are families of chemicals, known to have been stockpiled as chemical weapons, which still remain absent from the lists.[43]

The mechanism to alter the composition of the Schedules of Chemicals is particularly salient if one wants to account for the possibility that new, more toxic, chemicals suitable for use as weapons may be discovered in the future. However, the mechanism is equally important considering that extensive bargaining and horsetrading took place, driven in part by a concern to protect industry, during the negotiation of the lists.

5.4.iii. Review Conferences

The references to science and technical change in the text of the CWC can be divided into three broad categories:

(i) Provisions to enable the use of the most up-to-date tools during inspection and verification procedures of the Convention;

(ii) Provisions to ensure that those procedures are adequately targeted as the technical landscape evolves; and

(iii) Provisions relating to the role of the Convention in supporting technology transfer for peaceful purposes.

It is Article VIII of the CWC that lays out the structure and the decision-making procedures of the OPCW, including those of the Conference of the States Parties (CSP), the Executive Council, and the Technical Secretariat. The Article stipulates that the "Conference shall not later than one year after the expiry of the fifth and the tenth year

[43] The Russian research and development of the Novichok family of nerve agents is a case in point, for more information, see Mirzayanov (2009).

after the entry into force (…), and at such other times within that time period as may be decided upon, convene in special sessions to undertake reviews of the operation of this Convention. Such reviews shall take into account any relevant scientific and technological developments. At intervals of five years thereafter, unless otherwise decided upon, further sessions of the Conference shall be convened with the same objective." (Article VIII, paragraph 22) This provision addresses technical change directly and identifies it as a standing agenda item for the special review sessions of the Conference.

These types of conferences were not new to multilateral treaties nor to disarmament and non-proliferation treaties: for example, both the 1972 BWC and the 1968 NPT contain similar review clauses, and the rolling texts indicate that the concept of reviewing the Convention in terms of science and technology at regular intervals was a relatively uncontroversial one, at least on a theoretical level. In 1983, before formal negotiations had been signalled, a draft Convention included an "undertaking to establish a Consultative Committee […] and to promote the verification of continued compliance by performing scientific and technical review functions" (Committee on Disarmament, 1983). During the following years, the role assigned to what was then called the Consultative Committee (but which later became the Conference of the States Parties) to review developments in science and technology hardly changed (Conference on Disarmament, 1984, 1985).

But it was only in 1986 that a clause appeared specifically mentioning a review of the Convention. It stated that amongst the Consultative Committee's responsibilities to "after the expiry of a period of … years from the date of entry into force of this Convention, undertake a review of the operation of the Convention in accordance with Article …" (Conference on Disarmament, 1986, p. 45). This draft clause carried with it a footnote which noted that some states held that a provision for review belonged in another part of the Convention. By early 1988, this footnote had been replaced with another stating that "[t]he convening of further review conferences, possibly at certain intervals of years, could also be provided for" (Conference on Disarmament, 1988a), and later that year this footnote changed again to note that "the placement and wording

of this provision as well as the need for separate review conferences require further consideration"(Conference on Disarmament, 1988b). In the early 1989 rolling text, the provision on review conferences had taken its final shape (Conference on Disarmament, 1989a) but the reference to the wording, placement, and need for a review conference remained until 1991.

A possible explanation for this is that although the need for review had been agreed at a conceptual level, the placement of the review mechanism within the CWC framework continued to cause some difficulty. As Daniel Feakes has argued, the strong institutional structure of the Convention, as compared to the BWC and NPT, has created a very different role for CWC review conferences (Feakes, forthcoming). Feakes highlights the importance of BWC and NPT review conferences, particularly in the light of their lack of supporting structures, but the CWC has formal institutions through the OPCW and the need for an additional review mechanism CSP is therefore perhaps less obvious. Thus it was the support given to the concept which contrasts with the lack of consensus on where in the Convention such a review mechanism would be set out, and one can trace this ambivalence through the footnotes in the rolling texts between 1989 until late 1991.

5.4.iv. The Scientific Advisory Board

Another important mechanism in the Convention for reviewing developments in science and technology can be found in two paragraphs that provide for a Scientific Advisory Board (SAB) to allow the Director-General of the Technical Secretariat to provide advice on matters of science and technology to OPCW member states. In Article VIII of the Convention, the Conference of States Parties is tasked to

> "[r]eview scientific and technological developments that could affect the operation of this Convention and, in this context, direct the Director-General to establish a Scientific Advisory Board to enable him, in the performance of his functions, to render specialized advice in areas of science and technology relevant to this Convention, to the Conference, the Executive Council or States Parties. The Scientific Advisory Board shall be composed of independent experts appointed in accordance with terms of reference adopted by the Conference" (Article VIII, paragraph 21(h))

Then later, the Convention, in its description of the responsibilities of the Technical Secretariat, states that

> "The Director General shall be responsible for the organization and functioning of the Scientific Advisory Board referred to in paragraph 21 (h). The Director General shall, in consultation with States Parties, appoint members of the Scientific Advisory Board, who shall serve in their individual capacity. The members of the Board shall be appointed on the basis of their expertise in the particular scientific fields relevant to the implementation of this Convention. The Director General may also, as appropriate, in consultation with members of the Board, establish temporary working groups of scientific experts to provide recommendations on specific issues. In regard to the above, States Parties may submit lists of experts to the Director General." (Article VIII, paragraph 45)

The establishment of an independent body to provide technical advice originated in a French proposal (1987) raised during the *Ad Hoc* discussions on what would later became Article VI, 'activities not prohibited under this Convention'. It was in the elaboration of this Article, the part of the Convention that lays down the framework for the extensive routine procedures for industry inspections detailed in the Convention's Annexes, that concerns about technical change came to the forefront. These concerns are reflected in the French Working Paper which states that verification or monitoring measures "cannot be fixed once and for all, but will have to be evolutionary in nature so that they fulfil their aim many years after the entry into force of the convention, without harming the legitimate economic interests of any country" (France, 1987, p. 1). And then later: "while the convention must be firm and intransigent as regards its purposes and principles, it must be a *living institution as regards its application.* It must, indeed, be capable of adjustment to all the technological advances that will inevitably occur both in the chemical industry and in the sphere of control." (France, 1987, p. 1, author's emphasis) This background prompted the French to outline their proposal as a complement to the lists of chemicals that were to become the Schedules, for a 'scientific authority'.

The role the French had in mind for the scientific authority was threefold. First, to "[i]mmediately upon the declaration of stocks, to complete the compilation of the lists of products to be prohibited or monitored" (France, 1987, p. 3), a requirement which supports the assumption that some states harboured significant fears that others had

stockpiled weapons hitherto unknown. Next, during the implementation of the Convention, the scientific authority's role would be to identify new technologies that warranted incorporation into the inspection procedures of the Convention and to propose measures for verification. In an additional, third role, the authority would also be consulted on improving the efficiency of inspection and verification procedures, and on making them less intrusive.

Although little immediate progress was made following the French Working Paper, it was discussed in Pugwash meetings and it attracted sufficient support for France to reiterate and elaborate on its initial paper two years later (France, 1989). In its second proposal, France explained its choice of the scientific community to fulfil the roles it had outlined two years earlier:

> "There is every evidence that the representatives of the scientific community are best qualified to perform this task of monitoring, advising and preparing the ground for decision-making. The scientific community has a universal calling, and, without moving away from its own role, must be in a position to transcend divergences in culture and in interests between States in order to provide an objective assessment of scientific and technological developments as the affect the convention." (France, 1989, p. 1)

The Working Paper set out a proposal for the terms of reference the body, by this time named the 'Scientific Advisory Council'. These included options for the reporting structure of the Council (although no agreement had then been reached on who the Council would report to) and the fields of expertise that could be drawn upon. Roughly speaking, these were: chemistry; chemical engineering and industry; toxicology; pharmacology; biotechnology; and military sciences. The second French proposal also expanded on the tasks which would be assigned to the Council. These were in substance those detailed in the first Working Paper:

> "- Monitoring of scientific and technical developments as a whole, and particularly infields of relevance to the objectives of the convention.
>
> - Initial examination of the lists of chemicals following declarations of stocks and production facilities, and subsequently specific study of proposals for modification of the lists and related guidelines, and of requests for their revision (originating either from the Technical Secretariat or from the States Parties).
>
> -Well-grounded proposals for additions or modifications to the lists and the guidelines, and warnings concerning new toxins.

> - Review of the scientific aspects of verification methodologies;
>
> - Advice on the development of economic and technical co-operation among the States Parties, as well as assistance;
>
> - Advice on international co-operation in the collection and provision of scientific and technical data of relevance to the convention (international network of data banks)." (France, 1989, pp. 3 - 4)

These functions were effectively the same as those set out later within the Terms of Reference of the SAB that were adopted at the second Session of the CSP, in 1997 (Organisation for the Prohibition of Chemical Weapons, 2004a):

> "The role of the Board shall be to enable the Director-General, in the performance of his functions, to render specialised advice to the Conference, Executive Council or States Parties in areas of science and technology relevant to the Convention. Consistent with the provisions of the Convention, the functions of the Board include the following:
>
> - assess and report to the Director-General developments in scientific and technological fields relevant to the Convention;
> - as necessary, provide advice on proposed changes to the Annex on Chemicals originated by States Parties in accordance with Article XV of the Convention;
> - co-ordinate the efforts of the working groups temporarily established in accordance with paragraph 9 below;
> - as necessary, provide scientific and technological advice relevant to the Convention, including advice on technical matters related to co-operation and assistance, to the Technical Secretariat upon request;
> - upon the request of the Director-General, assess the scientific and technological merit of a present, or proposed, methodology for use by the Technical Secretariat in verification under the Convention;
> - when directed by the Conference acting in accordance with paragraph 22 of Article VIII, provide advice and make recommendations taking into account any relevant scientific and technological developments for the purpose of assisting the Conference in its review of the operation of the Convention;
> - assess and report on emerging technologies and new equipment which could be used on verification activities." (Organisation for the Prohibition of Chemical Weapons, 2004a, Annex, p. 2)

France's precise motives for proposing such a body are difficult to pin-point but it is clear from the first proposal that the scientific body would have a significant role in proposing changes to the procedures and technologies for undertaking industry inspections, particularly in order to address the intrusiveness of such inspections.

Although this role has become one of a range of roles assigned to the SAB, it is important in the context of the negotiation of the Convention. Based on the information derived from individuals formally engaged with the UK delegation during the negotiation phase, some states were significantly more protective positions towards their chemical industries than others. For example, France and Germany had substantially more defensive attitudes towards industry verification than the UK, the Scandinavian countries, Australia, Canada and Switzerland.[44] If this sensitivity was one of the drivers for the SAB, one of France's motives might well have been to apply changes in technology to the Convention in such a way to minimise the burden on its chemical industry.

That said, it is also probable that France's main position with respect to technical change was similar to that of the UK. This position was put in plain words at the time by British negotiators who said that the projected treaty should not be a graveyard. According to one interviewee, this view was shaped by intelligence assessments of developments in the Soviet chemical warfare programme. This prompted the UK to move the focus away from so-called 'legacy chemicals', those chemicals that had already been weaponised, towards chemicals that had not been previously known as chemical warfare agents, or chemical compounds that might be developed in the future.[45] The British response to the French proposals was favourable. Based on the same interview data, this was partly because a precedent existed for such a body in the International Atomic Energy Agency (IAEA) which also had a mechanism to advise its Director-General on the question of safeguards. It was also clear to those working on the CWC that the rate of change in the chemical sector was much greater than in the equivalent nuclear field. The existence of an independent board whose mandate was to monitor developments in science and technology was therefore in line with the UK's position outlined above.

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[44] Interview, Independent Consultant, 21 March 2007.

[45] Interview, official at the UK Foreign and Commonwealth Office, 17 November 2008.

Once the concept of an independent scientific monitoring body had been introduced into the rolling text, in the form of a footnote to the Consultative Committee's function in establishing subsidiary bodies (Conference on Disarmament, 1988a), there then emerged a number of disagreements as to the make-up, responsibilities and reporting structure of the Board. By the next year a Working Group had devised language to address specifically the Scientific Advisory Board and proposed a 'dual mention' of the SAB within the responsibilities of both the CSP and the TS (Conference on Disarmament, 1989b, Appendix II, p. 189). However, by 1990 there was still only one reference to the SAB, which required the CSP to "direct the Director-General to establish a Scientific Advisory Board to enable him, in the performance of his functions, to render to the Conference of States Parties, the Executive Council or States Parties independent and specialized advice in areas of science and technology relating to the Convention" (Conference on Disarmament, 1990). This clause was accompanied by a footnote expressing the need for further examination of the subject, particularly the relationship the Board with have with other organisational bodies and its financial implications. A second reference to the SAB was inserted later that year, and this resulted in the convoluted description of the Board's reporting structure that exists in the final Convention text.

In cases such as these, it often transpired that the easiest way to reach consensus was by writing constructive ambiguities into the text. These ambiguities could either allow multiple interpretations of the Convention text, or they could lay out complicated and sometimes contradictory provisions addressing the same subject. Pierre Cannone, a French delegate involved in the formulation of the French proposals and later involved in the OPCW Preparatory Commission, addressed this issue when he wrote that the convoluted prescriptions for the functioning of the SAB reflect "the differences of opinion which surfaced during the negotiations regarding the responsibilities of the SAB and its relationship with the different bodies of the OPCW. This provision does not facilitate a harmonious division of responsibilities" (Cannone, 1994). The 'division of responsibilities' to which Cannone alludes is the separation between the responsibilities of the Director-General and of the States Parties. These complications with regard to the functioning of the Board will be discussed further in chapters 6 and 7.

This section has discussed the historical origins of the general purpose criterion as embodied in the Convention's definition of a chemical weapon; the Schedules of Chemicals in the Convention's annexes; the provisions on review conferences; and the Scientific Advisory Board. Although addressed separately, the manner in which they developed was co-evolutionary and was specifically related to technological advances in chemical warfare during that period. For instance, as the chemical weapon definition expanded in scope, so the Schedules came to represent more than just a list of chemical warfare agents and their precursors. As the Schedules began to take form as a guide for routine inspections, so the need to maintain the up-to-date lists through the SAB became apparent. And as technological innovations in the United States, the Soviet Union and other states proceeded, so too did the need to maintain the references to technical change in the Convention. In short, technical change influenced to a considerable extent, the negotiations in all of the sections examined.

Having laid out, historically, the manner in which the negotiators of the Convention, as well as the experts involved, perceived science and technical change, the next chapter will address the current use of expertise in the CWC and will focus on the role, form and function of the Director-General's Scientific Advisory Board.

6 Expertise in the Organisation for the Prohibition of Chemical Weapons

At the OPCW, significant rhetorical power is given to science, and the claimed authority of science. The body most commonly identified as the source of scientific expertise is the Director General's Scientific Advisory Board (SAB). But the function of this group of experts, and the relationship it has with other organs of the OPCW is not straightforward. One complicating aspect of this relationship is the increasing disdain with which representatives of some member states view the Board's activities. Earlier chapters have demonstrated that rendering 'independent' 'scientific' advice is difficult at the best of times, but the climate of secrecy and suspicion often present in the field of security only adds to the complexity. Chemical weapons policy has been (and still is) subject to considerable political manoeuvring, and this section of my dissertation will argue that the limitations of 'science-based' policymaking are recognised, accepted and sometime exploited by both diplomats and scientists who are experienced in the field. But it also contends that the SAB's haphazard functioning and poor self-awareness have played a part in undermining its credibility.

The results described in this chapter are based principally on the collection of primary data *in situ* at the OPCW, notably in the form of observation, documentary sources and interviews as discussed in chapter 4. Secondary sources, largely documentary, have also been used to supplement and support the primary sources.

6.1 The structure and membership of the Scientific Advisory Board (SAB)

As the negotiations for the CWC progressed towards completion in 1992, the *Ad Hoc* Committee on chemical weapons had succeeded in agreeing to a Scientific Advisory Board, albeit with a complex and confusing reporting structure, as noted in the previous chapter. When the negotiations were completed, the OPCW Preparatory Commission (PrepCom) was assigned the task of drawing up the Terms of Reference for the Scientific Advisory Board. But the PrepCom failed to complete this task before the entry into force of the Convention[46] and the SAB's Terms of Reference joined a list of issues that were termed 'unresolved' and listed in the PrepCom's final report (Preparatory Commission for the Organisation for the Prohibition of Chemical Weapons, 1997). To this day, many of these issues remain unresolved but by the second Session of the Conference of the States Parties, in December 1997, the Terms of Reference for the Board had been drawn-up and were adopted.

The Board originally consisted of twenty experts (though this was revised upwards to twenty-five in 2004) and the membership is currently made up of academics, government scientists, and chemical industry experts representing the wide variety of disciplines related to the science and technology of chemical weapons; a summary of SAB member backgrounds is given in Appendix 1 and a photograph taken at its Tenth Session is given in Appendix 3. The term of appointment to the Board for any member

[46] Article XXI states that the "Convention shall enter into force 180 days after the date of the deposit of the 65th instrument of ratification, but in no case earlier than two years after its opening for signature." This minimal gap of two years was to allow the PrepCom the time to prepare the ground for implementation.

is three years, and each individual may serve on the Board for a period of up to two terms.

Without delving into the personality traits and agendas of the SAB members, it is apparent from observing meetings that informal or social sub-groups exist within the Board. These subsets are not formed along regional / political lines *per se* but they are sometimes aligned along certain normative concerns. It is in such situations that the concept of epistemic communities may apply. For instance, there exists a subset of the SAB (which belongs to a community that extends far beyond the Board's borders) that is particularly experienced in the issues of the CWC. The members of this subset are characteristically scientists who have had a longstanding interest in (and often involvement with) the Convention, and they include academic and government scientists and occasionally people from the chemical industry. Many would argue that this community possesses the distinguishing features of an 'epistemic community' (Haas, 1992, 2004) but the empirical findings of this research question (a) whether there indeed does exist such a community, and (b) should it exist, whether it lives up to the IR model as described in chapter 3.

6.1.i. Appointment process

The formal basis for the appointment of members to the Board is expertise. Article VIII, paragraph 45 of the CWC states that "members of the Board shall be appointed on the basis of their expertise in the particular scientific fields relevant to the implementation of this Convention". Very early on in the Board's existence, it became clear to the OPCW that measures needed to be taken to protect the SAB from the complex political juggling that dominate the activities of many other organs of the OPCW and, as Kathleen Lawand notes, this clause is both designed to focus attention on science (membership based on expertise) and away from politics (membership based on geographic representation) (Lawand, 1998). However, even if the Board were to remain as apolitical as possible, this does not exclude politics from entering into its make-up. Indeed as will be demonstrated below, politics plays a significant role in the Board's existence.

According to Lawand, the Terms of Reference for the SAB were drafted during a series of informal consultations of states party in which the "main points of contention related to the Scientific Advisory Board's composition, its function, and to a lesser degree, its role. Underlying the divergence of views on these constitutional issues were concerns regarding the degree of freedom of the Director-General in the appointment process and the relationship of the Scientific Advisory Board to its temporary working groups." (Lawand, 1998, p. 2) As demonstrated earlier, these concerns originated from the Geneva negotiations and were translated in turn firstly into the treaty's provisions on the SAB and then into the Board's terms of reference. But even though the Convention itself pays no regard to geographic representation with respect to the SAB, the Terms of Reference state that in considering the candidatures presented by states party, the Director-General must consult with the member states to ensure "a comprehensive spread of relevant fields of scientific and technological expertise, and result in a fair distribution of appointments from the regions" (Organisation for the Prohibition of Chemical Weapons, 2004a, Annex, p. 3). According to Lawand, this ambiguous language was necessary as a consensus-building tool to accommodate both those arguing for appointments based on experience and those arguing for appointments based on equitable geographic distribution (Lawand, 1998).

To judge from direct observation of the OPCW in action, the appointment process is in practice initiated by a call for nominations to all states party made by the Director-General and outlining the areas of expertise being sought. If the call is being made for positions on the SAB itself, the areas of expertise required are set out in general terms, but if the call is for positions on the SAB's Temporary Working Groups (more on these later) the requirements are more specific. Once nominations from states party have been received by the Director-General, they are studied by the Secretary of the SAB (which is now located in the Office of the Deputy Director-General) who draws up a series of appointment options balancing on the one hand, the types of expertise and experience required on the Board and on the other, fair geographic representation. These are then referred back to the Director-General who makes a decision. It is at this

latter stage that the Director-General is required to consult with OPCW member states, but the extent to which this process actually occurs is not widely known.

6.2 Mandate and role

As stated in the Convention and in the SAB's Terms of Reference, the role of the Scientific Advisory Board is to "render specialized advice in areas of science and technology relevant to this Convention, to the Conference [of the States Parties], the Executive Council or States Parties." The terms of reference further elaborate this role by stating that the Scientific Advisory Board is to:

- "assess and report to the Director-General developments in scientific and technological fields relevant to the Convention;
- as necessary, provide advice on proposed changes to the Annex on Chemicals originated by States Parties in accordance with Article XV of the Convention;
- co-ordinate the efforts of the working groups temporarily established in accordance with paragraph 9 below;
- as necessary, provide scientific and technological advice relevant to the Convention, including advice on technical matters related to co-operation and assistance, to the Technical Secretariat upon request;
- upon the request of the Director-General, assess the scientific and technological merit of a present, or proposed, methodology for use by the Technical Secretariat in verification under the Convention;
- when directed by the Conference acting in accordance with paragraph 22 of Article VIII, provide advice and make recommendations taking into account any relevant scientific and technological developments for the purpose of assisting the Conference in its review of the operation of the Convention;
- assess and report on emerging technologies and new equipment which could be used on verification activities." (Organisation for the Prohibition of Chemical Weapons, 2004a, Annex, p. 2)

Although these functions are clearly and formally set out, questions remain about what states party actually expect from the Board. Some interviewees believed that before the functioning of the SAB could be improved, a greater collective understanding of the

Board's role between states party to the Convention is required.[47] Officials at the UK National Authority took a similar view, noting that different states saw the SAB's role differently and arguing that it was the relationship between the SAB and the CWC states party that needed work.[48] But such a consensus will not be easy because interpretations of the SAB's role vary widely between the Technical Secretariat, states party to the Convention, and outside the OPCW itself. For example, the Republic of Korea may have stated that "SAB reports must be based upon purely scientific grounds" (2003, p. 3) which is in line with the Terms of Reference but in practice it is just one of a range of views on the extent to which the Board should engage with policy.

Despite the stress in the SAB Terms of Reference on the provision of scientific advice, a United States policy official revealed that questions to the SAB are often formulated in such a way that the Board is encouraged to address policy issues directly.[49] This interviewee stressed that there was no such thing as a purely technical matter and that the manner in which the questions were put to the Board required careful attention. Stemming from a lack of consensus on the role of the Scientific Advisory Board and on the extent to which it is expected to become involved with policy issues, there arise two quite separate problems. The first relates to the framing of the issues assigned to the Board, and the second concerns the extent that the states party can influence the Director-General's ability to implement the Board's recommendations. Both of these will be discussed in later sections of this chapter.

Although the SAB is formally required to report to and advise the Director-General alone, in practice, the Board reaches a wider audience (though not generally beyond the Organisation's bounds, for instance, the reports of its meetings are not made public). In recent years, the recommendations of the Board have attracted significant

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[47] Interview, official at the US Department of State, 10 June 2008; Interview, official at the UK Foreign and Commonwealth Office, 17 November 2008.

[48] Interview, officials at the UK National Authority, 17 November 2008.

[49] Interview, official at the US Department of State, 10 June 2008.

attention and have at times become contentious points of negotiation within the OPCW. As discussed earlier, the convoluted outcome of the negotiations for a Scientific Advisory Board led directly to differing interpretations of the Board's role and reporting structures, so this development is not surprising.

The issue of policy engagement has gained importance over time, and for the following reasons. Firstly, the Board has become increasingly political more by virtue of its existence than the nature of its recommendations alone. Some states party have come to regard the SAB as a tool of the West, which has led them to be increasingly sceptical of the Board's activities and this became extremely visible during the Second Review Conference in 2008, as will be discussed in the next chapter. Secondly, the SAB has become embroiled in a number of highly drawn-out political debates, and has delivered recommendations to the Director-General that have directly affected the political debate. Thirdly, the SAB has, in some instances, been tasked with issues that have resulted in a more – rather than less – polarised political debate with the delivery of the Board's recommendations. This has led some to question whether the SAB has been tasked beyond its scope? Or has the Board simply failed to perform its duties with sufficient rigour? The next section will provide some answers to the questions above by examining how the meetings of the SAB unfold.

6.3 Meeting structure and dynamics

To a significant extent, the frequency of SAB meetings is dependent on how the Board is funded year by year. The funding is organised through two separate streams: the annual budget of the Organisation and the 'SAB Trust Fund' set up by the Technical Secretariat in 2006. The need for a separate Trust Fund to support the activities of the Board arose from the limitation of the budgeted allocation to one formal meeting of the Board per year. In other words, further meetings of the SAB or any subsidiary groups are excluded from the Organisation's annual budget. This lack of funding meant that some members were unable to attend the meetings, and the Technical Secretariat

considered that a lack of funds had hindered the SAB'S ability to implement the recommendation of the First Review Conference to 'enhance' the interaction between the Board and the delegations (Organisation for the Prohibition of Chemical Weapons, 2003b, 2006). More recently, in 2009, the Council of the European Union has adopted a Joint Action (its fourth supporting the work of the OPCW) that will supplement the Trust Fund, where contributions from states party have been disappointing, to enable a second meeting of the SAB in autumn 2009 (Council of the European Union, 2009).

During the time spent in residence at the OPCW, I was able to attend two meetings of the Scientific Advisory Board. The formal meetings of the Scientific Advisory Board take place over three days, usually once a year. During the first day a number of standing items are addressed, such as the welcome address from the Director-General, an overview of developments in the OPCW, the introduction of new members and the establishment of a 'drafting committee'.[50] Once the agenda was approved, the meetings proceeded in an informal manner with discussion of the agenda items interrupted only by briefings from Technical Secretariat staff or outside speakers. During the last day of both meetings, significant time was devoted to reviewing the draft report that had been prepared by the drafting committee.

It became apparent to me as an observer during the meetings of the SAB, that a number of functional issues had had implications for the Board's results. Broadly speaking these fell into three categories: the level of participation; the meeting's records; and the procedures for reporting. These are discussed further below.

6.3.i. Participation

Of the twenty-five members that attend the meetings, only about half actively participate in the SAB's discussions. The twenty-five members of the Board are an eclectic group of scientists from various scientific backgrounds ranging from analytical chemistry to medical toxicology through chemical weapon munitions experts. In

[50] The drafting committee was assembled by the Chair of the Board, and was a product of self-nomination and designation based on drafting ability in the English language.

addition to this, no two members are from the same country and some members appear to have been selected to fulfil unofficial political criteria for geographic representation. At present, the sole common trait is that all its members are men.

Assessing precisely how this diversity impacts the dynamics of the Board is difficult but what is clear is that language barriers have influenced the ability of some members to become involved in the discussions of the Board. The level of preparation for the SAB meetings was also highly inconsistent across Board members. This caused a certain degree of chaos, with some Board members familiar neither with the agenda nor the background documents for the meeting. In part, this pattern of poor preparedness has led the current Secretary to the SAB to compile collections of background papers for each Board member which in theory gave all members access the relevant papers. But such arrangements can only go so far in assisting Board members who are not prepared to consult them in advance of the meetings.

Another explanation for the different levels of individual participation by members of the Board can be found in their variable experience in matters of regulatory science.[51] The ability of narrowly focused scientists to comment on issues under discussion in the Scientific Advisory Board that comprise both scientific and political elements is limited. By contrast, a significant minority of Board members have had direct policy-relevant experience in the chemical weapon context and these have emerged as ‘go-to’ individuals for advice on technical, and sometimes also on some political, issues within other forums. This spread of competence among Board members has meant that, in effect, most of the SAB is divided into two groups: the first formed by scientists new to the field and the other formed of individuals extremely familiar with field, with only a few Board members actually falling between the two groups. This imbalance in knowledge challenges the assumption made by some that SAB members have almost perfect scientific information.

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[51] “Regulatory science” is defined by Sheila Jasanoff (1990, p. 18) as science used in policymaking.

6.3.ii. The Temporary Working Groups

The Scientific Advisory Board has a system of ancillary groups, called Temporary Working Groups (TWGs) that are commissioned by the Director-General to address specific issues as and when required. As the Terms of Reference of the SAB state:

> "Each working group shall be chaired by a member of the Board appointed for that purpose by the Chair with the approval of the Director-General. The Director-General may appoint to the working group such experts from the lists provided by States Parties or as suggested by the Board or its members. Only citizens of States Parties are eligible to serve as members of a working group." (Organisation for the Prohibition of Chemical Weapons, 2004a, Annex, p. 4)

This provision allows the Board to extend itself beyond its own capabilities by tapping into a wider network of experts. The TWGs meet independently of the central Board meeting and produce a report on a given issue that is then forwarded to the SAB for its consideration. Due to the specificity of the issues that the TWGs address, their membership changes with different topics and usually consists of a mix of SAB members and experts recruited externally. The different composition of the Temporary Working Groups is reflected in the nature of their work and in the reports that they produce: discussion tends to be highly focused and technical and the reports are written for specialists, not policymakers. Once the outcome of a TWG is submitted to the Board, the SAB discusses the TWG recommendations within a wider context and formulates specific recommendations for the non-specialist audience.

The nine TWGs established to date are shown in Figure 4, below. Immediately visible from this is that the frequency of TWGs has decreased in recent years with, at the time of writing, only two TWGs undertaking active work on Sampling and Analysis and on Biomedical Sampling respectively. Instead the SAB has chosen to use external experts to brief the Board on emerging technologies. This has meant that more of the SAB's work takes place within the annual meeting rather than being delegated out. Part of the explanation is financial, as the OPCW budget (as outlined above) only provides for one regular meeting of the Board per year, but it means the SAB's three-day meetings are conducted under increasing pressure.

Subject matter	Year(s) established
The production of ricin in civil industries	1999
Chemical weapon destruction	1999
Analytical procedures	1999 - 2000
Equipment issues	1999
Adamsite	1999
Concentration limits for Schedule 2A / 2A* chemicals	2000
Biomedical samples	2004 - 2007
Sampling and analysis	2007
Advances in science and technology	2008 -

Figure 4 The Temporary Working Groups of the SAB

The format of delegating the Board's tasks to Temporary Working Groups carries with it many advantages that could influence the SAB's capacity to provide useful recommendations to policymakers in The Hague. The TWGs are also efficient in introducing potential future SAB members to the singular context of the chemical weapon regime and familiarising them with the style and substance of SAB activities. Furthermore, proposals have also been made to use the TWGs as forums to foster a more substantive relationship between the SAB and the Technical Secretariat, but there are possible drawbacks in too close a relationship. Amongst national policy-level officials, the Working Group format is favoured as being most suitable for the SAB,

and interview sources both within the Technical Secretariat and within national governments confirmed this position.[52]

Temporary Working Groups are also popular within the Board itself. The need to set up a TWG is often first recognised by the SAB – usually in circumstances where specific expertise is required – and the Board plays a key role in determining the Working Group's composition and Terms of Reference. Once a Chair is nominated from the Board, the TWG's membership, funding and terms of reference are discussed. Temporary Working groups are composed of SAB members and of outside experts recruited through the Member States. Based on my observations of the SAB, Board members are allocated to the TWGs on a voluntary basis; this clearly has advantages in reflecting current SAB expertise but in some cases the level of interest from the SAB is so high that the TWG is *de facto* another meeting of the Board in terms of its participation.

For instance, at the Eleventh Session of the SAB a call for membership on a new TWG on 'advances in science and technology and their potential impact on the implementation of the Convention' resulted in almost all present Board members raising their hands in interest. Such a wide membership defeats the purpose of a TWG which is to host small discussions, narrow in scope, on issues that require expertise beyond the means of the Scientific Advisory Board. In addition to over-representation by SAB members, another aspect of this TWG is intriguing. The establishment of a TWG on a topic as broad as 'advances in science and technology' is at odds with the mandate of the TWGs "to provide recommendations within a specific time-frame on specific issues" (Organisation for the Prohibition of Chemical Weapons, 2004a, p. 4). Setting up a TWG on this topic was a missed opportunity for the Technical Secretariat to reflect and offer its guidance on a question within the Board's own mandate but beyond the scope of a TWG.

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[52] Interview, Technical Secretariat staff member, 9 November 2007; interview, official at the US Department of State, 10 June 2008; interview, official at the Foreign and Commonwealth Office, 17 November 2008; interview, official at the Defence Science and Technology Laboratory, 8 December 2008.

The funding of the Scientific Advisory Board's ancillary groups is arranged independently of its core budget allocation, and therefore relies on a number of mechanisms to raise funds. Temporary Working Group meetings have been 'sponsored' by individual member states; for instance, Spain hosted and supported the second meeting of the TWG on Sampling and Analysis, in December 2007.[53] Meetings may also be supported through the aforementioned Trust Fund established by the Director-General in 2006.

6.3.iii. Democratic principles

A feature of the OPCW that has troubled academics and NGOs alike is the lack of transparency in the way the Organisation undertakes its activities. This confidential operation affects much more than its external relations, it also impacts on the functioning of its subsidiary bodies – including the Scientific Advisory Board – by reinforcing the knowledge gap between those members already belonging to the networks of information and those outside the loop.

Although the SAB routinely receives briefings from the Technical Secretariat on developments in the implementation of the Convention (usually once-a-year updates), it has been argued that these updates are neither adequate, nor do they present the balanced position expected from an 'independent' body. For instance one interviewee, an active member of the SAB, voiced concerns that the Technical Secretariat had presented a biased interpretation of results from the implementation of the trial phase of sampling and analysis during Schedule 2 inspections.[54]

Another cause for concern comes from the process used to report dissent among the Board members. As observed earlier, the assumption that scientists tend to agree on technical matters has been extensively contested in the literature. That dissensus exists

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[53] The second meeting of the Temporary Working Group on Sampling and Analysis was held in Madrid on 10 – 11 December 2007.

[54] Interview, current member of the SAB, 12 February 2008.

is not a problem in itself – in fact, in light of the theoretical propositions made in chapters 2 and 3 it could be viewed in an opposite light – but the balanced communication of disagreement is crucial to the success of the Board. It is of the utmost importance that the views of all members of the Board are represented in the SAB reports to the Director-General and that dissensus is not reported as consensus.

Experience from time spent at the OPCW – albeit limited – suggests that the reporting of dissensus varies significantly depending upon the nature of the issue at hand, but the usual outcome was that the full extent of debate was not adequately reflected in the reports. Instead, the reports would purport to summarise a process of deliberation and argument leading to one of two possible outcomes. Either a positive recommendation based on the appearance of consensus from within the Board (although no voting system was in place and, with low participation levels, it is impossible to say whether true consensus was truly achieved). Or the Board would cease to discuss an issue or particular recommendation, and if the item was not explicitly stated in the agenda of the meeting, would sometimes remove it from the record of the meeting altogether. This behaviour is presumably driven by a perception that, in some cases, it is better not to say anything at all than to deliver fragmented recommendations to the Director-General.

6.4 The framing of the questions to the SAB

The framing of questions to bodies rendering scientific advice had been widely addressed in the literature on the roles of scientific expertise, and the process of framing has been afforded some importance (see, for instance, the work of Stirling, 2008a, 2008b). The reason for such an emphasis is straightforward: the way a question is posed to a board of advisors influences directly the types of advice the board will be able to render. Accordingly, the balance between the political and the technical can be largely determined at the first stage of the advisory process, the delivery and thus the framing of the questions. As Funtowicz and co-workers argue

> "[i]n the framing of a problem, the issue, characterised by its purposes, becomes translated into a relatively precise specification of what questions can be put in a scientific way, and what reliable answers can be hoped for. The framing of the problem also frames our future ignorance, for what is excluded from enquiry at this stage will not be discovered (or maybe, at best, by chance, by mistake, by anomaly or by deviancy). Hence the framing of the problem is not purely technical, but has its own policy dimension." (Funtowicz et al., 2000, p. 333)

The question of framing within the OPCW's Scientific Advisory Board is, however, not a straightforward one, as its chains of responsibility are complex. According to the strict letter of the Convention, only the Technical Secretariat's Director-General can refer items to the Scientific Advisory Board. But in practice, other mechanisms have been made use of, for instance, CSP decisions led to the SAB's discussion of the reporting of ricin production (Organisation for the Prohibition of Chemical Weapons, 1997) and of the term 'production by synthesis' (Organisation for the Prohibition of Chemical Weapons, 1998). But although both Conference decisions led the Director-General to assign issues to the SAB, they do so with very different language. The decision on ricin "*[d]ecided* that the Director-General *shall* task the Scientific Advisory Board" (Organisation for the Prohibition of Chemical Weapons, 1997, p. 1, emphasis added) whereas the decision on production by synthesis "*[r]ecommends* that the Director-General *request* the Scientific Advisory Board" (Organisation for the Prohibition of Chemical Weapons, 1998, p.1, emphasis added) to address the issue. In the case of ricin, the Conference has clearly dictated the SAB's agenda.

In other instances, routes on to the Board's agenda are less clear still. One is through the deliberations of the Board itself. There have been several occasions when the Board itself has proposed recommendations on issues that have been formally referred to the SAB neither by the Director-General, nor the Conference of the States Parties. An example was the Board's decision to modify the discussion on whether the Convention's provisions for scheduled chemicals also apply to the salts of those chemicals to focus specifically on the status of one toxin, namely saxitoxin. As is stated in the section of the report of the SAB's Eighth Session dealing with salts of scheduled chemicals:

> "Related to this issue was the question of what constitutes saxitoxin, which is listed in Schedule 1 together with the Chemical Abstracts Service (CAS)

> registry number of the dihydrate (free base). This situation is of little help when it comes to considering which form or forms of the molecule are actually considered to be included in the Schedules of Chemicals." (Scientific Advisory Board, 2006, p. 4)

This is a clear instance of the SAB using its own initiative to bring to the attention of the OPCW an issue that it deemed important for the implementation of the Convention.

Another example of an unorthodox route onto the SAB's agenda can be found in the Board's 2005 report. At this meeting the Board discussed a number of items forwarded to it from "consultations within the facilitation process of the Executive Council" (Scientific Advisory Board, 2005, p. 7). This means that subsequent to consultations on issues under consideration in the Executive Council, the facilitator(s) of those meetings required technical clarifications on the following issues, some of which had already been addressed and reported by the SAB: captive use; the nomenclature of ricin; salts of scheduled chemicals; and the role of CAS registry numbers (Scientific Advisory Board, 2005).

The Scientific Advisory Board's preparatory work for the two CWC Review Conferences have also provided valuable opportunities for the Board to exert control over its own agenda. But there are also other influences at work that, at first, seem surprising; for instance, the two special SAB reports to assist the OPCW in its reviews of the Convention were heavily influenced by discussions within a very different forum, the International Union of Pure and Applied Chemistry (IUPAC). Prior to both the first and the second CWC Review Conferences, IUPAC convened international workshops to address the Convention in terms of the challenges and opportunities presented to it by technical change (Balali-Mood *et al*., 2008; Parshall, 2002b). On both occasions, the workshops brought together SAB members, government experts, and private and academic experts. The reports of these workshops were studied and heavily influenced the SAB's advice to the two Review Conferences.

In fact, the weight IUPAC has is not surprising at all considering that many of the members of the SAB are brought into the organising committee for the IUPAC workshops. However, IUPAC occupies a unique position as an NGO that has occupied

a position between the scientific discussion of the SAB and policy; it has taken on one role of a boundary organisation and, so far, this function has proved productive.

These various avenues for channelling expert advice on the technical aspects of the Convention have a number of consequences on the type and the function of the advice given. Not only does the Scientific Advisory Board receive calls for a wide variety of types of advice, but the fact that the SAB has more than one 'audience' adds further complexity to its work. Although, formally speaking, the SAB is the Director-General's tool, it must target its advice to the States Parties and to different branches of the Technical Secretariat, including the OPCW's Laboratory. For this reason, the SAB must be sensitive to the range of routes taken by issues into, and out of, the Board.

However, there is significant evidence pointing to weaknesses in the framing of questions on their way in to the SAB. In interview, one official drew attention to the way that the questions tended to be phrased by the Director-General in a 'what should be done about problem x or issue y?' manner.[55] Some concrete examples may be cited in this context. One is the formulation of the call for advice on low concentrations of Schedule 2 chemicals (a highly contentious and political issue as will be discussed further below):

> "The Director-General, following the decision of the Conference of the States Parties as contained in document C-V/DEC.19 dated 19 May 2000, requested the SAB to study all relevant aspects of the applicable concentration limits for mixtures of chemicals containing Schedule 2A and 2A* chemicals and to report the results for his submission to the Executive Council for consideration with a view to a decision being submitted for the consideration of States Parties at the Sixth Session of the Conference of the States Parties" (Scientific Advisory Board, 2001, Annex 2, p. 8)

The framing of this request, and particularly the use of the phrase 'all relevant aspects', in no way assists the SAB's task of providing 'scientific and technological advice relevant to the Convention' as it is required to do in the Board's Terms of Reference. Quite to the contrary, because the question is directly linked to a future decision of the Conference of the States Parties, it indirectly mandates the SAB to consider the issue in all its aspects (both scientific or political). In other words, the question mandates to

[55] Interview, official at the US Department of State, 10 June 2008.

SAB to make direct policy recommendations which in a sensitive area may be viewed as reckless.

It would be easy to assign blame to the Director-General's use of such phrasing for the negative outcome of the SAB's work on this issue. But in fact the phrasing used by the Director-General originated from a decision of the Conference of the States Parties which requested the Director-General to

> "task the Scientific Advisory Board to study all relevant aspects of the applicable concentration limits for mixtures of chemicals containing Schedule 2A and 2A* chemicals and to report the results to the Council for consideration with a view to a decision being submitted for the consideration of States Parties at the Sixth Session of the Conference of the States Parties." (Organisation for the Prohibition of Chemical Weapons, 2000, p. 1)

The question submitted to the SAB was a product of consensus-based decision-making between approximately 150 states forwarded to the Board by the Director-General who had been tasked to do so by the Conference of the States Parties. The questions, which therefore arise, are: does the Director-General have the liberty to adjust the phrasing of the question put forward by the CSP? If yes, then why was the formulation put forward by the CSP not adjusted to better suit the competences of the SAB? And if not, why not?

Other questions put to the Board seem even further removed from the 'scientific'. An example concerns the case of salts of scheduled chemicals brought to the attention of the SAB at its Second Session: the Director-General's request required the SAB to "give its advice on whether the listing of certain scheduled chemicals containing amino groups implies that the provisions of the Convention also apply to the salts of these chemicals, such as hydrochlorides, even if the entry in the Schedules of Chemicals makes no mention of such salts" (Scientific Advisory Board, 1999, p. 4). Although a number of scientific and technological factors are highly relevant to this debate (for instance, it was a salt form of saxitoxin, rather than the free base, that had actually been weaponised in the past) the main point of contention related to policy not to science. The question does not ask whether the salts of chemicals are chemically 'equivalent' to their free-base but instead requests the SAB to comment on the legal interpretation of the Convention on an issue that is already well known to experienced policymakers in

the field. The SAB skirted around the regulatory issues to respond that although salts were chemically different to their parent compounds, the equilibrium in which they existed meant that there was no fundamental difference in chemical properties (Scientific Advisory Board, 1999).

The two examples given above shed light on the Organisation's mixed record in being sufficiently careful when framing requests for advice from technical experts. But it is also important to recognise that there are examples of considerable care being taken in the design of questions. For instance, also at the Board's Second Session, when it was tasked by the CSP to address the unresolved meaning of the Convention's term 'production by synthesis', the question was formulated as follows:

> The Conference had requested that the Scientific Advisory Board "address, solely from a scientific and technical aspect, the qualitative and quantitative implications of this issue in relation to their impact on declarations and inspections and, without making any recommendations or in any way prejudging the nature of any future decision on the issue, to report its findings to the Director-General."(Organisation for the Prohibition of Chemical Weapons, 1998, p. 1; Scientific Advisory Board, 1999, Annex 2, p. 18)

What is immediately evident in the question above is that the tone is quite different to those cited above it, and the turn of phrase is more specific. This question to the SAB also accomplishes two very important things: it set boundaries on the scope of the study undertaken by the SAB and it limited the extent to which the Board could address policy rather than scientific factors. In effect, this question constructs a boundary between the scientific and political aspects of "production by synthesis" even though this issue, as with other examples, is not purely scientific – and this allows the SAB to maintain its authority when speaking on matters of science and technology.

Observed in the illustrations set out above is that the highly changeable way issues are assigned to the SAB by various elements of the OPCW has led the Board to be very uncertain as to the extent to which it is expected to address policy issues, if at all. This was also apparent in the Board meetings I attended, and in one case there was a discussion about whether or not the Board should provide a recommendation to the Director-General that might upset some member states. This political tension in the SAB is therefore not only a problem of inconsistencies in how questions put to it are

framed, but also a product of the way the Board approaches the subject of politics itself. This is an area where specific guidance to the Board may help ensure that its activities are not undermined by politics.

6.5 A difficult issue: low concentrations of Scheduled chemicals

Simply to state that the SAB has been politicised would be to ignore the subtle and intricate nature of the Board's involvement with the technical/political debates. The Board is sensitive to the politics that pull and push its agenda, and SAB members are aware too of the issues that have remained conspicuously off the Board's agenda.

The case of low concentrations of Scheduled chemicals provides a good example of an issue where the SAB has had little tangible influence on policy. The establishment of declaration thresholds for low concentrations of Schedule 2A and 2A* chemical mixtures in particular, has become a thorn in the side of the OPCW, and has remained unresolved since entry into force of the CWC. [56] Indeed, there had already been significant discussion on the topic well before entry into force (Preparatory Commission for the Organisation for the Prohibition of Chemical Weapons, 1993). The issue first came to light during the negotiations for the Convention as concerns emerged about the threat presented by mixtures of chemicals containing low concentrations of Scheduled chemicals and their 'ease of recovery' (Hart, 2002). In other words, could these mixtures be distilled to provide militarily significant quantities of chemical weapon agent? This concern was compounded by the particular status of PFIB (a Schedule 2A chemical) that had already been contentious within negotiations. Its role in the debate is further explored below.

[56] Schedule 2A contains two chemicals: Amiton (‚O-Diethyl S-[2-(diethylamino)ethyl] phosphorothiolate and its alkylated / protonated salts) and PFIB (perfluoroisobutene). Schedule 2A* contains only one chemical compound: BZ (3-Quinuclidinyl benzilate).

From an early stage in the discussions, two clear positions were identified: one side argued for declarations to be based only on the volumes of production with no consideration of concentrations; whilst others argued for a threshold to be set at the lowest possible concentrations. By the time of entry into force of the Convention, some limited progress had been made: agreement was reached on the principle that '*de minimis'* concentrations of Schedule 2A/2A* chemicals and Schedule 3 chemicals would be omitted from the declaration provisions. However a threshold value for 'low concentration' was not agreed, and still has not been for Schedule 2A/2A* chemicals.

According to John Hart, during the Preparatory Commission, and on entry into force, a general consensus on low concentration thresholds had existed: 30% for Schedule 3 chemicals, and 10% for Schedule 2 (Hart, 2002). The fourth Session of the Conference of the States Parties, in 1999, set the process for resolution in motion by deciding (Organisation for the Prohibition of Chemical Weapons, 1999) that the issue would be taken up by the Executive Council, and a recommendation was drafted for the Council's seventeenth Session. However insignificant action was taken on the issue until the nineteenth session of the Executive Council (3 – 7 April 2000) when a draft decision on low concentrations of Scheduled 2A/2A* chemicals was forwarded to the fifth Conference of the States Parties. This draft decision stated that the study of applicable concentration limits for mixtures containing Schedule 2A and 2A* chemicals be referred to the Scientific Advisory Board, which would report findings to the Council in time for the latter to submit a decision to the Conference at its sixth session (Feakes, 2000).

The fifth Session of the Conference of the States Parties duly referred the issue to the SAB (Organisation for the Prohibition of Chemical Weapons, 2000) but before the matter could be taken up by the Board, the twenty-first Session of the Executive Council called for a meeting of experts which was convened in November 2000. It is worth noting here, that during this period, at the twenty-second session of the EC, the Director-General expressed his concern that the recommendations of the SAB were being ignored (Mills, 2000). At its twenty-fourth Session, the Executive Council deferred the issue, this time to its twelfth Meeting on 15 May 2001 which had been

convened to discuss issues pertaining to the chemical industry ahead of the sixth Session of the Conference of the States Parties. The Harvard Sussex Program researcher at the time noted that "[t]he Council considered a proposal on low concentration limits, which recommended that declarations were not required for mixtures of chemicals containing 0.5 percent or less of Schedule 2A or 2A* chemicals. Although this proposal found much support among delegations, action was deferred to the Council's twelfth meeting." (Mills, 2001, p. 5) In fact, no progress on Schedule 2A/2A* chemicals was made at the twelfth meeting of the Council either (a proposal to set the threshold at 0.5% did not meet consensus), although consensus was finally achieved on the concentration thresholds for Schedule 3 chemicals (the threshold was set at 30%).

The issue of declaration thresholds for Scheduled 2A/2A* chemicals was then referred back to the Council at the sixth Session of the CSP in May 2001 but as the report of the Executive Council's activities reveals, the matter had still not been resolved by the end of 2002:

> "[t]he Conference at its Sixth Session considered the draft decision on the recommendation on guidelines regarding low concentration limits for declarations of mixtures containing Schedule 2A and 2A* chemicals (C-VI/DEC/CRP.15, dated 15 May 2001), and mandated the Council to take a consensus decision on this issue as soon as possible, in advance of the Seventh Session of the Conference. This item was still under consideration at the end of the period under review." (Organisation for the Prohibition of Chemical Weapons, 2002)

The 'low concentrations' issue had been addressed for years in the Executive Council's 'Industry Cluster', but in 2006 these discussions reached a political impasse and stalled. The issue was then not addressed again within the OPCW for a period of more than two years, and consultations have only recently resumed under Executive Council facilitation. At the time of writing, agreement still remains elusive and member states continue to implement different regulatory provisions both in the application of varying concentration thresholds and through different methods for calculating concentration levels.[57]

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[57] Postscript: the issue of low concentrations of Scheduled 2A/2A* chemicals has now been resolved. The fourteenth Session of the Conference of the States Parties decided that declarations are not necessary under Part VII of the Verification Annex for mixtures of chemicals containing 1% or less of a

Failure to reach agreement in this area cannot be explained by the issue being a marginal policy issue; to the contrary, it is a 'fundamental' policy issue for the United Kingdom and for other member states also.[58]

In fact, the presence of PFIB on the Schedule 2A list is the most likely reason for the little progress achieved so far. As outlined in the history of the negotiations for the CWC, chapter 5, PFIB was added to the lists of schedules as a marker for potential 'mask breaker' chemicals. Although no evidence of the weaponisation of PFIB existed in the public domain, some scholars have postulated that the chemical had been studied for its suitability as a weapon (Hart, 2002). The other feature of this highly toxic chemical is its emergence as a common by-product in the industrial production of fluoropolymers, known more widely as non-stick surfaces such as Teflon. PFIB is an unstable compound that causes pulmonary edema when its fumes are inhaled, and it is produced when Teflon is exposed to heat (Patocka and Bajgar, 1998). The chemistry and occurrence levels of PFIB mean that a decision is needed to establish at which concentration threshold the chemical might isolatable at militarily significant quantities and therefore fall into the scope of CWC inspection. This decision requires both technical and non-technical perspectives; scientific aspects of toxicity and volatility must be balanced against notions of threat assessment and considerations for safeguarding the Teflon industry. The conclusion of the specific arguments about how to deal with PFIB is the key to resolving the general issue of low concentrations of Schedule 2A/2A* chemicals.

Schedule 2A/2A* chemical, nor for mixtures of chemicals containing more than 1% but less than or equal to 10% of a Schedule 2A/2A* chemical, provided that the annual amount produced, processed, or consumed is less than the relevant verification thresholds specified in paragraph 12 of Part VII of the Verification Annex. (See Organisation for the Prohibition of Chemical Weapons (2009) *Decision: Guidelines regarding low-concentration limits for Declarations of Schedule 2A and 2A* Chemicals* C-14/DEC.4 dated 2 December 2009. Fourteenth Session of the Conference of the States Parties. The Hague).

[58] Interview, official at the Defence Science and Technology Laboratory, 8 December 2008.

The failure of the Scientific Advisory Board to make progress on the issue of low concentration has concerned policy officials, but there are also serious questions remain about how the issue has been handled by other organs of the OCPW. For instance, as noted earlier, the framing of the question to the Board was ambiguous and left the SAB to decide which aspects of the issue were 'of relevance'. The SAB formed a Temporary Working Group, which met in The Hague from 30 - 31 August 2000 and recommended to the SAB that for two of the three chemicals in Schedule 2A/2A*, Amiton and PFIB, the concerns were of a 'regulatory' rather than of a 'scientific' nature (Scientific Advisory Board, 2001). In the specific case of the third chemical, BZ, the TWG proposed a conditional recommendation for a concentration limit of 1%. The TWG's report cast policy alternatives in an 'either, or' fashion, outlining the relevant policy motivations for each option. The SAB endorsed the findings of the TWG and reported to the Director-General it had:

> "observed that the issue at stake is not in fact of a scientific nature, but is regulatory, and commented that scientific advice can indicate to the decision-makers which concentration limits would be appropriate for what regulatory purpose, and that any decision on this issue remains outside the realm of science." (Scientific Advisory Board, 2001, p. 2)

The Scientific Advisory Board was clearly concerned not to enter into discussions that extended beyond its mandate and the capacity of scientific advisers. But as one British official noted, states party viewed the report of the Scientific Advisory Board as a 'fudge'.[59] What it clearly shows, is the disparity of expectation that exists between member state delegations and the Scientific Advisory Board over the scope of its work.

The implication here is that some, if not many, delegations do expect scientists to speak about regulation and politics as well as about science. If this is the case, the SAB will feel more pressure from member states expecting their political positions to be consolidated by the Board's recommendations. In other words, do delegations also expect their members of the SAB to fall in line with national positions? This question will be examined below.

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[59] Interview, officials at the Defence Science and Technology Laboratory, 8 December 2008.

6.6 Political influence or independence?

The Scientific Advisory Board is composed of individuals drawn from different walks of scientific life; many have no direct prior involvement in the Chemical Weapons Convention, but all bring with them very specific personal and/or professional agendas. Nevertheless, both the Convention itself (Article XIII, paragraph 45) and the Board's Terms of Reference (Organisation for the Prohibition of Chemical Weapons, 2004a) clearly state that members of the Board must act in their personal capacities. In spite of this, some Board members have other professional duties in the field that could be said to jeopardise their independence. As stated earlier, the current composition of the SAB is illustrated in Appendix 1 and comprises ten academic scientists, thirteen government scientists and two representatives from the chemical industry. Of the twenty-five current Board members at least eight also have professional affiliations with their National Authorities and/or delegations.

The nature of these affiliations varies significantly, from formal appointments as advisors to substantially less formal relationships through personal networks. However particular developments within and outside the Board's official activity lead to serious questions being raised regarding the independence of its membership. For example, during my assignment with the OPCW, one member state alleged that some issues were being suppressed from discussion or unduly neglected by certain members of the Board.[60] In this case, it transpired that one member of the SAB had reported his concerns to his national delegation. The circumstances surrounding this accusation should be made clear: during the Board's discussion of the said agenda item in question, no contribution was made by the concerned individual. Only after the meeting did he voice his opinion, and even then, only to his national delegation. The accusation prompted by this Board member and taken up by his national delegation, implied that other members had been captured by political interests and were mediating

[60] In this case the issue of concern was that of new technologies for the destruction of chemical weapons.

their positions accordingly. This would be serious enough but what this example reveals is more serious still: there is still mistrust (on political grounds) between scientists and some Board members have maintained or developed very close relationships with their national delegations.

Ehsan Masood (2003) claims that the political neutrality of advisers to international organisations can never be achieved, claiming that advisors are subjected to intense lobbying from national and NGO sources. Writing specifically about proposals to introduce new posts for scientific advice to the UN system, Masood argues that "member states will oppose such centralization of science advice, not because they particularly favour independent advice but because they will have less influence on the kinds of questions that such an adviser will be allowed to ask, and the experts that he or she will be encouraged to consult." (Masood, 2003, p. 471). This argument provides one explanation for the SAB recently becoming the subject of considerable political debate.

The situation is more complex than it might appear on the surface. Where some countries maintain close relationships with their Board members,[61] other countries have very little contact at all, at least on a formal basis. For example, the British SAB member is a government chemist but has no direct input into decision-making procedures. Indeed a number of UK policy officials maintained in interviews that a proper distance between the Board member concerned and policymakers was proactively enforced.[62] In the United States, it was made clear to me that the American member on the SAB had always been, and would continue to be, a representative from chemical industry.[63] This may well be so, although one anonymous interviewee implied that even the American delegation ensured that the US member on the Board

[61] Note that this is not to say that the criterion of the member serving in their personal capacity has been broken.

[62] Interview, official at the UK National Authority, 17 November 2008; official at the Defence Science and Technology Laboratory, 8 December 2008.

[63] For a long time the American Board member, Will Carpenter of the Chemical Manufacturers Association (now the American Chemical Council) was the only industry representative on the Board. Interview, official at the US Department of State, 10 June 2008.

was at least made aware of national policy positions.[64] The dual problem of mistrust between some SAB members and the complex relationships some members have with their national delegations represents a chicken and egg situation; they clearly influence each other but exactly how is at the moment unclear. The relationships between experts and other organs of the OPCW are further explored below and in the next chapter.

6.7 Relationship with the Technical Secretariat and states party to the Convention

6.7.i. The OPCW's Technical Secretariat

Aside from the Technical Secretariat's own Secretary to the SAB, little sustained contact of a substantial nature between the Technical Secretariat and the SAB was observed during fieldwork. This was apart from presentations given to the SAB by various Secretariat staff members either on a routine basis (for example, a standing SAB agenda item is a briefing from the OPCW Laboratory) or upon request by the Board itself. Other contacts seem largely dependent on Secretariat staff interest rather than on any formal arrangement.[65]

If the SAB was to be more closely associated with the Technical Secretariat, the most appropriate branch would be the Policy and Review Branch, within the Verification Division, which is responsible for reviewing the Convention's verification system and proposing improvements to the Director-General. According to an interview with a senior member of this Branch at the time,[66] the SAB is dissociated from much of the work of the Secretariat because it operates ahead of the Organisation as a whole – it is

[64] Interview, SAB member, 27 March 2009.

[65] Interview, Technical Secretariat staff member, 9 November 2007.

[66] Interview, Technical Secretariat staff member, 13 November 2007.

forward-looking whereas the Secretariat is generally preoccupied with more immediate issues or the follow up of decisions already made.

There is currently little 'meeting of minds' between the Secretariat staff and the SAB and this interviewee highlighted a strong need for the presence of a bridging factor to bring the two bodies closer together. In order to improve the working relationship between the Technical Secretariat and the SAB, the interviewee suggested holding regular meetings, similar in substance to the Academic Forum held in 2007 for the OPCW's Tenth Anniversary but narrower in scope, that would allow for a constructive interaction between the two bodies. The interview underlined the unexploited potential of the SAB's more focused discussions within the TWGs in facilitating knowledge transfer between the Technical Secretariat and the SAB.

6.7.ii. States Party to the Convention

Some commentators feel very strongly that the SAB has failed in the sense in that some states party, particularly within the NAM, see it as a tool of the West, and this has not been as strongly apparent in the past. According to a British official, part of the reason for this is that the reports of the SAB (particularly for the Second Review Conference) appear to NAM states to favour Western policies, such as those pursued by the UK.[67] However, according to this interviewee, the reason for the similarity between UK and SAB positions is that both approach issues from an objective scientific and technical standpoint and in such circumstances it is hardly surprising that there is strong correlation. A further reason outlined in this interview is that those states that have grown sceptical of the SAB's activities (even those with members on the SAB), sometimes have very little interest in the views of their own scientific experts.[68] For example, the advice of the current Chair of the SAB was disregarded by his own member state ostensibly because the views presented were inconsistent with the state's national position.

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[67] Interview, official at the Foreign and Commonwealth Office, 17 November 2008.

[68] Interview, official at the Foreign and Commonwealth Office, 17 November 2008.

Another sign of the complex and difficult relationship between the SAB and the OPCW member states is the accusation by some delegations that they receive an over-sanitised version of the Board's discussions. This is partly true since the reporting of time-consuming discussions is seldom complete, but, as observed earlier, the same accusation could be levelled at the Secretariat in the sense that it also provides an over-sanitised view of its activities to the SAB.

This chapter has provided a unique insight into the way that the OPCW's Scientific Advisory Board functions and relates to other organs of the OPCW. It has also demonstrated that the Board has a mixed record; it suffers from a number of shortcomings, including insufficient financial support, problems in the participation and preparation of its members, and the discrepancies in the relationship of some of its members with national delegations. On the other hand, as the case of low concentrations has demonstrated, the SAB has demonstrated that it is not the plaything of the member states and that it can stand its ground and refuse to be drawn into political narratives. The next chapter will concentrate on individual state perceptions of both the SAB and of the role of expert advice within national frameworks.

7 National perceptions of expert advice.

Our study of the procedures and processes used to source international expertise for the implementation of the CWC has exposed diverse views on what the role of the SAB should be, how it should function and how its members should relate to their national delegations. In addition, and as has been argued in the literature on expert advice (e.g in Jasanoff, 1990), the capacity of the Board to render effective advice is significantly compromised without the financial, administrative and substantive support of the OPCW (both its member states and the Technical Secretariat). In order to examine the relationship between the SAB and the member states more comprehensively, this chapter will explore the wider role of expertise within domestic chemical weapons policy as well as the mechanisms of states party for considering the recommendations of the SAB. The findings of this research are based predominantly on interviews with government officials and other commentators on the nature of technical advice.

This chapter concentrates principally, however, on how the Scientific Advisory Board is perceived by national delegations, and the analysis draws heavily on the views outlined by diplomats during the run up to the CWC's second Review Conference which took place in April 2008. As the Review Conference drew closer and as initial

consultations evolved into intense negotiations, delegations participating in the Open-Ended Working Group were under pressure to present national positions on a variety of issues, including those that addressed technical change and the Scientific Advisory Board. The response of the member states to this pressure was at times surprising and initiated a chain of events that eventually took centre stage at the Review Conference and will be discussed below. In addition to the interview-based research outlined above, the first part of this chapter will also draw from ethnographic observation, documentary analysis from my placement at the OPCW and some interview data. And to provide a contextual background to the chapter, there will be a brief introduction to the CWC Review Conferences; this is presented in the paragraphs that follow.

7.1 Formal reviews of the CWC

Article VIII of the Chemical Weapons Convention states that, *inter alia,* the role of the Conference of the States Parties is to "review scientific and technological developments that could affect the operation of this Convention". One feature of this 'review' is the sustained work of the Scientific Advisory Board; another is the series of Review Conferences (in the form of Special Sessions of the Conference) that take place on a discontinuous basis. As seen in chapter 5, the Convention introduces the Review Conference in Article VIII, paragraph 22, as follows:

> "[t]he Conference shall not later than one year after the expiry of the fifth and the tenth year after the entry into force of this Convention, and at such other times within that time period as my be decided upon, convene special sessions to undertake reviews of the operation of this Convention. Such reviews shall take into account any relevant scientific and technological developments. At intervals of five years thereafter, unless otherwise decided upon, further sessions of the Conference shall be convened with the same objective."

So in 2003, six years after the Convention had entered into force, the first Review Conference was held and the second Review Conference took place five years later, on 7 – 18 April 2008.

Both scholars and policymakers consider these special sessions as an important opportunity for the OPCW to remove itself from the routine procedures that dominate ordinary meetings of the Conference of the States Parties. The quinquennial reviews are seen as an opportunity to cast eyes to the horizon and to reflect on the longer-term future of the Convention. The objective of the Review Conference is to prepare a consensus report that at once provides a retrospective analysis of the implementation of the Convention alongside a strategic assessment of the future requirements.

It is during the extensive preparation for the Review Conference that the Technical Secretariat and the OPCW member states actively review the achievements and the shortcomings of the Convention. This preparation takes place within an Open-Ended Working Group format. Daniel Feakes argues that prior to the first Review Conference, the open-ended format was chosen for a number of reasons, including: its inclusive approach that allows delegations not on the Executive Council to participate; it allows The Hague-based delegations (rather than capitals) to maintain control of the process; and it also represented the cheapest option (Feakes, forthcoming).[69] The mandate of the Open-Ended Working Group was agreed at the 26th Session of the Executive Council, which decided that

> "this open-ended working group shall make recommendations to the Council on the substantive and organisational aspects of the review conference; and requests the open-ended working group to commence its work without delay, and to report to the Council at each regular session on the results of its informal deliberations during the preceding intersessional period." (Organisation for the Prohibition of Chemical Weapons, 2001 quoted in Feakes, forthcoming, p. 18)

The Open-Ended Working Group for the preparation of the first CWC Review Conference was established under the chairmanship of the Permanent Representative of Argentina.

The Open-Ended Working Group for the preparation of the second CWC Review Conference commenced its work approximately eighteen months before the date of the conference. The Chair, in line with a regional rotation, was allocated to the Western

[69] The financial incentive for the Open-Ended Working Group structure being all the more impressive because by 2001 the OPCW had just fallen into financial crisis that culminated with the controversial ousting of its first Director-General, Jose Bustani, in 2002.

and Others Group – to the Permanent Representative of the United Kingdom to the OPCW - and the meetings of the group were convened with increasing frequency as the Review Conference drew closer. In the final weeks the meetings took place daily and the Group worked with great intensity. The urgency with which it proceeded was due to the importance of achieving as much consensus as possible on substance before the start of the two-week Conference. This is important as, in reality, the high numbers of state delegations present at the Review Conferences, their relatively short duration, and the increased political tension felt within them all mean that achieving consensus is much more difficult. So just as the Working Group met with increasing frequency, the substance of its meetings evolved from exploratory discussions on issues that might be raised to intensive negotiations to agree on precise report language. The product of this process was the draft report submitted by the chair of the Working Group on the eve of the Conference itself.

A number of scholars have commented on the outcomes of both CWC Review Conferences (Feakes, 2008; Feakes, forthcoming; Guthrie, 2008a, 2008b; Kelle, 2002; Krutzsch, 2005; Meier, 2008) so the general aspects of these conferences will not be discussed in detail within my work. What will be addressed in paragraphs below are features of the second CWC Review Conference that relate specifically to the subject of my dissertation, i.e. its treatment of technical change and expert advice.

7.2 Member State views on the OPCW's Scientific Advisory Board

During the preparations for the Second Review Conference, the SAB entered the agenda of the Open-Ended Working Group (OEWG) under several guises, but most prominently as the discussions of the Working Group broached the Review Conference's mandate to review developments in science and technology, as outlined earlier. In this regard, the Board's preliminary report to the Director-General on developments in science and technology relevant to the Convention was prepared and

submitted in May 2007 (Scientific Advisory Board, 2007) and was forwarded to member states at the forty-ninth Session of the Executive Council one month later.

7.2.i. Technical versus policy language

As the Chair of the OEWG attempted to focus the attention of member states on the preliminary report of the Scientific Advisory Board, a number of issues hindered a substantive discussion of the Board's recommendations. A visible barrier to discussion was the immediate reaction to the report: at least four delegations highlighted that the writing style of the SAB's report was so 'highly technical'[70] that the technical matters found within them could not be discussed by non-specialists. This view was not only held by smaller representations that might lack the necessary experts in capital to analyse the report, but also by a number of larger delegations and across regional groups.

It was in this context that Iran first proposed that the OEWG discuss the SAB's recommendations within the setting of a meeting of 'governmental experts'.[71] At this stage the proposal, which was later developed into report language during the second Review Conference, was to hold a meeting of government experts to discuss the SAB report *before* the Review Conference itself. Based on the model adopted after the First Review Conference (Organisation for the Prohibition of Chemical Weapons, 2003a, 2004b), Iran's proposal was to bring together national experts at an earlier stage than before to discuss the SAB's findings. Iran's call for such a meeting did not, however, find significant support with other delegations, although it was strongly supported by the Indian delegation which stressed that such a meeting would allow both the technical and the political aspects of the report to be addressed.

The arguments set out by Iran in favour of such a meeting were threefold: precedent from the First Review Conference; the need to interpret the SAB's report in policy

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[70] Ethnographic notes, tenth meeting of the OEWG, held on 11 September 2007, The Hague.

[71] Ethnographic notes, tenth meeting of the OEWG, held on 11 September 2007, The Hague.

language; and an opportunity to address the wider implications of the SAB's views.[72] The original proposal Iran had made was to hold the meeting before, not after, the Review Conference. Iran argued that it had been held after the first Review Conference because the Scientific Advisory Board's report to the Director-General had been received late in the review process. However, the lack of wide support from the OEWG meant that the issue was effectively deferred to discussion at the second Review Conference itself.[73] India's initial comments evolved from a statement of support for Iran's position, to a vague proposal related to the enhancement of contact between the SAB and national delegations,[74] and eventually, to its negotiating position (at the Review Conference) which reflected, but was not identical to, the proposal made by Iran. How the matter evolved in the Review Conference itself will be addressed in later sections.

It is difficult to assess the extent to which member states had genuine difficulties in dissecting the SAB's recommendations. It is probable that some small delegations and states with little chemical weapon expertise would find much of such texts complicated, but the larger delegations with experts working within government are generally used to technical debates (that are quite ordinary within a number of OPCW forums).

Whether the technical nature of the Report was real problem or just a convenient way to postpone discussion on technical problems known to be difficult to resolve, the question of whether the language of the SAB is too technical for policymaker discussion is an important one. The Netherlands certainly felt this to be an issue worthy of attention, and signalled to the OEWG that a mechanism to translate the technical wording of the SAB's report into policy language was required.[75] One way in which this problem might be mitigated is through the Director-General's Note that is prefaced

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[72] Ethnographic notes, tenth and eleventh meetings of the OEWG, held on 11 September 2007 and 3 October 2007, The Hague.

[73] Ethnographic notes, eleventh meeting of the OEWG, held on 3 October 2007, The Hague.

[74] Ethnographic notes, tenth meeting of the OEWG, held on 11 September 2007, The Hague.

[75] Ethnographic notes, tenth meeting of the OEWG, held on 11 September 2007, The Hague.

to the Board's reports when they are transmitted to the Executive Council. These Notes summarise the recommendations of the Board and provide the member states with the specific position of the Director-General on each issue. According to two US government officials, this opportunity to assert the Director-General's influence is currently not being effectively applied: according to them, the language generally used is vague, weak and ambiguous.[76] But notwithstanding current deficiencies in the formulation of the Director-General's Notes, they clearly have the potential to act as a bridge between the technical report submitted by the SAB and the political debates undertaken by the member states. They are also fully consistent with role of the Technical Secretariat as a boundary organisation which is linked both to technical neutrality and to the concerns of states party to the CWC. This proposal will be developed further in the next chapter, but first, another chief concern of the member states will be addressed: the budget of the OPCW and, in particular, the question of funding allocations to the SAB.

7.2.ii. Funding

During the second review of the Convention, the financial management of the meetings of the SAB attracted the attention of the Technical Secretariat and member states alike, the former through its 'comprehensive report' on the implementation of the Convention (Organisation for the Prohibition of Chemical Weapons, 2008a) and the latter through their discussions and papers within the OEWG. The budget of the OPCW is tightly controlled and closely scrutinised by member states, and shifts in budgetary allocations are administered under intensive multilateral negotiation.

As the Terms of Reference of the SAB state, the "budget of the OPCW, starting from 1998, shall contain resources adequate for travel and per diem costs associated with the annual meeting of the Scientific Advisory Board, and that any other meetings of the Scientific Advisory Board shall be held at no cost to the OPCW." (Organisation for the Prohibition of Chemical Weapons, 2004a, p. 1) Thus as the situation stands, all other

[76] Interviews: official at the US Department of State, 10 June 2008; official at the US Department of State, 18 April 2008.

meetings of the SAB – including all meetings of Temporary Working Groups – are financed independently of the annual Board meeting. In 2006, under conditions of significant under-funding, the Director-General decided to set up a special Trust Fund for the SAB to enable it to function more extensively through its ancillary groups, as was discussed in chapter 6. In 2007, eight member states contributed to the trust fund, these were: Japan; Nigeria; Saint Lucia; Spain; Switzerland; Saudi Arabia; the UK; and the US (Organisation for the Prohibition of Chemical Weapons, 2008a).

Very early on in the discussions for the second Review Conference, a number of delegations proposed an increase in the OPCW's budgetary allowance for the SAB to cover an increase and a broader coverage of SAB activities. This reasoning can be well illustrated through two US statements delivered to the OEWG and another, confirming its position, to the Executive Council:

> "Given its role, the United States hoped to ensure that funding for the SAB was adequate, and suggested that the Board might benefit from holding more than one meeting every year (as was currently allowed for in the OPCW budget) and that consideration of this should take place."[77]
>
> "The United States stated that funding for the SAB should be increased to cover more than one meeting per year."[78]
>
> "We continue to support increased funding under the regular budget for the SAB to allow two meetings per year, instead of the current single meeting, and the provision of some funding for temporary working groups." (United States of America, 2008)

This language, spearheaded by the US, was subsequently picked up by other delegations including Canada and the UK. The UK stated at the time that although it had contributed a total of £8,000 to the SAB Trust Fund, both the SAB and its Temporary Working Groups should be funded from the regular budget of the Organisation.[79] In contrast to this enthusiastic push for an increase in the SAB's

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[77] Ethnographic notes, Eleventh meeting of the Open-Ended Working Group for the Second Review Conference, 3 October 2007.

[78] Ethnographic notes, Twentieth meeting of the Open-Ended Working Group for the Second Review Conference, 14 February 2008.

[79] Ethnographic notes, Fourteenth meeting of the Open-Ended Working Group for the Second Review Conference, 4 December 2007.

funding, other delegations (in particular those of states in the NAM) have approached the issue with caution, wary of the financial implications of additional funding to the SAB for the Organisation's budget.

This issue of funding for the Scientific Advisory Board was also raised by the Director-General in the Technical Secretariat's Review Conference paper which stated that

> "[e]xperience has shown that the SAB needs to meet more than once a year and that holding just one session annually makes it difficult for the SAB to provide timely and well-researched scientific and technical advice. It has also become apparent that the effectiveness and quality of the work of the SAB may suffer because certain members of the temporary groups who are not funded by their own institutions or governments are not able to attend group meetings." (Organisation for the Prohibition of Chemical Weapons, 2008a, p. 83)

This concern, that the work of the SAB has been constrained by budgetary deficiencies, is widely recognised by the Technical Secretariat and by many member states, and it is an especially serious issue when considering the time limitations imposed on the Board's activities which were covered in the previous chapter. Adequate funding is a significant factor in the efficient functioning of any advisory board, as other scholars in the field have found (see for instance, Jasanoff, 1990).

7.2.iii. The SAB and the OPCW member states

After the First CWC Review Conference, held in 2003, a directive for a meeting of governmental experts was implemented to bring together national experts, members of the SAB and government officials on 28 – 30 January 2004 (Organisation for the Prohibition of Chemical Weapons, 2003c). By the end of the Second Review Conference, a similar meeting had been agreed:

> "The Second Review Conference requested the Council, through a meeting of governmental experts open to all States Parties, to consider the report by the Scientific Advisory Board which the Director-General had forwarded to the Second Review Conference." (Organisation for the Prohibition of Chemical Weapons, 2008b, p. 29)

As far as the discussion of the SAB in the report of the Second CWC Review Conference is concerned, the discussions in the meetings of the Open-Ended Working

Group offer a useful background. Even during the relatively early stages of the review process, as discussed earlier, two member states had drawn specific attention to the level of contact between the SAB and national delegations: namely Iran and India.

Iran entered discussions of the SAB with a clear strategy: to defer all discussion of the Board to a specific meeting that would be held in the presence of government experts as noted above. India's position held evolved since earlier discussion within the OEWG and was for the SAB to report to the states party on a more permanent basis. In this respect, India proposed an addition to the Review Conference's draft report – later negotiated out – that the Review Conference should recommend that a 'standing committee' be set up to examine the recommendations of the SAB and to place its own recommendations before the Executive Council.[80]

The possibility of a clause that would imply any level of government oversight of the Scientific Advisory Board rapidly became a significant point of contention at the second Review Conference. Unpredicted challenges were made to the SAB's position by states that had hitherto held a rather ambivalent attitude towards the Board. This was reflected in the limited reporting of the Review Conference, as follows:

> "Some delegations continue to have strongly held views on some subjects. Firm lines have been held by some delegations, notably the positions of Iran and India on issues such as the role of the Scientific Advisory Board. For example, both wish to see experts appointed by governments to review the reporting by experts appointed by the Director-General." (Guthrie, 2008a, p. 2)

India and Iran's positions were most forcefully stated during the final days of the second Review Conference when it broke into small theme-based facilitation groups designed to achieve progress by discussing each issue in a more focused manner. The themes were: general obligations of the Convention; the destruction of chemical weapons; Articles X and XI; Article VI; national implementation of the Convention; and the functioning of the Organisation. It was in this last category, facilitated by the Permanent Representative of Switzerland, that the Scientific Advisory Board was discussed and where Iran and India joined forces to press for a governmental meeting.

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[80] Ethnographic notes, negotiations during the Second CWC Review Conference, 17 April 2008.

This created a *de facto* stand-off between the NAM and the WEOG: although most Western member states would reluctantly accept a meeting to discuss the SAB's review of science and technology, they would not accept a permanent filter between the SAB and the Executive Council.[81] This confrontation came as a surprise, the Scientific Advisory Board is not usually considered such a 'hot' issue and at this Conference the most problematic issues were, at the outset, the destruction of chemical weapons, the way in which the OPCW would address terrorism, the role of the Convention with respect to preventing the re-emergence of chemical weapons, and Other Chemical Production Facilities. It was early evening on the last day of the Review Conference when the Iranian proposal for an expert meeting was accepted over the Indian proposal for a standing committee, as compromise measure.[82] In developing an explanation for why the SAB became entangled in controversy it is necessary to return to the concepts developed in the theoretical chapters of this dissertation, and this will be covered in the next chapter.

For states within the WEOG, this outcome was initially viewed as negative but tolerable. This outcome had not altered the independence of the Scientific Advisory Board nor had it breached the limit of what many states would accept; the 'red line' beyond which consensus would have been blocked and the Conference might have collapsed. Such a collapse might well have resulted in a dramatic loss of confidence in the consensus-based approach to decision-making that has underpinned the Convention's work until now.[83] However, since the immediate end of the Second Review Conference, the stance of the British government (and possibly other WEOG states too) has shifted from deep concern about any type of governmental involvement to a more optimistic reading that, as Iran had originally asserted, such a meeting could facilitate further discussion of the issues raised by the SAB in its report to the Director-

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[81] Interview, official at the Foreign and Commonwealth Office, 17 November 2008.

[82] Ethnographic notes, negotiations during the Second CWC Review Conference, 18 April 2008.

[83] Such a failure did in fact occur later on in 2008 when the thirteenth Session of the Conference of the States Parties ended with no consensus report. The implications of this have been debated by observers and diplomats, see (Meier, 2009).

General.[84] The UK's objective for the meeting was to reinstate a level of confidence in, and cognitive authority to, the SAB by disentangling the technical issues from the political. But a number of factors have complicated this outcome.

One complicating factor, as outlined in the previous chapter, is that some dissatisfaction is felt from within the Scientific Advisory Board itself in the manner in which its decisions are taken, and the ways in which it liaises with the other organs of the OPCW. One member of the Board has argued that although the current Director-General assigned more importance to the SAB's activities than was the case in the early years of implementation, there still remained scope for the Director-General to commit the Technical Secretariat further to the Board's activities.[85] By contrast, other individuals within the Secretariat's staff have hinted more cynically that the SAB is, to some extent only 'window dressing'.[86] Even low levels of unease quickly lead member states to question the role of the SAB, and this is particularly true when Board members work in close coordination with their national delegations.

In this context, one should note again that the relationship between members of the SAB and their national delegations varies substantially. For instance, the current Iranian Board member (who is also the current Vice-Chair of the SAB) is an academic who seems to have little direct contact with Iranian government officials. The current UK member is a defence scientist but the British government claims to be rigorous in maintaining a correct distance between its SAB member and British decision-makers.[87] In contrast to the UK and Iran, the Indian Board member – currently an academic – clearly maintains a closer contact with the Indian National Authority.[88] Levels of independence are not uniform across the entire Board and the reason that they vary perhaps reflects varying national positions on the role of scientists in policymaking.

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[84] Interview, official at the Foreign and Commonwealth Office, 17 November 2008.

[85] Interview, member of the OPCW's Scientific Advisory Board, 12 February 2008.

[86] Ethnographic notes, personal communications during fieldwork periods.

[87] Interview, official at the Defence Science and Technology Laboratory, 8 December 2008.

[88] Ethnographic notes, meetings at the Second Review Conference, 7 – 18 April 2008.

A second consideration that might erode confidence in the activities of the Scientific Advisory Board arises from the perception by some national delegations that SAB reports favour the policies of the WEOG, and by extension, that the SAB is simply a tool of the West.[89] This perception may in fact have been exacerbated by the particularly strong language used by the UK, the US and other WEOG states in support of the SAB's contributions (and in pushing for a discussion of technical change in general) during the run-up to the Second Review Conference.[90] This sceptical outlook (whether real or simulated for tactical reasons) on the part of a number of OPCW member states, especially from the NAM, has its roots partly in the process that has linked the work of the Board to a number of highly political debates.

One such case that has received significant attention since the First Review Conference has been that of the frequency and selection methods for inspections at Other Chemical Production Facilities, otherwise known as OCPFs.[91] Increases in the inspection frequency for these sites has polarised the OPCW member states roughly along the WEOG / NAM line: the WEOG (with the exception of Germany[92]) strongly favour expanding OCPF inspections and the NAM vehemently oppose. In arguing for such increases, many WEOG states have relied heavily on technical arguments and have frequently used the recommendations of the SAB to complement these arguments, thus leading scientific advice to be concretely associated with specific political positions. Consequently, as Collingridge and Reeve (1986) have argued and as described in previous chapters, the political controversy is translated into a parallel debate ostensibly about science and technology. In this case, the science has not yet been heavily challenged in the public arena but what has occurred (and has been described above) sets the precedent for such a challenge and for a questions of legitimacy to be

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[89] Interview, official at the UK Foreign and Commonwealth Office, 17 November 2008.

[90] Ethnographic notes, Open-ended Working Group, various meetings.

[91] These are chemical facilities that produce non-scheduled discrete organic chemicals. For an overview of the role and evolution of OCPF inspections see Feakes (2002), Hart and Sutherland (2007) and Tucker (2007).

[92] Interview, official at the US Department of State, 10 June 2008.

asked of the body that delivers technical advice. It is significant that some of the initial stages of such a debate have been played out beyond the OPCW, through personal contributions of SAB members in the HSP journal: the case for increases in OCPF inspections has been put forward by Robert Mathews (2008, 2009) and the case against by Detlev Maennig (2008). As noted previously, technical debates mirroring politics are not *per se* a negative course of action but may in fact be quite the opposite; when experts are viewed as political actors, discourse between scientists simply becomes another layer of pluralistic policy coordination (Collingridge and Reeve, 1986).

The issue of OCPFs has also been linked to the work of the Scientific Advisory Board in other, and less tangible, ways. One example is the action of one state party that currently opposes the addition – recommended by the Scientific Advisory Board – of unscheduled chemicals or derivatives to the OPCW Central Analytical Database (OCAD).[93] This position has direct consequences for the analysis of samples during OPCW inspections. During one interview a British defence chemist noted that the implications of this are more serious when taken in the context of the Technical Secretariat's ambition to expand sampling and analysis procedures to Schedule 3 and, eventually, to OCPF inspections.[94]

British and American officials see the crux of the OCPF problem as being the fundamental difference in developing country attitudes, particularly those of India and China, to the CWC as compared with states within WEOG.[95] Some developing countries, including those who are familiar with the issue of chemical weapons, perceive themselves as being disassociated from the concerns of a Convention that was largely rooted in the Cold War and instead assign a higher priority to the growth and development of their domestic chemical industries. This growth has been very

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[93] This is in line with previous statements made by India on the subject of the OCAD.

[94] Interview, official at the Defence Science and Technology Laboratory, 8 December 2008.

[95] Interviews: official at the US Department of State, 10 June 2008; official at the US Department of State, 12 June 2008; official at the US Department of State, 30 June 2008; official at the UK National Authority, 17 November 2008; official at the Defence Science and Technology Laboratory, 8 December 2008.

significant and can be illustrated with industry data taken from the International Council of Chemical Associations (ICCA):

- "Sales growth ranges between 8 and 15 percent in [South] Korea, the Middle East, India and China, while sales growth in traditional chemical producing nations – Japan, the US and the EU – hovers at or below four percent.
- Chemical production from 1995 to 2005 increased by almost 95 percent in the developing countries but only 18 percent in developed nations." (Gerard, 2007, p. 5)

Many developing countries thus see the regulations imposed by the CWC as a constraint on their development and routinely request assistance from the OPCW for the development of their industry under Article XI. According to a senior US official, this creates a 'legitimate dilemma' for developed states as they are being asked to directly fund the creation of foreign competitors for their own industries. For developed states a possible strategy would be to build up the interest of developing countries in the Convention. In this regard, one step put forward in interviews was for developed states party to consider the preparation of a combined chemical weapon threat assessment, though this would involve the difficult task of intelligence declassification.[96] The logic behind this suggestion was that developing countries have neither the experience nor the expertise to recognise the level of threat but once confronted with it, indifferent states party might adjust their political priorities accordingly.

Having looked at technical advice to the OPCW, there is clear correlation between the empirical findings of this research and much of the literature from studies of national science and technology policy. My study finds that, just as in STS, advice from experts is often ignored, undermined and used to legitimise policies in the very same ways that have been documented in national studies, but that within international regimes, mistrust (between scientists and between states) becomes very much more acute. In the next section of this chapter, it will be the national level that is examined. The United Kingdom and the United States have both evolved complex structures for the use of scientists in policymaking and both assign significant importance to science and

[96] Interview, official at the US Department of State, 30 June 2008.

technology in the context of the CWC. However, these two member states differ in the way that expert opinion is sourced and in terms of how the advice is used.

7.3 National structures for sourcing expert advice on chemical weapons policy in the United Kingdom.

In many respects, the UK considers itself a model for decision-making in the field of chemical weapons. Chemical weapon issues are addressed through three channels in government: through the Ministry of Defence (MoD); the Foreign & Commonwealth Office (FCO): and the Department for Business, Innovation and Skills (BIS).[97] The UK's National Authority for the implementation of the CWC is currently located within BIS and this section will focus principally on its activities. However, maintaining a focus on one particular department in the UK was a challenge because a defining characteristic of British government policymaking, and one to which policy officials assign significant importance, is that it is often inter-departmental. Chemical weapon policy formation thus takes place within a rather fluid atmosphere between the key government departments involved.

One British official asserted that the UK has always been ahead of other states, including the United States (which still has a reputation for notoriously bad intra-governmental relations), in terms of incorporating technical expertise into CWC policy.[98] The advantage that the UK is said to hold derives largely from its use of

[97] Before 28 June 2007 this was the Department for Trade and Industry (DTI), which on this date was re-organised to form two new government departments: the Department for Business, Enterprise & Regulatory Reform; and the Department for Innovation, Universities and Skills. In June 2009 these re-merged to form BIS. Postscript: the National Authority is now located in the Department of Energy and Climate Change.

[98] Interview, official at the UK Foreign and Commonwealth Office, 17 November 2008.

DSTL and MoD expertise, and from the continuity of contact between its government departments.

From the outset, the UK has closely integrated its approach to the political and technical features of the Convention. For instance, in 1989, as formal negotiations for the CWC neared their final stages in Geneva, an inter-departmental committee, the CWC Steering Group, was set up to discuss issues relating to the Convention. It brought together the Assistant Under Secretary of State (for Defence) at the FCO as Chairman; equivalents in the MoD (Defence Arms Control Unit and Directorate of Defence Policy for instance) and the DTI; a member of the Geneva delegation (usually the Ambassador, or sometimes a technical expert); the FCO Arms Control and Disarmament Research Unit CWC Desk Officer; officials from the Defence Intelligence Staff; and scientific advisers from Porton Down (now DSTL), including the Director-General and the head of the branch dealing with arms control. This high-level meeting met monthly and very quickly concluded that many of the issues relating to the CWC were of such a highly technical nature that the committee required more support. A subsidiary body, the Technical Sub-Group (TSG) was therefore set-up to routinely advise the steering group, and held monthly or six-weekly meetings. Its membership was made up largely of Porton Down scientists and defence policymakers.

According to a British government official, the Steering Group was originally designed to mitigate agenda clashes between the MoD and the FCO which risked undermining the closer inter-departmental coordination required to facilitate the UK's negotiating objectives and tactics.[99] The Steering Group was successful in this respect: when the different government departments worked together it became clear that their differences were more superficial then substantive. The Group also benefited from the continuity of its members and the collegial atmosphere that was built up over time within it.

[99] Interview, official at the UK Foreign and Commonwealth Office, 17 November 2008.

A retired official, who served the British government in Geneva and in the UK as an expert and diplomat, characterised the relationship between technical experts and the government as "cohabitation".[100] This interviewee explained that before technical working papers were tabled in Geneva, they were commented upon by many government officials; the expert's function was to provide a bones upon which the principal elements of discussion could be hung. The policymaking process was inevitably a top-down mechanism where political concerns (sometimes those that came from the US) overrode technical ones. A current technical expert expressed a similar opinion: that British decision-making on chemical weapon policy matters was only partly 'evidence-based'. Other factors including overarching politics and the likelihood of achieving consensus within a multilateral forum, combined with judgements about appropriate timing, come into play.[101]

This assertion differs considerably from the current government position – repeated on a number of occasions - that the United Kingdom approaches chemical weapon policy from an 'objective' and 'technical' standpoint and that it prioritises technical considerations and the well-being of the Convention over domestic industrial concerns.[102] The suggestion made by the British officials is that developing countries implement a reverse approach with political factors overriding their technical advice. In this respect, one interviewee believed that such a position was exacerbated by the fact that developing assigned few staff (in the case of India, for instance, only four or five) to work on the Convention, and this led to a conservative approach.[103] In addition, the official concerned believed that the perceived barrier to development was still a central factor in India's CWC policy.

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[100] Interview, British technical expert and diplomat (retired), 23 October 2008.

[101] Interview, official at Defence Science and Technology Laboratory, 8 December 2008.

[102] Interviews: official at Foreign & Commonwealth Office, 8 November 2008; official at Department of Energy and Climate Change, 11 November 2008.

[103] Interview, official at the Foreign & Commonwealth Office, 8 November 2008.

The National Authority in the UK states that it takes advice from 'wherever we could get it'[104] and in implementing the CWC, it consults other government departments when necessary, particularly DSTL and the chemical industry. This dependence on outside expertise is especially important in the UK's National Authority because officials at BIS are not technical experts themselves. The absence of expertise within the National Authority was highlighted in interviews with technical experts who noted that DSTL experts were especially important on-site at OPCW inspections because they were able to provide direct advice to National Authority staff who are not chemists, or who had no previous training in chemistry.[105] The sourcing of expertise, both technical from the DSTL and non-technical, has a very important role in the functioning of the UK National Authority, and close contact with the other government departments is a crucial feature in this respect. But the National Authority's soliciting of expert advice for its activities extends well beyond other government departments to a number of other stakeholders, including the chemical industry and academia through the National Authority Advisory Committee (NAAC).

7.3.i. The UK's National Authority Advisory Committee (NAAC)

According to an FCO official, an advisory committee for British chemical weapon policy based upon the negotiation-era role of the chemical industry working group that had advised the UK government was championed by a number of influential academic figures.[106] The proposal raised no objections in Whitehall and what has resulted since 1997 is unique in terms of chemical weapon policy; it is thought to be the only committee of its kind. According to the NAAC's Terms of Reference (as stated when the National Authority was housed in BERR), the Committee

> "assists the Department for Business, Enterprise & Regulatory Reform (BERR), with its task of ensuring that the Chemical Weapons Convention and the Chemical Weapons Act 1996 are implemented effectively in the UK. BERR takes in to account the cost and resource constraints and the necessity

[104] Interview, officials at the Department of Energy and Climate Change, 11 November 2008.

[105] Interview, officials at the Defence Science and Technology Laboratory, 8 December 2008.

[106] Interview, official at the Foreign & Commonwealth Office, 8 November 2008.

> to avoid unnecessary and excessive regulation. In particular, the Committee will advise on:
>
> - The effectiveness and efficiency of the compliance measures required to implement the Convention and the Act;
> - The effectiveness of the monitoring measures operated by the BERR;
> - Technical developments which may have potential application in chemical weapons;
> - Matters related to the reception of incoming inspections;
> - The preparation of the Annual Report." (United Kingdom of Great Britain and Northern Ireland, 2009, accessed 10 March)

The Annual Report referred to in the quotation above, is the Secretary of State's Annual Report on the Operation of the 1996 Chemical Weapons Act.

Currently, the Committee is formed of seven individuals, four from the chemical industry, two academic appointments with experience in the field of chemical weapon policymaking, and one former government scientist. Committee members serve for a maximum of two terms of four years. Meetings of the NAAC also include *ex officio* government officials; members of the National Authority, a member of the Laboratory of the Government Chemist and representatives from the MoD, DSTL, and the FCO are usually present. Its full membership at the time of writing is contained in Appendix 4.

With respect to the selection of NAAC members, an official of the UK National Authority explained that Committee positions are now open to applications in response to an advertised post: specifications are drawn up by the National Authority and by other members of a selection panel, and applicants are interviewed on this basis. The post specifications are formally endorsed by Ministers, on the basis of a Parliamentary Note addressed to them. After the interview process, Ministers select candidates from a shortlist drawn up by the selection panel which identifies the strengths and weaknesses of each candidate. The primary qualification sought in recruiting Committee members was experience and knowledge, particularly with respect to the regulation of the chemical industry and the application of chemistry. Technical knowledge was also of importance and although a formal background in chemical weapon issues was an

advantage, it was not strictly required, as it would be picked up as involvement in these areas developed.[107]

Based on information obtained from interviews with members of the NAAC and with the National Authority, the agenda of the NAAC is drawn up primarily by the National Authority.[108] It is based on a number of standing items, such as reporting on Executive Council sessions as well as on specific issues related to CWC implementation. Once discussed with the Chair of the Committee, the draft agenda is distributed to members of the Committee and other participants.

According to a senior National Authority official, the role of the NAAC is threefold: it acts as a *sounding board* for ideas; as a body to accommodate *public representation*; and as an independent *review mechanism* for the National Authority's implementation of the CWC in the UK.[109] Additionally, one British official argued that, on the basis of their experience representing the Committee at OPCW headquarters, information coming from the NAAC rather than from the National Authority lends arguments more weight than if they were statements from the British government.

At the FCO the feeling was that, in general terms, the NAAC had been useful. Although there is not necessarily any concrete correlation between the views of the Committee and policy outcomes, the Committee discussions do feed significantly into the UK's position at the Industry Cluster meetings in The Hague.[110] This view was confirmed by a member of the National Authority who added that when certain industry issues were discussed and proposals made at the OPCW, the National Authority presents them to the NAAC for feedback from its members on the costs/benefits of such proposals.[111] Another member of the National Authority stressed

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[107] Interview, official at the Department of Energy and Climate Change, 11 November 2008.

[108] Interviews: official at the Department of Energy and Climate Change, 11 November 2008; NAAC member, 30 October 2008.

[109] Interview, official at the Department of Energy and Climate Change, 11 November 2008.

[110] Interview, official at the Foreign and Commonwealth Office, 8 November 2008.

[111] Interview, official at the Department of Energy and Climate Change, 11 November 2008.

that, as the mandate of the NAAC was consultative and advisory (it has no decision-making power), there were no legal procedures for following-up on advice. However in the development of policy, the National Authority routinely took into account the advice delivered by NAAC members. The National Authority found the Committee to be very useful as a 'second eye' and as an independent source of advice.

7.4. National structures for sourcing expert advice on chemical weapons policy in the United States

In the United States, the CWC National Authority is split between the Department of Commerce's Bureau of Industry and Security and the Department of State's Bureau of International Security and Non-proliferation, and is responsible for the implementation of, and the development of US policy for, the Convention. Domestic chemical weapon policy formulation extends well beyond these departments, but this section will focus on the activities of the Office of Chemical and Biological Threat Reduction located within the State Department Bureau. This office has the following mandate with respect to chemical weapons:

> "1) developing and promoting dynamic policies and programs on a bilateral basis to combat the threat posed by chemical weapons and related materials, including efforts to assist destruction of chemical weapons stockpiles and related equipment and technology;
> 2) leading U.S. efforts to implement obligations under the Chemical Weapons Convention, including operation of the U.S. National Authority;
> 3) advancing and protecting key U.S. national security interests within the multilateral framework of the Chemical Weapons Convention and the Organization for the Prohibition of Chemical Weapons;
> 4) providing technical advice and policy support to the U.S. Mission to the Organization for the Prohibition of Chemical Weapons;
> 5) leading the development and implementation of Australia Group export control and catch-all controls for CW-applicable items and technology;
> 6) preparing recommendations for Department principals on sanctions and implementing sanctions laws to include the INPA, as well as other penalties as they related to chemical weapons and associated technology and equipment;

> 7) chair the SHIELD-Licensing and Interdiction group and review and make recommendations on proposed U.S. exports for CW proliferation concerns and consistency with overall U.S. nonproliferation policy; and
> 8) coordinate with the ISN/FO Sanctions Coordinator to provide relevant expert support, as needed, to the Coordinator's management of the INPA process for the bureau.; and
> 9) drafting of relevant sections of nonproliferation reports to Congress in coordination with the Sanctions Coordinator in the ISN/Front Office and with other offices."[112]

The use of technical expertise in US policymaking for the CWC differs significantly from the procedures used in the United Kingdom. No formal advisory system such as the British NAAC exists in the US. According to a senior official at the Department of State, the reason for this is largely to avoid the strict statutory requirements mandated for such groups.[113] These requirements originate in the 1972 Federal Advisory Committee Act (1972) which sets out detailed conditions for the formation of advisory committees that would make it difficult to convene a body similar to the NAAC in the UK. [114] FACA was designed to address two specific concerns:

> "[t]he first (…) was that the public perceived many commissions as duplicative and inefficient, and otherwise lacking adequate controls or oversight. The second concern was the widespread belief that advisory committees did not adequately represent the public interest, and that committee meetings were too often closed to the public." (Ginsberg, 2008, p. 4)

Since 1972, a number of amendments to FACA have enabled the Act and hence the management of federal committees to be reinforced. One such amendment, adopted in 1997, elaborated provisions for the public observation of meetings (Ginsberg, 2008)

An International Security Advisory Board[115] (ISAB) is in fact a high-level committee, convened in accordance with the FACA, to advise the Secretary of State, and briefings from this Board are routinely circulated to the Bureau of International Security and

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[112] From the US Department of State website, accessed on 16 September 2009 at <http://www.state.gov/t/isn/16189.htm>

[113] Interview, US Department of State, 10 June 2008.

[114] So-called 'FACA fear' has been documented, most notably as a barrier to collaboration in natural resources management, see for example (Sturtevant et al., 2005).

[115] Formerly the Arms Control and Nonproliferation Advisory Board (ACNAB).

Nonproliferation. The ISAB's charter allows for up to twenty-five members, it meets formally on a quarterly basis and its discussion covers all areas relevant to the Bureau, its current membership is contained in Appendix 5. Any meeting with more than seven members of the Board is considered formal and statutory conditions required by FACA and its amendments then apply. Further, the ISAB provides recommendations for the entire Bureau, not just the Office dealing with chemical and biological weapon policy.

In addition to receiving the recommendations of the ISAB through the Secretary of State, the Office of Chemical and Biological Weapons Threat Reduction in the Department of State also attends quarterly meetings with the chemical industry on regulatory compliance. According to a State Department interviewee, the arrangement whereby the US CWC National Authority is invited to meetings coordinated by the American Chemistry Council, enables the government departments concerned to avoid the cumbersome administrative procedures that would be required if they hosted the meetings themselves.[116] Such a working arrangement, informal in nature, has been in place since 1978[117] and according to a senior State Department official, the relationship between the US government and the chemical industry has remained cooperative since that time. During industry-government meetings, Government departments give a general briefing on the status of the CWC and a more detailed discussion is then held on industry inspections.

In a marked contrast to the United Kingdom's National Authority, the Office of Chemical and Biological Threat Reduction's expertise is often drawn from in-house staff. Within the Bureau of International Security and Non-proliferation, internal experts are routinely involved in policymaking reflecting the Unite States' higher mobility between government and non-government frameworks. According to a senior State Department official,[118] internal experts also perform some horizon-scanning by,

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[116] Interview, US Department of State, 10 June 2008.

[117] This date is in line with the initial involvement of the US chemical industry in the CWC, as discussed in chapter 5.

[118] Interview, US Department of State, 10 June 2008.

inter alia, monitoring chemical trade journals for new innovations. However, much of the horizon-scanning activity takes place within the intelligence communities who look for new potential agents rather than trends in chemical processing. According to a scholar at the National Defence University,[119] the reason for differences in horizon-scanning objectives between the various government agencies is that the intelligence and defence communities were restricted by their funding allocations to defensive research. Generally speaking, the Department of Homeland Security had only limited resources for the constant monitoring of threats from toxic industrial chemicals. Known as TICs, toxic industrial chemicals have taken greater prominence in threat assessments since 9/11 because they are easily accessed and therefore perceived as attractive to non-state actors.

A number of other experts feed into the policymaking structures in the Department of State, one example given by policymakers in the US being an ongoing research programme into the concept of 'technological latency' running at the Lawrence Livermore National Laboratory. The term, technological latency, as used by Lawrence Livermore researchers, refers to an underlying (and unused) capability for the development of chemical weapons as held by many states. This project has highlighted the potential value of a greater focus on the verification of processes rather than the identification of novel agents.[120] An argument that has gained momentum in Washington DC, is that the level of 'latency' has increased with recent increase in the pace of technological innovation seen in the chemical sciences.

The National Defence University's Center for the Study of Weapons of Mass Destruction is another government-affiliated body that is, according to one interviewee, viewed as relatively neutral and is able to serve as a useful mediator between government departments.[121] However, the University maintains very close ties with central government particularly because most research staff were formerly government

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[119] Interview (a), National Defence University, 13 June 2008.

[120] Interview, Senior Advisor McKenna Long & Aldridge, 16 June 2008.

[121] Interview (a), National Defence University, 13 June 2008.

officials at the Pentagon, the Joint Chiefs of Staff, and the Defense Threat Reduction Agency. Other institutions exist to provide advice to the government on scientific issues, one of these was the Office of Technology Assessment (OTA) which existed from 1972 to 1995. Since its closure, much of the OTA's work has been taken over by the National Academy of Science. According to a former employee of the OTA, the Office advised US government on science and technology policy and was widely respected as a source of 'objective' analysis in technical policy matters.[122]

The resources referred to above appear impressive but the blunt truth, according to another interviewee, was that much expertise in weapons systems was disappearing as Cold War era either retired or died; only very few 'real' experts were currently available to contribute to policy and these individuals were hugely important for safeguarding institutional memory.[123]

Returning finally to the SAB, it is clear that the United States closely follows both its proceedings and its recommendations. Once received, the reports of the SAB enter an inter-agency process to enable the formulation of a national position on its recommendations. Interview data show that this can happen through two mechanisms: the report is either circulated for comments and a formal position is then adopted; or a draft position is prepared by the Office of Chemical and Biological Weapons Threat Reduction (Department of State) and then circulated with the report.[124] The distribution circuit usually includes the two Department of State Bureaus involved with chemical weapon policy, both the military and civil sides of the Pentagon, the Department of Energy, the Central Intelligence Agency, and the Department of Health and Human Services. Once a common position has been set, it is returned to US representation in The Hague.

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[122] Interview, Center for Strategic and International Studies, 24 June 2008.

[123] Interview (b), National Defence University, 13 June 2008.

[124] Interview, US Department of State, 10 June 2008.

It is apparent that, even between two member states like the UK and the US that are closely aligned in policy terms at the OPCW, significant differences in policymaking exist at the national level. These differences, often unsurprising are more than mere differences in procedure between the countries and are pervasive too in the manner in which the two states use, and view the role of, expertise in policy. Although both countries attach importance to function of their experts, the United States incorporates them directly into policymaking to a much greater extent than does the United Kingdom. In the UK, almost all experts involved in chemical weapon policy (with the exception of certain individuals) are maintained at the advisory rather than the policymaking level. Whether this is a product bureaucratic style – the United States does have higher mobility between state and other institutions – or just a consequence of statutory requirements, it is hard to say. However, this question deserves further enquiry not least because my findings suggest that should such significant differences exist in states that have a similar approach to the CWC, variations in other states might be even more pronounced. These differences would impact on the international level too, and this is an area for future research.

The next chapter will build on the results of this and previous chapters to provide some thoughts on an analytical framework for these findings. In doing so, a number of theoretical concepts will be used to explain these results and set out the thesis of this dissertation.

8 Reconciliation: the role of scientific advice in international policy coordination.

The main objective of this dissertation is to assess the effectiveness with which the chemical weapon prevention regime accommodates technical change, particularly through the use of experts. The empirical analysis has been led by science policy literature on the role of technical expertise and the use of science in decision-making, but it has also been informed by the IR cognitivist school that asserts the power of knowledge in the international policy context.

In the background of the international consultations and negotiations that led to the signing of the Chemical Weapons Convention one can note the apprehension about what future technologies would bring or presage, and how they would affect the work of the CWC. As discussed in chapter 5, many clauses of the Convention that refer to technical change were driven by the concern about binary chemical weapons. These weapons signalled an innovation in chemical weapon agent delivery that led negotiators to shift their focus away from only regulating the end products to also focusing on precursor chemicals.

Experts played significant roles in the design of the Convention as members of national delegations but although interested scientists organised themselves to exert influence

on policy, such organisation occurred largely along political lines and assigning causality to policy outcomes has not been possible. Experts from different political systems did not necessarily agree on scientific information, nor was there a common consensus to which they found themselves adhering. In other words, although the conditions of decision-maker uncertainty seemed right from an epistemic community perspective, there was insufficient evidence of an epistemic community of scientists, or, at least insufficient evidence of one functioning as the concept would have it do. This is not to say that like-minded experts did not organise themselves to influence policymakers but this was not a singular voice of science. In other words, scientific knowledge does not lead to identical interests and positions because it is not objective.

Experts in NGOs performed a different role. Again in chapter 5, the review of the role played by the Pugwash movement in talks and negotiations for the CWC concluded that Pugwash enabled experts and negotiators to speak candidly about all aspects of policy issues. The manner in which the chemical weapon study groups were organised by Pugwash was a crucial factor in its success: public openness and wide participation were traded for individual openness and the presence of key (and highly influential) actors. That scientific experts were behind this success was not coincidental but a product of the professional culture in which they work: a culture familiar with the need for dialogue across national barriers. I argue however that the implication – as would be derived through the analytical lens of epistemic communities – that Pugwash's success came from the knowledge of the experts behind the movement is mistaken. Pugwash exerted influence by fostering an environment perceived by decision-makers as a much needed forum for frank discussion of policy (at times political, at others, technical) with scientific experts and policy officials speaking to both these components.

If science is not always a source of knowledge that is perceived to be objective, the concept of an international environment driven by epistemic communities begins to collapse. If scientific interpretation differs and can lead to politically significant differences in position, so-called epistemic communities then become little different to other common interest groups operating in the political sphere. Groups of experts form

along political lines and argue against each other with technical arguments that reflect (and are used to support) political positions. This is evident from the extensive science policy literature discussed in chapter 3.

Likewise, in chapter 6, the results of empirical research on the Scientific Advisory Board suggest that a similar dynamic between experts is in play. But a deeper analysis revealed that even between experts of the same 'political culture', significant differences emerged in the interpretation of the science; the discussion of OCPFs that is presently being played out in HSP's own journal is a case in point. This can be explained in several ways: access to different information affected their conclusions; or, that different interpretations of the same information had led to different conclusions, or scientific conclusions were overridden by other (seemingly) more salient factors. These other factors become important when, as the case of the SAB has demonstrated, different experts have a range of relationships to their states even though all are supposedly independent. Disregarding the reasons why scientific consensus has not been achieved, it is clear that the interpretation of science for policy does not necessarily lead to a clear-cut scientific consensus.

The previous chapter illustrated how CWC member states use the SAB to speed up, divert, or decelerate progress in various policy areas. It argued that during multilateral negotiation, states routinely use science, more specifically the SAB, as a marker to establish their position in politically salient areas.

This chapter will draw from these results to expand on the preliminary claims set out in the theoretical introduction to this dissertation. It will proceed by demonstrating that although often valuable, the concept of epistemic communities needs to be more closely aligned with the role of science as expressed in STS. Following this will be an initial examination of how the literature on science and expertise can inform and improve on the shortcomings of epistemic communities. It will argue that by encouraging a more realistic view of how science interacts with politics, a more effective interaction would be facilitated. In short, science is not straightforward.

8.1 Constructing a thesis

The main claim of this dissertation is that during the negotiations for the CWC, the role of science and experts was perceived in a manner that has been sustained in the first decade of the Convention's implementation, but has been based on an outdated understanding of a complex relationship that has been influential in IR. This relationship, as embodied in the concept of epistemic communities, is based on three specific premises about science:

1. Experts reach consensus;
2. Experts shape national interests; and
3. A clear separation exists between science and politics.

This chapter will argue that these three assumptions neither stand up to the contemporary literature on the function and role of science in policymaking, nor to the empirical findings outlined in the two preceding chapters. It will instead propose that an alternative way of thinking about science might be introduced into the international political system, in the same way that some scholars have argued for national systems of decision making, to support more realistic use of science in policy environments.

8.1.i. Consensus in science

The literature on epistemic communities states that a key condition for an effective epistemic community is that its position be held by consensus, and without such a condition, experts lose their authority. Such consensus is achievable between experts because they hold the same causal beliefs and policy preferences. Haas attributes a lack of scientific consensus to temporal factors; claiming that 'ripe' issues are most productively dealt with by epistemic communities (Haas, 2004, p. 579). When commenting on the lack of progress on the Intergovernmental Panel on Climate Change, Haas argues that the

> "scientific consensus is not yet strong, and thus the available scientific knowledge is not fully usable. Yet, in the case of climate change, the fact that usable knowledge is not yet available for climate change has much to do with the political choices associated with the design of the IPCC, and thus suggests the political limits to states' willingness to confer some degree of autonomy to scientific institutions and to defer to their guidance." (Haas, 2004, p. 580)

The findings of research presented herein do not support the notion that scientific knowledge will necessarily ripen and lead to scientific consensus. The problem is that from an STS perspective, experts rarely achieve consensus even when they fulfil other criteria for an epistemic community outlined in chapter 3. Experts with similar knowledge bases, interests and causal beliefs will habitually argue and disagree about both the interpretation and the implications of science. Empirical findings in chapter 5 and chapter 6 illustrate that disagreements on scientific knowledge are not necessarily remedied by time: those that existed between experts during the design and negotiation phases of the CWC continue to exist decades later.

The SAB serves as a good example of this, with persistent lack of scientific consensus resulting in sloppy reporting of its recommendations to the Director-General. If this research into the role of experts in the CWC is typical of experts in other international regimes, as I believe to be the case and is corroborated by national research, then the expectation that experts are able to deliver a singular voice on policy matters is compromised.

That said, some demarcation can be made between the types of advice called for. As discussed in detail in chapter 6, the effectiveness of the SAB depends very much on the types of questions it is asked to address, and the ways in which these questions are formulated. In this respect the contrasts between how topics assigned to the Board are framed – the salts of Scheduled chemicals and 'production by synthesis' being two examples described – demonstrated that the SAB is sometimes expected to discuss policy, and sometimes not. Once the SAB debate enters into the domain of politics, members of the Board do not tackle the issues head on but skirt around the edges with very cautious advice. In the case of low concentrations, just as with other issues, the political incentives to resolve the issue were undermined by technically complex decisions about threat and regulation.

Dissensus has been discussed in the STS literature on expertise, and has drawn significant attention not only to the fact that it exists and is unavoidable but also to the way in which it is reflected and dealt with. However the view in IR, and the view dominant during my fieldwork, is that consensus is a prerequisite for successful advice. This dissertation contends that if consensus on scientific issues is difficult to achieve on a national level, it is even more difficult in an international context. This is so because, as demonstrated in chapter 7, each state brings to the international platform different ideologies about science's role in government and different procedures to incorporate science into policy. From the literature, there is evidence that the most effective use of science is based on the premise that also holds in other spheres; that processes of deliberation and argument between all stakeholders is necessary. For this reason, many science policy scholars argue that the results of expert deliberation are better reproduced in a pluralistic, 'either, or' way (Stirling, 2007, 2008a, 2008b).

8.1.ii. Science and national interests

To the inherent difficulty of establishing any causal relationship between a position taken by experts and a policy, there is also very little evidence to suggest that experts are especially empowered in uncertain times, as the model of epistemic communities suggests. To quote again Peter Haas:

> "[t]he epistemic communities approach focuses on this process through which consensus is reached within a given domain of expertise and through which the consensual knowledge is diffused to and carried forward by other actors. Its primary concern is the political influence that an epistemic community can have on policymaking, rather than the correctness of the advice given. " (Haas, 1992, p. 23)

Thus the model as set out above claims that the communication of expert advice – informed by causal beliefs and policy preferences and based upon their consensual knowledge base – enables them to influence state and international political outcomes.

Haas continues that "[a]s the scientific consensus becomes the collective consensus of decision makers and as the nature of the problem is redefined in broader and more interlinked terms, the need for more comprehensive patterns of policy coordination

may also be recognized and pursued." (Haas, 1992, pp. 29-30) But based on the experience and empirical results of my research, this dissertation concludes instead that groups of experts (even when organised to reach consensus and under conditions of manifest uncertainty) are not able to influence state interests where any significant degree of political interest is involved. It does so with three arguments.

Firstly, a technical expert may have no more relevant 'knowledge' *per se* than a decision maker and, although the political aspects of some technical issues may be more visible than others, each technical question will tend to have policy implications affecting either the security, or the regulatory, or the normative frameworks of states. This was demonstrated on a number of instances throughout the empirical chapters. For instance, the question of whether or not the salts of scheduled chemicals should automatically be included in the provisions of the Convention had very little scientific basis at all; it was a policy question that had implications for chemicals regulation. Yet, advice on the issue was sought through the SAB. Equally, a future conclusion to the longstanding debate on low concentration thresholds for Schedule 2 chemicals could lead to significant changes to the declarations required from the chemical industry worldwide. Although decisions on technical issues do require the input of experts in the field, the interest of the decision maker is dependent on an understanding of the political implications of such decisions. Both the expert and the decision-maker have incomplete knowledge, but the decision maker has the over-arching political framework for guidance. If expert advice supports such a position it is legitimised but if not, it is ignored.

A second argument is that science does not equate to truth and therefore science cannot 'speak truth to power'. The research conducted herein clearly demonstrates that experts can be heavily influenced by political considerations even though, in the case of the CWC, they are supposed to be independent. As demonstrated by the case of the SAB, many experts sat on advisory Board's have other agendas (personal and professional) that will affect their views. Scientists are just as susceptible to political capture as anyone else, and this is only reinforced in an environment such as the CWC which is highly political in nature. Further, the ability of any epistemic community to influence

state interest is especially hard to achieve as state interests are defined within a national context which can be quite invisible to many transnational groups of experts. This is not to claim that scientific advice does not ever influence international policy coordination in national systems, it can, but not in the simplistic manner claimed in the literature on epistemic communities. Individual experts may exert significant influence on decision-makers, however, this is likely to occur once an individual is viewed not as a rational voice of science but as a policy voice who also knows the science. In other words, technical experts become influential when they move beyond science altogether.

The third argument is that no causal relationship between scientific advice and specific policies can be assumed, even when substantive correlation can be referenced as evidence for such a link. It is clear from empirical results that states are very quick to co-opt scientific arguments to support their political objectives. For instance, quite clear from my research is that the UK's 'evidence based policy' approach is a consequence of the UK's decision to prioritise the CWC's interests, rather than its own industry's. In contrast, various other states chose to prioritise their industry and largely ignored calls from other states to heed the rationality of science.

The model of epistemic communities would hold that the necessary conditions have not been met to allow experts to affect change in state thinking, and that insignificant uncertainty or simply experience has meant that decision makers now have fewer incentives to act on expert advice. While it is certainly true that there has been an ossification of state party positions with respect to the CWC, it is national systems for incorporating expert advice that will be carried into an international setting. States that have no culture for incorporating scientific perspectives into policy at home cannot be expected to develop one abroad, and thus the notion outlined by Peter Haas that, under the required conditions, epistemic communities can affect the manner in which states approach political issues, is also misplaced.

8.1.iii. Science and politics

The third, perhaps implicit assumption upon which the notion of epistemic communities rests is that science and politics are separable and that this separation allows technical experts to claim authority in policy debates. The present dissertation contests this assumption in two ways: first that rather than two distinct entities, science and politics in the chemical weapon regime exist along a single and fluid scale; secondly that, because science cannot be disentangled from politics, any claim to scientific authority can be challenged.

The first point is illustrated well by the issue, outlined in chapter 6, of low concentrations of Schedule 2 chemicals. For years this circular discussion perplexed many involved in it, particularly those who saw it as a technical issue that should have been solved long ago. In fact it was not solved quickly because so many non-scientific factors influenced the issue. As the discussion evolved, these political and regulatory arguments became ever more difficult to disentangle from technical considerations and thus became integral to how the subject was viewed. In essence, this issue became politics dressed-up as science. As noted in chapter 6, some decision makers have taken issue with the manner in which the Scientific Advisory Board dealt with the issue of low concentrations, claiming that the issue had been fudged but this reaction is misplaced. The Board, when tasked with a question from the Director-General or from the states party, can only comment on the technical aspects of that issue in accordance with its mandate. Given a topic that is driven as much by regulatory and political factors as by technical ones, the SAB was clearly forced to deliver ambiguous advice rather than forcefully enter into the politics of the issue. This very closely mirrors Sheila Jasanoff's remarks about science advice in the US context. She states

> "[d]iscretionary advisory systems, however, have a drawback that should not be overlooked. If agencies are free to determine when to seek advice, the decision to consult or not consult can be used as a powerful tactical weapon to delay decisions and justify inaction. Delegating a sensitive issue to an advisory committee remains one of the most politically acceptable options for regulating agencies, even when the underlying motive is to transfer a fundamentally political problem to the seemingly objective arena of science." (Jasanoff, 1990, p. 242)

This tactic of deflecting political issues takes place on the international level as well, and as will be discussed below, it is unclear to what extent decision makers are aware of the consequences of such an action.

Misunderstandings about the relationship between politics and science exist within both the expert and the political communities but at the same time, certain individuals hold a very clear understanding of the interplay between the two spheres. As detailed in chapter 6, within the SAB a number of these individuals act routinely to warn other members of the Board about the political implications that certain recommendations may carry with them, thus influencing the acceptability of those recommendations. Similarly, there exist a number of highly experienced policymakers who have an acute understanding of the underlying technical issues.

Within political circles, some debate has taken place on whether or not the subject of so-called 'non-lethal' chemical weapons should be referred to the SAB.[125] To do so would have severe consequences both for the SAB and for the way in which the issue will evolve. Such a proposal has been discussed in various forums, and although the specific arguments for such an action are unclear, one probable reason is that the technical recommendations of the SAB might carry more weight in the international setting where several attempts to address 'non-lethal' chemical weapons have been thwarted.[126] But based on the findings in this dissertation, such an approach could undermine the value of the Board by reinforcing the view now held by a number of states party that it is a tool of the West. Should the issue be introduced to OPCW discussion through the SAB, the utmost care must be taken to avoid the possible consequence outlined above. The ways in which this might occur will be discussed further below.

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[125] Although not addressed directly in this dissertation, 'non-lethal' chemical weapons is a highly sensitive topic within the CWC that has rarely been discussed in official OPCW forums.
[126] Most recently, a Swiss paper titled *Riot control and incapacitating agents under the Chemical Weapons Convention* (Switzerland, 2008) was tabled during the second CWC Review Conference. However, the paper was not addressed directly by the Conference.

8.2 Epistemic communities as political entities

Although this thesis challenges three key assumptions of epistemic communities about the nature of science and experts in an international policy context, there are good reasons for looking at epistemic communities in a rather different way. Epistemic communities, if they exist at all, do not exist as a "transmission belt of like-minded scientists" (Haas, 2004, p. 576) that deliver consensual information to a chaotic political system but are embedded within that very system. In other words, the membership and ideologies of epistemic communities are not all identical and are not confined to experts with the same causal beliefs. Even within an epistemic community populated solely by scientists, each individual will be subject to different political drivers that will inevitably influence his or her views. That said, this dissertation proposes that epistemic communities are political actors and must be treated accordingly. Epistemic communities exist within a political system that includes many different actors, all of whom are vying for power or influence.

Although many commentators assume that epistemic communities achieve power through science, this theoretical notion is in reality affected by the system in which it is embedded. The concept, ambitious in its claims, thus loses its defining characteristic: that consensual advice from experts can influence decision makers under conditions of uncertainty. In other words in an international setting, power trumps knowledge.

As suggested above, if scientists are to exert influence on the international policy level, a better understanding of the intricacies and limitations of this process must be cultivated within the relevant communities. In this respect and as argued throughout this dissertation, it is in the field of International Relations that this research should find its voice. As scientific and technical considerations increasingly define international affairs, an approach that does not oversimplify the role of science in international policy is now overdue, and is outlined below.

8.3 An alternative approach: boundary organisations and regime robustness.

By returning to some of the concepts introduced earlier in this dissertation, it is possible to outline another model for the use of science in an international policy setting. If scientific expertise is to be successfully applied to multilateral decision-making, it will be with the aim of creating a regime that is both more effective and more robust. Whilst increased effectiveness would mean that decisions are made and implemented in a more efficient manner, increased robustness would allow the regime to fare better as it comes up against significant challenges. As outlined in chapter 3 these two notions are interlinked – an ineffective regime cannot be a robust one.

As the CWC is the normative backbone of the chemical weapon prevention regime, efficient decision-making within the OPCW forms the basis for achieving its effective operation. As stated in the introductory chapter, the Executive Council's record of achieving the consensus necessary to ensure that decisions are agreed in a timely manner has been questioned, and the dominant pattern of deferral that exists within it has been highlighted. The complexities that arise from a debate that includes both technical and political arguments only add to the already difficult process of reaching agreement within a multilateral forum based on consensus. It is for this reason that, in treating issues of a technical nature, agreement should be facilitated by the Technical Secretariat as much as possible.

The Technical Secretariat's role in facilitating consensus on technical issues is important. It matters not least because its experts are highly regarded by many states party to the Convention. In this regard the Secretariat serves an important role as a boundary organisation. Accountable to the dual authority of the states party and to its technical mandate, it is the Secretariat that holds the responsibility to establish, blur or shift the boundary between science and politics. It is also to the Secretariat's Director-General that the SAB delivers its recommendations.

8.3.i. Setting the boundary

The three principal functions of the boundary organisation outlined in chapter 2 are the translation of information; mediation across the science / politics divide; and communication to all stakeholders (McNie, 2007). But boundary organisations also have a more difficult and important task in constructing and defining the border between the science and politics.

In the case of the OPCW, one way in which this is done is through the SAB. The boundary between science and politics can be defined by those issues that are referred to the SAB, and those that are not. The advantage of constructing and defining a division between science and politics has been highlighted by Sheila Jasanoff, and in her words, "by drawing seemingly sharp boundaries between science and policy, scientists in effect post "keep out" signs to prevent nonscientists from challenging or reinterpreting claims labelled as "science". The creation of boundaries seems crucial to the political acceptability of advice" (Jasanoff, 1990, p. 236). The boundary thus defined is neither absolute, nor fixed but it is constructed to foster a reductive approach to policy facilitating accountable policy outcomes. For this reason, the Director-General should take the utmost care to ensure that this key step, defining the border, is effectively administered.

The empirical results of my research have clearly demonstrated that in the case of the chemical weapon regime, and of the OPCW Technical Secretariat in particular, this initial and important stage in international policy formulation has been overlooked. As discussed in chapter 6, the procedures followed by the Secretariat when referring an issue to the SAB appear to be arbitrary. Both the mechanisms through which issues appear on the agenda of the Board's meetings and the formulation of the questions to the Board may need to be more vigorously discussed within the Technical Secretariat. This process could fall within the mandate of the Secretary of the SAB as well as to the Policy and Review Branch if the Director-General is to make best use of the SAB. In terms of agenda setting for the SAB, the procedures used must operate with rigorous transparency in order to prevent the Board's agenda from being captured by political interests. And in the formulation of specific questions to the SAB, the Director-General

must avoid the ambiguities of political language and present requests in narrow, technical, and uncontroversial language.

At the moment, although the SAB's mandate with respect to the Convention is clear, the Technical Secretariat has come to refer the tasks outlined above – agenda-setting and framing – to the SAB itself. As previously discussed, it is routine for the members of the SAB to propose future agenda items and they are often required to distil technical essence from the general and ambiguous questions referred to them. But the SAB is not a body equipped to make these decisions. Although certain members of the Board are familiar with the context of the discussions undertaken, this is very much based on individual political networks and the Board has very little overall access to direct political and policy information. This is an area where the Technical Secretariat could take on additional responsibility.

8.3.ii. The translation of information

The discussions of the Scientific Advisory Board during the second Review Conference provided some very useful insights into how the SAB's reports were perceived by various states party to the CWC. As discussed in chapter 7, the impression at the time was that diplomats based in The Hague had difficulties in understanding the policy implications of the Board's recommendations. A variety of subsequent proposals were made at the time including one proposal that led to a recent meeting of governmental experts on the basis of a directive in the report of the Review Conference itself. The report states that

> "The Second Review Conference requested the Council, through a meeting of governmental experts open to all States Parties, to consider the report by the Scientific Advisory Board which the Director-General had forwarded to the Second Review Conference." (Organisation for the Prohibition of Chemical Weapons, 2008b, p. 29)

This meeting was held in February 2009. Its objective was to "consider the suggestions and recommendations made by the Scientific Advisory Board in its report entitled 'Report of the Scientific Advisory Board on Developments in Science and Technology'" (Organisation for the Prohibition of Chemical Weapons, 2008c, p. 1) and

informal feedback from the meeting suggests that very little substantive discussion was held.[127]

Two conclusions can be drawn from such a result. First, the aggressive negotiating of certain states party to hold the meeting combined with their lack of participation at the meeting itself suggests it was an attempt to delay or curtail discussion rather than a serious effort to understand and discuss the science in a policy environment. Second, that such meetings are not conducive to serious discussions of the SAB's advice.

The alternative to holding post-hoc meetings on the recommendations of the SAB is for the Director-General to make more use of his own formal reactions to the SAB reports, and this would fit in well with the Secretariat's role as a boundary organisation. These 'Notes', as discussed in chapter 7, currently summarise what the SAB's reports set out in more detail, but they could provide the necessary translation from technical language to policy implications. If such an assessment were carried out by the Secretariat, rather than by the SAB or within highly charged open-ended meetings, the analysis might avoid the polarisation of views that often arises from state party discussions.

The role of a boundary organisation such as the OPCW Technical Secretariat in translating technical language therefore has significant importance in providing as balanced an impression as possible of the linkages between the technical and the political sides of an issue. A further advantage that the Technical Secretariat holds is that it is already familiar with the extent of knowledge held by diplomats working in The Hague and is sensitive to the underlying political concerns held by OPCW member states. Such a requirement to provide what one interviewee called 'technical translation' was voiced by a number of states party during the preparations for the second Review Conference (see the earlier reference in chapter 7), and it is also a requirement derived from theoretical reflections on the use of science in policy outlined above.

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[127] Informal Interviews, member of the OPCW Scientific Advisory Board and official at the Foreign & Commonwealth Office, 27 March 2009.

8.3.iii. Mediation across the science / politics divide

The ability of the chemical weapon prevention regime to successfully address challenges or opportunities that are presented by science and technology relies heavily on its ability to resolve issues that involve different interpretations of science. Throughout this research a recurring theme has been that there is no purely technical policy issue; this was true during the exploratory discussions and negotiations for the CWC and it is still true today. Many of the same political debates about technical issues are recurring almost twenty years later, a striking example being the issue of low concentrations of Schedule 2 chemicals, noted above. This and such current rhetoric surrounding science as the debate on OCPF inspections, serve to highlight the importance of a very careful treatment of the science / politics divide, especially in fields where the impacts of policy changes will be felt widely.

As shown in chapter 7, even within states party that from an outside perspective appear to share very similar views on technical matters in the OCPW (e.g. the UK and the US), there are different national procedures to source technical advice. There are strong informal networks of actors in both the UK and the US but in more formal terms significant differences exist: the UK relies on its National Authority Advisory Committee and its scientists at DSTL, whereas the US has a much more complex inter-agency system with its chemical industry association playing a larger role. This suggests that other states will differ even more. They might do so because although chemical weapon expertise in countries like the UK and the US is depleting, many states have little or no any relevant experts at all. In addition, as evidence from the OPCW's SAB has suggested, different states perceive the relationship between experts and government on very different terms. Thus addressing technically complex topics on a multilateral basis requires one to make very different assumptions and expectations of how scientists will contribute to policy debates. It will also lead to very different views about the existence and position of the boundary between science and politics.

Once again it seems clear that the responsibility for mediating across such a boundary should fall to the independent Technical Secretariat. To a certain extent this is already the case, but although the Secretariat (through its Director-General) is not afraid to set out its view on technical issues, this seldom takes the form of routine secretariat papers that dovetail with recommendations given by the SAB. An exception to this has been in the Technical Secretariat's paper for the second Review Conference (Organisation for the Prohibition of Chemical Weapons, 2008a), however, this long paper appeared too late for states to adequately incorporate its views into their policy formulation.[128] It is during the five-year intervals between the Review Conferences, using the reports of the Scientific Advisory Board as a tool to catalyse wide interest, that the Secretariat should carry out the majority of its boundary work.

Another area for mediating across the science / politics boundary is in the Technical Secretariat's interaction with the Scientific Advisory Board itself. This dissertation contends that the relationship between a boundary organisation and its source of scientific advice must be iterative in nature. This is to say that the processes between referring an issue to the SAB and receiving the Board's recommendations must not, indeed they cannot, take place in a linear fashion. Issues need to be revisited and different facets discussed, linkages between some issues will evolve and other issues may simply fall off the policy agenda. During these processes, the boundary organisation must remain highly engaged with the discussion at both ends of the spectrum. In this respect, there is a clear lack of engagement on the part of the Technical Secretariat during the meetings of the SAB. As previously discussed, only very few Secretariat staff members not directly involved in the meetings attend, and the only dialogue between the two bodies takes place either informally or through short Secretariat briefings.

In the SAB's examination and re-examination of technical issues, the Technical Secretariat must foster common understandings and shared goals both within the Board

[128] The paper was officially distributed to member states on the 4 April 2008 – three days prior to the Review Conference.

and outside it. In order to achieve this, it is imperative that the boundary organisation is able to communicate effectively across stakeholders.

8.3.iv. Communication

Communication is set well within the purview of the Technical Secretariat's activities, in fact most of the Secretariat's activities are centred on communicating and mediating between states party to the Convention. Considerable effort also goes into communicating with other international organisations, the chemical industry, states not party, and intermittently with NGOs. This aspect of the Secretariat's function will not be discussed herein.

8.4 The functioning of scientific advisory committees

Having discussed the role of a boundary organisation in promoting discussion and in facilitating the resolution of technical issues, I now return to the experts themselves. With the myth that scientific experts are able to speak in a singular, objective voice largely dispelled by both the literature and by the empirical findings, this dissertation re-examines the role of experts in international policy with a specific focus on those who participate in policy through scientific advisory committees. The paragraphs above looked at the role that boundary organisations such as the OPCW's Technical Secretariat play in cultivating a constructive approach to science policy issues; this section will do the same for advisory committees operating within international frameworks. Empowering experts in such an environment depends not on propagating an idealised view of their impact on policy, but on accepting the limitations of scientific advice and in understanding the ways in which it *is* able to contribute to political debates.

The empirical findings on the functioning of the SAB in chapter 6 reveal that there are significant deficiencies in the functioning of the Board. These may be categorised as

follows: meeting structure and dynamics; independence; subsidiary groups; and presenting recommendations. This section will build on the results of chapters 6 and 7 to develop the current understanding of the role of scientists that could be applied more generally across international policy. Broadly speaking, this research on international scientific advisory committees supports the views presented in Sheila Jasanoff's *The Fifth Branch* that focused on the national level in the United States.

8.4.i. Structure and dynamics of meetings

The organisation and execution of the SAB meetings at the OPCW headquarters were extensively discussed in chapter 6 and a number of relatively general problems emerged. First, due to the diverse nature of the Board members, differences in experience have a significant effect on the manner in which the group behaves. These differences, which in the case of the SAB are represented largely by familiarity with the regime, are significant factors in the formation of cliques within the larger group that can affect the discussions held. In the case of the OPCW's SAB, some members have negligible previous experience in 'regulatory science', let alone in the context of the Chemical Weapons Convention. Whilst complete standardisation of committee membership is neither possible nor desirable, there is a case for a requisite level of experience. At the moment, this is made difficult by the strict application of the guidelines on geographic balance,[129] a constraint compounded by the steadily dwindling community of experts that have a hands-on understanding of chemical weapons. Nevertheless, whilst concrete expertise of chemical weapons might be more difficult to find, there exist numerous fields that deal specifically with the regulation of chemicals. This 'peripheral expertise', and equivalent expertise in fields like environmental and drug precursor regimes, should be better exploited.

Although unintended consequences are difficult to predict, there are almost certainly positive consequences in bringing in expertise from other regulatory areas. For instance, as the chemical weapons prevention regime heads slowly towards a change in focus –

[129] The problem here is that it is from those countries that suffer from low representation within the OPCW that there is a significantly smaller pool of expertise to draw from.

away from military focused weapon destruction and towards a civil/military focus on preventing re-emergence – the OPCW's activities are likely to mirror more closely the function of environmental regimes like REACH[130] in the European Union, which has reorganised the European system for the regulation of industrial chemicals. It is in these areas of health and environmental regulation that broad populations of experts are growing across the world, including growing populations of experts in regions under-represented in the OPCW.

However, it is also essential for the effectiveness of advisory boards that their members are able to communicate. This does not simply mean in terms of a common language (a vital concern of its own) but also in terms of an ability to discuss scientific issues in a common language. Whilst scientific experts are well versed in communicating the results of scientific research to various audiences, my research indicates that, when straddling the science / policy divide, experts tend to use different techniques to put their views forward. This echoes Jasanoff's view that the "search for technically qualified experts is tempered by equally important concerns for breadth, balance, and familiarity" (Jasanoff, 1990, p. 91) with the objectives and methods of an organisation.

Another empirical observation that has direct implications for this thesis is that the effectiveness of advisory committees depends significantly on the motivation and commitment of their members. As my research has shown, lax preparations for SAB meetings have direct repercussions on the progress of the annual Board meetings. Much of the limited time available is wasted on reintroducing agenda items, and reports of the meetings are written and approved too hastily. This rather chaotic process means that without adequate preparation, a substantial part of the meeting is devoted to bringing unprepared members up to speed and to discussing the report-writing methods rather than the substance of the Board's agenda. Although addressing the lack of commitment on the part of some SAB members is not straightforward, a clear intersessional plan of work between meetings would certainly help. Part of this work plan could be undertaken by individual SAB members (e.g. background papers,

[130] REACH stands for Registration, Evaluation, Authorisation and restriction of Chemicals.

agenda proposals), and a large part of the substantive work of the Board could be more effectively undertaken by delegating it to the meetings of the Board's ancillary groups, the Temporary Working Groups.

If it is the boundary organisation's role to set the boundary between science and politics, mediate across it and then to translate the information coming from it, it is the job of the advisory committee to produce such information. If it is characteristic of advisory committees to be convened only once or twice a year and, when convened, to be given a very short period to produce their reports, then the careful management of this time is a central concern. The framework of the OPCW's SAB allows for it to function through its Temporary Working Groups which have traditionally been theme-based groups of highly specialised scientists (see Chapter 6). For this reason, and were the funding of their activities to allow it, the SAB might assume a rather different primary role of overseeing the work of its temporary working groups and formulating the recommendations arising from their results. This would incorporate the peer review concept already familiar to experts but would also require broader knowledge of the regime to ensure that the recommendations made by the SAB were relevant to the policy questions asked.

In this regard, another degree of separation can be established. Not only is the science distanced from politics through a boundary organisation, but science may also be distanced from policy through a similar division in the SAB. If this model were to be implemented, the discussions held within the TWGs would be limited as much as possible, and implications for policy would be discussed within the SAB. This division of labour between the Board and the TWGs would help maintain the divide between science and policy by neutralising the political associations of the Board and lending the Board's views added legitimacy. The fluid membership of Temporary Working Groups would also allow for changes in the profile of the working groups as required by the evolution of subjects under discussion.

The impact of such a proposal on the work of the meetings of the Temporary Working Groups would be relatively limited, but the meetings of the TWGs would become

much more routine activity, insofar as budgetary allocations allowed. Nor would the membership and recruitment of the TWG need change significantly although further consideration might be given to the optimum size of such groups. A significant difference, however, would be the manner in which issues are referred to the TWGs. As underlined above in the discussion of how issues are referred to the SAB by the Director-General, the framing of technical policy problems is fundamental to their outcome. The same would be true with respect to how the Board assigns topics or issues to TWGs; there would need to be careful consideration of the following points:

- The scope of the issue;
- The expertise available;
- The kind of information the SAB wishes to receive;
- Pluralistic conclusions;
- Whether the TWGs should present bias in their recommendations?

8.4.ii. Engagement with politics

The empirical findings in this dissertation have drawn attention to the friction between members of the Scientific Advisory Board on the extent to which the Board should take into account the policy positions of states party in their debates. In light of the thesis as stated so far, it is clear that the biggest risk that the Board runs in doing so is to lose its fragile legitimacy; and any loss of legitimacy could, as suggested earlier in this chapter, impact seriously on the overall robustness of the regime and its ability to weather external challenges.

The initial focus of my research was to study the impact of recent changes in chemical technology on a regime that was built around a static period of innovation in chemistry. In such a context, the robustness of the chemical weapon prevention regime was important not only for keeping up to date with technological change during its inspections, but also for withstanding the new ‘opportunities’ presented by such changes. Other more immediate challenges that test the resilience of the regime come also from other areas. New challenges will surface from a renewed interest in so-called non-lethal chemical weapons, but the most conspicuous challenge to date is from the

almost certain failure of the two largest possessor states to destroy their chemical weapons by 29 April 2012, the CWC's final extended deadline for destruction. In addressing these challenges, stakeholders in the chemical weapon prevention regime will retain the expectation that scientists will contribute in a positive way to policy. For this reason, a loss of legitimacy of the Scientific Advisory Board would be severely damaging. Legitimacy once lost is hard to restore.

My research has confirmed that erosion in the credibility of advisory committees takes place when their recommendations become associated with political positions, and when their conclusions indicate that political drivers may have captured the committee. My research also proposes that the likelihood of capture occurring increases dramatically if advisory boards are tasked with political issues that are presented as technical problems – as was seen in the issue of low concentrations – or when governments appropriate technical arguments to legitimise policy, as has been seen in the ongoing debate over OCPF inspections.

The SAB has suffered from a loss in its credibility: a number of states party now view the SAB as a tool for promoting a Western agenda rather promoting an independent voice. It is perhaps in reaction to this that some states parties' national authorities have developed an overly close rapport with their national representatives on the Board and have themselves compromised the independence of the SAB, thus creating a vicious circle. The boundary organisation's mandate to preserve a divide between science and politics relates directly to the preservation of the legitimacy and hence resilience of the regime. The work of the scientific advisory committees must therefore be seen to sit very clearly on the side of science and should maintain as much distance as possible from both politics and policymaking. Either that or scientists must relinquish their claim to cognitive authority and approach political issues head-on, as did the Pugwash movement during the Cold War. As argued in chapter 5, the success that Pugwash had in influencing the political agenda came primarily from its highly pragmatic approach to discussing overtly scientific but implicitly political issues.

8.5 Implications for academic literature

The opening chapters of this dissertation suggested that the topic and context of my research had not been adequately covered in any one body of literature. Science and Technology Studies provided many of the conceptual tools used in the analysis of research data but it failed to accommodate the complex structures of an international setting. The IR model of epistemic communities yielded assumptions about the nature of science that science policy research had clearly shown as false. For this reason, this dissertation sits between the two literatures and contributes to both.

A recognised shortcoming of the literature outlined in chapter 2, is its strong bias towards studies conducted at the national level. Where papers have ventured beyond the state, they usually restrict themselves to comparing policies between states. In the context of chemical weapon policy, this research has demonstrated that state-centric research is important but fails to tell the whole story. The analysis of the preparatory multilateral discussions for the second CWC Review Conference illustrated the unprecedented role of international policy, specifically through the increased influence of the NAM and the counteractive measures taken by the WEOG and, to some extent, the European Union. This dissertation cannot say whether this trend in the chemical weapon prevention regime is one that stems from broader international groupings asserting leverage, but it seems possible. It is certainly the case that many of the most prominent policy areas are addressed in international forums, studies of science and technology policy cannot afford to remain bound to the national level of analysis.

My research confirms also, that in matters of science and expertise, many of the phenomena identified from studies on national science policy are also played out on the international platform. If anything, these processes of politicisation and legitimation are amplified on the international stage because of the polarisation of political positions and the higher levels of mistrust.

This dissertation contributes significantly to the epistemic communities model taken from the International Relations literature. The critique in chapter 3, arguing that the

treatment of science in epistemic communities remains cloaked in an uncomplicated view of science and permits only a narrow role for expert advice, is heavily supported through empirical data. My research has made it clear that epistemic communities must go further; a rethink of its portrayal of science in international policy coordination, one that accommodates the political roles of expert advice, is timely. Specific recommendations for the field will be elaborated in the next, and final, chapter of this dissertation.

9 Conclusions

The past decade has seen visible and global changes in the chemical sciences which have catalysed interest in the capacity of the Chemical Weapons Convention to respond. The opening paragraphs of my dissertation drew attention to an existing body of literature that has identified these trends and highlighted that technical change would impact the chemical weapon prevention regime, notably through effect on the implementation of the CWC. My research has built upon existing scholarship to examine the regime's procedures for addressing technical issues through the use of expert advice. Within the governments of OPCW member states and through the Scientific Advisory Board that makes recommendations to the Technical Secretariat's Director-General, scientists and other experts are consulted about the technical aspects of policy matters. A better understanding of this process is essential if changes in the technological landscape are to be adequately incorporated into the chemical weapon prevention regime. My dissertation has achieved this goal by presenting a rigorous exploration of the Scientific Advisory Board's role and function, its relation to other organs of the OPCW, and an analysis of the use of experts and science in two member state governments.

This closing chapter will summarise the primary results of the empirical chapters and their analysis; it will outline the contribution the thesis makes to knowledge; it will

provide policy recommendations specific for the OPCW and for governments; and it will demonstrate the relevance of these findings to other fields of research.

9.1 Summary of empirical results

The empirical results of my research have explicitly addressed the research questions contained in chapter 1 and may be summarised as follows.

Unless they were actively involved within national delegations, chemical industry experts did not participate directly in the discussions and negotiations for the CWC, but their views were put forward through industry associations. Although industry experts only became significantly involved with the Convention during the later stages of its negotiation, their contribution to the Convention's text (especially to its procedures for chemical industry inspections), and later, to its implementation have been substantial. Some of the chemical industry experts who influenced the negotiation remained active in the field, and some subsequently went on to advise the OPCW through the SAB.

Other experts contributed to the design of the convention in two significant ways: through their national delegations or through the work of non-governmental organisations, particularly through the Pugwash Conferences. However, these two channels of activity lent themselves to very different types of influence. The former frequently acting to reinforce the hidden agendas of political manoeuvring, the latter speaking 'science to politics' in a manner that dealt explicitly, and transparently, with the political drivers. The former being constrained by the mistrust that divided the geo-political lines, the latter being capable of relatively open and candid discussion. Derived from personal and second-hand accounts of Pugwash activities during the negotiation period, an unexpected conclusion was that it was the manner in which their meetings were approached and structured that set the productive atmosphere between interested scientists, experts, and high-level officials. By contrast, and within the

formal machinery of multilateral negotiation, experts participating in ‘expert group’ meetings were used to legitimise national policy positions.

The concern among some negotiating officials for the long-term relevance of the future treaty (a concern that was compounded by developments in the state-of-the-art in chemical weapon technology) resulted in technical change being explicitly written into the treaty. An analysis of the textual origins of relevant parts of the Convention revealed that no part of the Convention, whether a technical or a political provision, was negotiated in isolation. But these aspects of the Convention were not so much designed as part of a coherent whole but were the product of complex and iterative debates that evolved around many different concerns. Because agreement in many areas remained elusive to the end, the final text contains ambiguous treaty language reflecting the disagreements of the negotiators, and many of these ambiguities have since been reflected in the implementation of the CWC’s mandate through the OPCW.

One can see this in the functioning of the SAB with its complex lines of responsibility, the vague procedures used in assigning tasks to the Board and in the distribution of its recommendations to different organs of the OPCW. Other ambiguities written into the Convention, such as its provisions on riot control agents and OCPFs, remain hotly debated amongst decision makers and scholars. In doing so, some commentators maintain that the Convention is a legal document that should be strictly implemented as such, and others argue that the implementation of the CWC should be carried out in the spirit of the intentions of negotiators.

Other significant peculiarities of the SAB also affected the execution of its responsibilities. As detailed in chapter 6, these included lax preparation for the meetings by some members and significant imbalances in participation. The Technical Secretariat’s procedures for the Board are unclear and as a result are inconsistently applied; for instance, my research found a surprisingly high disparity in the care taken to frame questions put to the Board according to its mandate, and in setting its agenda. These shortcomings, combined with a range of expectations from member states, have led to confusion and uncertainty within the SAB regarding to what extent it should

address policy in its recommendations. But, as demonstrated by the case of 'low concentrations', when drawn too far into political debates, the SAB has been able to stand its ground and refuse baits thrown at it to address directly the politically contentious aspects of issues. Although, this is an unpopular move from the point of view of the states party, it is crucial to protect the Board from politicisation and, as such, must be replicated should the SAB feel its mandate undermined by requests put to it.

The flow of information in and out of the SAB further illustrates the inconsistencies present in the Board and is a problem compounded by a lack of substantive and regular contact between the Board and the Technical Secretariat. Although the high level of expertise of Board members carry in their own field is not in question, their detailed knowledge of the Convention varies considerably due, in part, to the range of relationships between members of the SAB and their respective national delegations or governments. These relationships are then mirrored in the manner in which the Board is viewed by OPCW member states, an issue that was addressed in chapter 7.

The flow of information issue referred to above has also led some member states to claim that they receive an incomplete and over-sanitised picture of the discussions of the SAB. This is partly true due to the inadequate reporting of the Board's activities because of the near-impossible speed at which the Board must write its draft reports. An obvious solution would be to allow the SAB to meet more often, but although it is a policy favoured by a number of states party, a predictable obstacle found in this research would be a strong reluctance of many member states to fund such meetings on a permanent basis.

State perceptions of the SAB were investigated during the preparations for the Second Review Conference, specifically through the meetings of the Open-Ended Working Group. In this context, what was not said in the meetings of the Working Group became just as important to the analysis as what was said, and it became clear that many member states were reluctant to discuss the substance of the SAB's recommendations and their implications for policy. Some member states blamed the

Board's use of highly technical language, but the push from some delegations for government oversight of the Board suggests a more complex basis for a sometimes deep mistrust of the Board's role.

At the second CWC Review Conference, individual member state concerns about the legitimacy of the SAB quickly spilled-over into collective politics, and a polarisation of views led to a stand off between the NAM and the WEOG regional groups. This is a finding that will be unsurprising to those familiar with multilateral diplomacy but it offers a significant insight into how international policy coordination differs from studies of national level policy formulation.

An exploratory feature of my research compared and contrasted the United Kingdom and United States' use of experts in the formulation of policy within the chemical weapon regime to study differences at the state level. It found that both member states have in place ways of receiving technical advice and incorporating expert opinion into their policy formulation processes that are closely related in terms of policy choices. However, their policy formulation on technical issues differs quite significantly; the United States relies more on 'in-house' experts whilst the United Kingdom uses defence scientists and an advisory committee to source expert advice. These results suggest that more extensive deviations could be expected between other states and a better understanding of them would be necessary to fully appreciate the complexities of using expert advice in the international environment of the chemical weapon prevention regime.

9.2 Policy Recommendations

The empirical results were elaborated in chapter 8 by the application of theoretical concepts developed in the early chapters of my dissertation. This analysis gave way to a number of suggestions for the improvement of the effectiveness and robustness of the chemical weapon prevention regime. These suggestions are reproduced below in

the form of specific policy recommendations to the OPCW Technical Secretariat and the SAB. They take into account existing OPCW efforts to address issues addressed in this dissertation and aim to reflect current concerns, including budgetary ones, within the Organisation.

My research has demonstrated that disparate national approaches to science in policymaking make the giving of scientific advice at the international level a delicate process. It requires, on the one hand, an understanding that no policy issue is purely technical, and on the other, a set boundary to distinguish between the technical and the political components. The main recommendation for the Technical Secretariat and SAB is therefore that the activities and procedures of the Board must be more effectively supported by the Technical Secretariat. This is necessary so that the SAB may provide advice of a more robust nature. Additional support does not simply mean an increase in its share of the budget allocation (although this would be a positive development) but requires the development of the Technical Secretariat's role as a boundary organisation. Specific policy recommendations are set out in more detail below.

9.2.i. OPCW Technical Secretariat

1. *The Secretariat must set and enforce a clear boundary between science and politics when issues are assigned to the SAB by developing explicit procedures to set the Board's agenda.*

To achieve this, the Technical Secretariat must:

- Clearly define issues assigned to the SAB. Where issues are of direct political relevance, the Technical Secretariat must employ its own judgement and expertise to ascertain how best to refer the technical aspects to the Board;

- Use relevant experts within the Technical Secretariat to formulate questions that are highly specific, not general, so that the SAB is assigned a clear technical problem on which to focus their attention. The Secretariat must take

care not to pose questions leading the SAB to discussions that exceed its mandate, for instance, debates that are political or regulatory in substance; and

- The Director-General's staff must ensure that all members of the Board are kept informed of the wider context and of developments issues as they occur. This would enable the SAB to stay firmly on the science side of the science/politics divide, and to lend to their recommendations, a characteristic of political acceptability.

These procedures must be implemented in a transparent manner so that member states can have confidence in the independent nature of the Board. If they were set, the Secretariat would have an opportunity to develop a much needed framework to protect the Board from becoming entangled in political debates.

2. *The Technical Secretariat must further develop its capacity to respond to SAB recommendations through the Director-General's Notes.*

The substance of the Director-General's Notes must change from a selective reiteration of the Board's views to a translation of the SAB's recommendations into readily understandable policy terms (so-called 'technical translation') for the states party. The substance in these Notes would bridge the divide between the scientific and the political and therefore fill the gap currently felt by delegations to the OPCW, as identified in chapter 7. In addition, the timing of these Notes (which would be circulated alongside the SAB's own reports) would benefit from an increased interest in, and an increased awareness of, issues of a scientific or technical nature.

The Technical Secretariat is in an ideal position to translate the technical language of the SAB because it is sensitive to the concerns of the member states but staffed with many technical experts of its own.

3. *The Technical Secretariat must increase its interaction with the SAB, but must adopt a cautious approach to the relationship between the SAB and the states party.*

As argued in chapter 6, it is the Policy and Review Branch of the Secretariat's Verification Division that is most well equipped to enhance its interaction with the SAB, not only through attendance at the Board meetings, but also through a more substantive role in the preparation of papers relating to the Board. More generally too, the meetings of the SAB would greatly benefit from wider TS staff attendance and participation in its meetings. By contrast, my research suggests prudence in fostering too close a relationship between the SAB and the states party. Although member states may request that the Director-General task the Board with specific questions, the SAB must answer to the Director-General alone or risk its independence being undermined by state party pressures. A more specific recommendation on the interaction between the SAB and the states party is given below.

4. *The Technical Secretariat should promote the discussion of SAB recommendations with states party in an informal forum.*

As has been discussed in previous chapters, there is little evidence that the format of the recent meeting of government experts (held in February 2009) encouraged a constructive discussion of the SAB's report and recommendations. A more suitable way of fostering direct interaction between the SAB and the states party, if such a relationship is considered necessary, is through informal discussion. If such meetings were held in an open format, perhaps as lunchtime workshops during the Conference of the States Parties, they would provide a more relaxed forum that would facilitate a more substantive discussion. However, direct contact between the SAB and the states parties would expose the Board to political attack; under such circumstances, its ability to defend itself by asserting its scientific basis would be crucial in maintaining its perceived legitimacy.

9.2.ii. Scientific Advisory Board

The SAB has been and remains an extremely valuable source of advice for the OPCW but it suffers from a number of shortcomings that have been detailed at length in

chapter 6. Some of these shortcomings would disappear were my recommendations for the Technical Secretariat to be implemented, but other shortcomings to do with how the SAB functions as a group would unfortunately linger on. Advice directed at the functioning of the SAB is outlined below.

1. *To accommodate declining numbers of chemical weapon experts, the OPCW must familiarise itself with, and exploit, other pools of relevant expertise for SAB membership.*

A trend in the field of chemical weapons, and one highlighted several times in this dissertation, is that the pool of expertise from which technical experts on chemical weapons are usually drawn is rapidly decreasing. As a consequence, the OPCW, in its recruitment of individuals to stand on the Board, has had to recruit from a broader pool. Here there exists scope for the Technical Secretariat, and members of the Board itself, to play a more proactive role developing the network of future potential Board members.

The OPCW should look into other areas of expertise with the potential to contribute to the Convention, some examples of these are chemistry experts in the control of chemical precursors for illicit drugs and in environmental regulation and compliance, but other fields will exist too.

2. *The SAB must further develop its intersessional work programme.*

This recommendation tackles the problems of uneven preparation for, and participation in, the SAB's meetings. The Board, assisted by the Secretary to the SAB within the Technical Secretariat, should seek to organise and implement an intersessional programme of work that would involve all Board members. This programme could be updated between meetings on an online platform, perhaps a website that all SAB members would be able to follow. Such a website, operating on a secure interface, could host virtual discussions on the issues being addressed by the Board, set intersessional tasks and enable members who are hesitant to participate in the formal

meetings to contribute through alternative means. An inclusive approach such as this is clearly necessary to overcome the barriers to participation that currently affect the Board's performance. Such a process would also gain in importance should the recommendation for Temporary Working Groups be implemented, as proposed below.

3. *The meetings of Temporary Working Groups should assume a more central role within the work framework of the SAB.*

It is still unclear at the time of writing whether the meetings of the SAB will revert to one a year (the extra meeting in 2009 being funded through the most recent EU Joint Action), but, should such a limitation to the Board's activity return, a considerable change in the way the SAB operates will be required for it to function effectively. My research found strong support, both within and outside the SAB, for the work of the Temporary Working Groups and my dissertation recommends that these groups fulfil the following criteria:

- Specific issues should be routinely discussed by small TWGs. Group meetings should take place in parallel, back to back to the meeting of the SAB;
- TWGs should continue to be populated with a mix of SAB members and outside experts, and should retain the flexibility for its membership to evolve with the discussions of the Group. However, the size of TWGs should be reduced to a maximum of approximately ten members; and,
- The tasks assigned to TWGs must be narrowly defined to allow specific technical problems to be addressed comprehensively within the Group's time limitations. If the formulation of questions to be put to the TWGs was done in cooperation with the relevant branch of the Technical Secretariat, it would help assure the effectiveness of the process.

If these conditions were established, the SAB itself could then concentrate on reviewing the findings of each TWG and incorporating their findings into its formal report to the Director-General, rather than rushing through its own discussions and

hastily producing its reports. This proposed structure would decentralise the work of the Board, allowing it to work more efficiently. It would also incorporate peer-review, the most widely respected means for scientific appraisal, to raise the confidence of the Board in its own procedures. And it could allow the TWGs to become recruitment pools for new SAB members who, on joining the SAB, would then already be familiar with the CWC and with the activities of the OPCW.

4. *To the greatest extent possible, the SAB must insist on the independence of its members, and on a purely scientific approach to its tasks.*

This recommendation applies to the SAB as well as to its TWGs. The SAB must proactively resist pressure (arising either from OPCW member states or from the Technical Secretariat or, even, from within the Board itself) to address matters that are not fundamentally technical issues. There is a good precedent for this; when the SAB refused to enter the political debate over low concentration thresholds for Schedule 2/2A chemicals, its decision was appropriate.

This final recommendation has in mind a general theme, one that has permeated all the chapters of my dissertation, that independent scientific advisers must perform an extremely difficult, yet important, function to maintain their credibility. This function is to remain purely scientific and completely independent whilst acknowledging that, in practice, both are almost impossible.

9.3 Contribution to knowledge

My research contributes to knowledge on several different levels. It has given unprecedented and original insight into the inner machinery of the OPCW's Technical Secretariat. The results presented in chapters 6 and 7, and further developed in chapter 8, shed new light on the operation of the Scientific Advisory Board and on the way different actors in the field perceive its work. This is an important contribution to the

body of research on chemical and biological weapons because although the Chemical Weapons Convention is often held in very high regard, sometimes even as a model for effective multilateralism, its procedures and the activities of the OPCW remain largely hidden to the wider world. This dissertation contributes to bringing these procedures out into the open and to further understanding the implementation of the CWC through the activities of the OPCW.

The particular research method I have employed to gain access to the data outlined above represents a modest methodological contribution. Whilst ethnographic techniques are becoming more prevalent in academic research, especially in the social sciences, this is the first time the technique has been applied in the field of chemical weapon policy. It therefore constitutes an additional example of successful ethnography in an international organisation, as well as a precedent in its own field of study.

A stronger contribution comes from my dissertation's contribution to theory. Although chapter 8 does not present a fully-fledged conceptual framework to address the function of experts in international policy coordination, it does make an important contribution by outlining what such a framework would need to cover. In this respect it focuses on the importance of structures that condition the use of science in policymaking and policy coordination, namely boundary organisations. My dissertation has drawn heavily from concepts that are well established in the STS literature but are less developed in International Relations. In this respect it has therefore enriched IR by presenting a more constructive approach to the use of expertise in policymaking and policy coordination. The communication of advice on technical issues from epistemic communities does not lead to a convergence of international policy but it is used to advance, stall or sideline domestically set political objectives.

For Science and Technology Studies, the contribution to knowledge is more nuanced but nonetheless significant; the research presented herein provides a further scope for the application of an STS approach, which has hitherto had a strongly state-level bias,

to international and multilateral issues. It confirms that many complicating factors that affect the use of science and experts in national policy formulation are replicated in the international context. But in the international system studied herein, it is striking how often specific issues are made political (or 'politicised') on order to exert a general influence on negotiation outcomes. My research highlights a tendency of some OPCW member states to 'hijack' technical issues on the grounds that they are presented only in technical terms. It is essential that international institutions contain within them an effectively functioning advisory infrastructure capable of giving robust recommendations about technical problems so that they are not so readily exploited.

9.4 Suggestions for further research

Before a conceptual framework can be fully developed to cover the use of science in international policy coordination, further research should be undertaken to determine the extent to which similar motives for politicising technical issues, which are observable in the chemical weapon regime, exist also in other regimes. Such a study would need to target international regimes that have a strong scientific element, so that results can be contrasted to the chemical weapon prevention regime. Such research should draw on both Science and Technology Studies and International Relations.

Future research could also explore more deeply the motives for and the mechanisms through which technical issues are approached and exploited in multilateral and / or in consensus-based decision-making systems. Although the experience of preparing the Second CWC Review Conference through the Open-Ended Working Group cannot be generalised across other conferences or regimes, it demonstrated a relationship between science, experts and multilateral politics that might extend to a more general claim once tested in other contexts. Such a claim, based on the findings of my research would contend that in international policy coordination, matters of a technical nature are often captured by political forces in order to exert leverage on the negotiation table.

This would be particularly true for regimes that rely on political consensus for their decision-making.

Another avenue for future study is the role that NGOs can play as boundary organisations. For instance, drawing from a finding presented herein, the International Union of Pure and Applied Chemistry (IUPAC) has now set a precedent for its involvement at the interface of science and policy during preparations for the CWC's quinquennial review conferences. Its specific function in this regard was not fully explored in my study but it may be important, and it may also be further refined. And, although my dissertation predominantly addressed the activities of the Pugwash Study Group on Chemical and Biological weapons in a pre-CWC context, this group too has sustained its activities on the boundary of science and politics. The Group's meetings have continued to be widely attended and it has continued to exert influence on the implementation of the Convention. Its extraordinary work in this respect deserves further scholarship.

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Appendix 1

Composition of the Scientific Advisory Board as at 11 February 2009

Chairman

Chairperson : Philip Coleman

Member Background

1. Dr Mahdi BALALI-MOOD (Iran)

Director of Medical Toxicology Centre, Imam Reza Hospital, University of Medical Sciences, Mashhad, Islamic Republic of Iran. Chief editor of the Journal of Birjand University of Medical Sciences, founder of the Iranian society of toxicology (and thrice its president), former president of the Asia-Pacific Association of Medical Toxicology, regional secretary of the World Federation of Clinical Toxicology and Poison Control Centres. Areas of expertise: toxicology of chemical warfare agents, chemical safety, ecotoxicology.

2. Professor Herbert DE BISSCHOP (Belgium)

Department of Chemistry, Royal Military Academy, Belgium. Scientific consultant for chemical and biological disarmament and non-proliferation matters at the Ministry of Foreign Affairs. Member of steering committee for the destruction of OCWs, member of Federal Health Council. Areas of expertise: biodegradation and toxic kinetics of nerve agents, destruction of (old) chemical weapons, workers protection..

3. Dr Robin BLACK (United Kingdom)

Detection Department, Defence Science and Technology Laboratory (Dstl), Porton Down, United Kingdom of Great Britain and Northern Ireland. Areas of expertise: analysis of chemical warfare agents in environment and biological media, risk assessment, synthesis of chemical warfare agents.

4. Dr Jose Gonzalez CHAVEZ (Mexico)

Universidad Nacional Autónoma Mexico, member of the chemistry department. Work in analytical chemistry and verification-related specialization, including inspector training (OPCW, UNMOVIC), also a member of the OPCW Confidentiality Commission. Areas of expertise: analytical chemistry.

5. Dr Philip COLEMAN (South Africa)

Managing Director of Protechnik Laboratories, Lynnwood Glen, South Africa. Work in chemical defence and synthesis/analysis. Advisor to the National Authority, including on chemical-industry issues, member of the OPCW Protection Network. Areas of expertise: synthesis and structural analysis of organic compounds, Carbon13 nuclear magnetic resonance.

6. Professor Breccia FRATADOCHI (Italy)

Former Director of the United Institute of Chemical, radiochemical and metallurgical sciences, University of Bologna, Italy. International Scientist of the year, 2002 (International Biographical Centre Cambridge), member of the board of several national committees, member of Bologna Academy of Sciences and New York Academy of Sciences. Areas of expertise: radiochemistry, biochemistry (drugs, metabolism, activation), industrial application of microwave chemistry, waste disposal.

7. Dr Shuzo FUJIWARA (Japan)

Technical Adviser, Research Core for Explosion Safety, National Institute of Advanced Industrial Science and Technology (AIST). He joined the National Chemical Laboratory for Industry (NCLI), an industrial R1D institute of the Ministry of International Trade and Industry, where his interest was safe handling of hazardous

chemicals and utilisation of energetic materials. Since the establishment of AIST in 2001 by reorganising the ministry's R&D institutes, he had worked as the Director of the Safety and Environmental Protection Department and the Director of the Research Centre for Explosion Safety (RCES) in AIST. Since March 2007, he has been a Technical Adviser of the Research Core for Explosion Safety in AIST and also a Technical Adviser of the Technical Research & Development Institute (TRDI). He is a board member (director) of Japan Explosives Society and Japan Society for Safety Engineering, a member of OECD-IGUS (International Group of Experts on Explosion Risks of Unstable Substances. He is the author of over 300 scientific publications and an inventor of over 90 patents.

8. Dr James Robert GIBSON (United States)

Consultant in United States of America on toxicology and occupational safety and health. Past management positions in research and development, chemical manufacturing, and corporate administration (Corporate Director of Safety and Health) at Dupont. Former Assistant Director of Dupont's Haskell Laboratory for Toxicology and Industrial Medicine, and thereafter Director of Dupont's Crop Protection Products Division. Eight years of service on the National Academy of Sciences/National Research Council's Committee on Review and Evaluation of the Army Chemical Stockpile Disposal Program. Member of the National Research Council's Committee on Evaluation of Chemical Events at Army Chemical Agent Disposal Facilities. In October 2003, appointed as member of a new NRC standing Committee on Chemical Demilitarization.

9. Professor László HALÁSZ (Hungary)

Head NBC Defence and Environmental Security Department, Miklós Zrinyi National Defence University, Budapest, Hungary. Work in chemical defence (detection, remote sensing, protection, environmental issues). Areas of expertise: chemical engineering, environmental engineering, polymer technology, chemical defence.

10. Dr Abdool JACKARIA (Maurtiius)

Director of Forensic Science Laboratory, Reduit, Mauritius. Areas of expertise: forensic toxicology, drugs analysis (certified), analysis of chemical-warfare agents.

11. Professor Bjørn-Arne JOHNSEN (Norway)

Director of Research, Division for Protection and Material, Defence Research Establishment, Kjeller, Norway. Areas of expertise: organic chemistry, medical chemistry, environmental toxicology, chemical defence, and physical and medical protection.

12. Dr Valery KUKHAR (Ukraine)

Head of Laboratory for Fine Organic Synthesis, Institute of Bio-Organic Chemistry and Petrochemistry, Academy of Sciences, Kiev, Ukraine. Former President of the Ukraine chemical society, member of the Chernobyl Commission of the Academy of Sciences and other committees. Areas of expertise: bio-organic chemistry (F and P analogues of natural compounds), chemical and technological aspects of environmental protection.

13. Dr Young-chul LEE (Republic of Korea)

Senior Engineer at the Korean Institute of Industrial Technology, ChonAnSi, Republic of Korea. Work in the fields of petroleum and fine chemicals, plastics, and ceramics. Former senior scientist at Oak Ridge National Laboratory, United States of America, and researcher at the Korean Atomic Energy Research Institute. Areas of expertise: polymer science and engineering, chemistry, chemical technology, and chemical disarmament.

14. Dr Detlef MÄNNIG (Germany)

Vice President Speciality Silicas and Matting Agents, Degussa AG, Frankfurt, Germany. Chairman of the German Chemical Industry Association (VCI) Working Group against Chemical Weapons. Degussa AG's Manager for Convention issues. Chairman of the European Chemical Industry Association Working Group against Chemical Weapons. Former consultant to the German Delegation to the Conference on

Disarmament in Geneva. Areas of expertise: industrial manufacturing of chemicals, Convention implementation in the chemical industry.

15. Dr Bob MATHEWS (Australia)

Chemical, Biological, Radiological and Nuclear (CBRN) Defence Centre, Melbourne, Australia. Manager of the NBC counter-proliferation arms control programme. Associate Professor at the Asia Pacific Centre for military law. Areas of expertise: analytical chemistry, chemical defence, research into the proliferation of chemical weapons, the Convention, and industry consultations.

16. Mr Stefan MOGL (Switzerland)

Head of Chemistry, Federal Department of Defence, Civil Protection and Sports, Federal Office for Civil Protection, SPIEZ LABORATORY. Area of expertise: analytical chemistry, chemical disarmament, industrial hygiene.

17. Dr Godwin OGBADU (Nigeria)

Professor of biochemistry and Director of the Advanced Biotechnology Laboratory, Sheda science and technology complex, Abuja. Member, New York Academy of Sciences and serves on several national and international committees. Areas of expertise: industrial biotechnology, fungal toxins, irradiation and food chemistry.

18. Professor Titos QUIBUYEN (Philippines)

Director, Institute of Chemistry, College of Science, University of the Philippines, Quezon City. Professor of organic chemistry. Former Head of the Environmental Science Programme and of the Materials Science and Engineering Programme at the University of the Philippines. Areas of expertise: organic and environmental chemistry, synthesis, natural products, toxic-waste management, risk assessment.

19. Professor Igor Vladimirovich RYBALCHENKO (Russian Federation)

Scientific director of the chemical analytical OPCW designated laboratory at the Military Science Centre of the Ministry of Defence of the Russian Federation. He is a member of the Research Council on Analytical Chemistry of the Russian Academy of Sciences and chairman of the Russian Academy of Sciences Research Council Commission for the detection and identification of explosive, narcotic and toxic chemicals. He is also a member of the editorial staff for the Russian Academy of Sciences Analytical Chemistry Journal.

20. Professor Miguel SIERRA (Spain)

Professor of Organic Chemistry at the University Complutense of Madrid, Spain. Member of the American Chemical Society and the Real Sociedad Española de Química. Areas of expertise: organic chemistry, organic synthesis, transition-metal mediated organic and organometallic transformations, environmental organic chemistry, and development of anti-infective agents.

21. Dr Danko ŠKARE (Croatia)

Rudjer Boškoviæ Institute, Zagreb, Croatia. Department of Organic Chemistry and Biochemistry, Secretary of the National Authority for the Implementation of the Chemical Weapons Convention. Areas of expertise: organic chemicals, organic synthesis, chemical-warfare agents, and chemistry of energetic materials.

22. Dr Rolando A. SPANEVELLO (Argentina)

Professor of Organic Chemistry, School of Biochemical and Pharmaceutical Sciences, Universidad Nacional de Rosario, Argentina. Research Scientist (Project Director) at the Argentine National Scientific Research Council. Areas of expertise: organic synthesis and industrial chemistry.

23. Professor Jean-Claude TABET (France)

Professor at the Laboratory of Structural Organic Chemistry and Biology, University of Pierre and Marie Curie, Paris, France. Areas of expertise: chemical analysis, mass spectrometry, organic/biochemistry.

24. Dr R. VIJAYARAGHAVAN (India)

Head of the Pharmacology and Toxicology Division of the Defence Research and Development Establishment (DRDE), Gwalior, India. Work in pharmacology, toxicology, and antidote development. Areas of expertise: drug development, safety evaluation, antidotes to chemical-warfare agents, computer-based toxicity evaluation.

25. Professor Zhiqiang XIA (China)

Director of Information Research Centre, Research Institute of Chemical Defence (RICD), Beijing, China. Senior member of the Chinese Society for environmental sciences. Areas of expertise: environmental sciences, risk assessment, scientific information, investigation of abandoned chemical weapons.

Appendix 2

List of Interviewees

Individual	Affiliation
Ichiro Akiyama	Technical Secretariat, OPCW
Seth Carus	National Defense University
John Caves	National Defense University
Donald Claggett	U.S. Department of State
Graham Cooper	Technical Adviser (ret.)
Terry Dance	UK Department for Business, Innovation and Skills
Herbert de Bisschop	Royal Military Academy, Belgium
Gerald Epstein	Center for Strategic and International Studies (CSIS)

Bill Kane	Technical Secretariat, OPCW
Detlef Maennig	Evonik Degussa GmbH
Donald Mahley	U.S. Department of State
Robert Mathews	CBRN Defence Centre, Australia.
Jim McGilly	DSTL
Caitriona McLeish	Harvard Sussex Program
Robert Mikulak	U.S. Department of State
Stefan Mogl	Spiez Laboratory, Switzerland
Tuan Nguyen	McKenna Long & Aldridge
Patrice Palanque	Technical Secretariat, OPCW
Peter Plant	PJP Consultants

Karl Rodrigues	UK Department for Business, Innovation and Skills
Dieter Rothbächer	Technical Secretariat, OPCW
Per Runn	Technical Secretariat, OPCW
Alejandro Shiliuk	Technical Secretariat, OPCW
Adi-Maria Simoiv	Technical Secretariat, OPCW
Ralf Trapp	Independent Consultant
Jonathan Tucker	James Martin Center for Nonproliferation Studies
John Walker	Arms Control and Disarmament Research Unit, UK Foreign and Commonwealth Office
Craig Wallbank	UK Department for Business, Innovation and Skills

Appendix 3

Members of the Scientific Advisory Board and Technical Secretariat Staff

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Appendix 4

Current members of the UK National Authority Advisory Committee (NAAC)

Dr Tony Bastock OBE (Chairman)
Group Managing Director, Contract Chemicals Ltd
Reappointed until 17 May 2013

Dr Kenneth Patterson
European SHE Manager, Synthomer
Reappointed until 15 February 2011

Professor Alastair Hay OBE
Centre for Epidemiology and Biostatics, University of Leeds
Appointed until 31 January 2010

Mr Douglas Leech
Technical Manager, Chemical Business Association
Appointed until 31 January 2010

Dr David Faraday
Director, Evolve LEADTEAM Ltd
Appointed until 31 January 2010

Professor Ron Manley OBE
Visiting Chair at the Defence Academy, Cranfield University
Appointed until 21 October 2011

Dr Caitriona McLeish
Science and Technology Policy Research, University of Sussex
Appointed until 21 October 2011

Appendix 5

Current members of the US International Security Advisory Board (ISAB)

1. Amb. Paul Wolfowitz (Chairman)
2. Dr. Michael R. Anastasio
3. Ms. Alison B. Fortier
4. Admiral Edmund P. Giambastiani
5. Amb. Robert Joseph
6. Dr. Stephen Krasner
7. Mr. Mitchel B. Kugler
8. Dr. Ronald F. Lehman, II
9. Vice Admiral Robert R. Monroe, U.S. Navy (Ret.)
10. Dr. Gordon C. Oehler
11. Dr. Michael O'Hanlon
12. Dr. M. Elisabeth Paté-Cornell
13. Dr. Keith B. Payne
14. Dr. Robert L. Pfaltzgraff, Jr.
15. Senator Charles S. Robb
16. Dr. James R. Schlesinger
17. Dr. William Schneider, Jr
18. Dr. William Van Cleave
19. Mr. R. James Woolsey