Introduction: A Web of Prevention?

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In June 2006, an ominous article titled 'Dark materials' appeared in the UK newspaper the *Guardian*. In it, the author warned about future dangers to the human population and the planet as a whole because of developments in science. He stated:

> *We are collectively endangering our planet, but there is a potential threat from individuals too. 'Bio' and 'cyber' expertise will be accessible to millions. It does not require large, special-purpose facilities as do nuclear weapons. Even a single person will have the capability to cause widespread disruption through error or terror.*

Among the many areas of science identified as raising serious questions, biotechnology was said to be enabling 'qualitatively' novel forms of human intervention. The article went on to state: 'There is an ever-widening gap between what science allows, and what we should actually do. There are many doors science can open that should be kept closed, on prudential or ethical grounds.'

While highlighting the significant potential for societal benefit associated with scientific developments, the author also called for meaningful forms of restraint. He advocated that scientists:

> *… should forgo experiments that are risky or unethical. More than that, they should foster benign spin-offs, but resist dangerous or threatening applications. They should raise public consciousness of hazards to environment or health.*

Furthermore, claims were made that the choices in the application of science were too important to be left to scientists alone to handle.

What made this contribution particularly noteworthy was its author: Lord Martin Rees, then also serving as the president of the British Royal Society, one of the world's oldest academies of eminent scientists.

The article received a number of responses, including one from Professor Ross Anderson at Cambridge University (Anderson, 2006). This professor of security engineering said that the system of 'worldwide surveillance and regulation' proposed by Lord Rees was both 'foolish and wicked'. Further to this, he argued:

> *Controls on biological technologies are particularly foolish. The diseases that kill millions are not biowar lab nasties, but naturally occurring pathogens such as HIV, Sars and flu. If the US and Europe won't let Sudanese students do PhDs in pathology, then Khartoum won't have capable public health services – which could be bad news for us next time a virus starts making its way down the Nile.*

Instead of embracing the sorts of controls identified by Martin Rees, Professor Anderson proposed that 'The scientist's job is to shine light in the darkness, and if we occasionally burn our fingers on the candle, so be it. Lord Rees can choose the darkness if he wants. I'm not going to.'

The account of the exchange raises many questions: What destructive possibilities are enabled by modern science? Are these bringing hitherto novel capabilities for causing death or disruption? What are the chances that such potentials turn into actualities? To what extent might science need to be controlled because of security fears? Who should determine what measures are prudent?

In response to concerns regarding biological weapons, during recent years a number of individuals and organizations have proposed the need for a 'web of prevention'. While such a web is not intended to block out all light, so to speak, the various appeals made for it do suggest that something should be done to reduce the likelihood that biological weapons are developed or employed. This book provides an examination of the possible elements of such a web, one *specifically* focused on the governance of scientific research. The contributors do so while also giving critical attention to the assumptions – regarding the nature of threats and the possible effects of responses – underlying such a call.

Origins

The concept of a 'web' of measures to address biological weapons overall has a relatively recent pedigree, with its origins in the early 1990s. However, a similar concept, that of a 'regime', was used during the 1980s to describe international measures adopted against chemical weapons. Today, while both web and regime are still frequently used, another term that has come into common currency in relation to efforts to deal with the problem of chemical and biological weapons is 'network'. Although each term has different origins and different implications, they all have, at root, the idea that there is no single 'solution' to the challenges posed by chemical and biological weapons, that multilateral arms control conventions are only a part of the response, albeit a very significant one, and that in order to effectively counter chemical and biological weapons, other complementary measures are required.

Over the decades since the entry into force of the 1972 Biological Weapons Convention (BWC), the attention paid to the complementary elements of the web has waxed and waned. However, the concept appears to be undergoing something of a resurgence in recent years, stimulated by the re-emergence of international terrorism, dramatic advances in science and technology, changes in the nature and conduct of diplomacy, and the rise of significant new actors. Tracing the evolution and connection between notions of webs, regimes and networks will sharpen our focus about the prospects for a web and help situate the contribution of the authors to this volume. It will also be used here to recount policy and conceptual developments during recent years regarding the prohibition of biological weapons.

Webs

In 1993, Graham Pearson, then the Director-General of the Chemical and Biological Defence Establishment at Porton Down in the UK, introduced the concept of the 'web of deterrence' into the debate on chemical and biological arms control (Pearson, 1993, p150). Pearson wrote that it has 'become evident that no arms-control regime is guaranteed to be wholly effective' and that what was therefore needed was 'a strategy that complements arms control with a range of other measures to form a web of deterrence'. He identified the key elements of such a web as comprehensive, verifiable and global chemical and biological arms control; broad export monitoring and controls; effective defensive and protective measures; and a range of determined and effective national and international responses to the acquisition and/or use of chemical and biological weapons (Pearson, 1993, p151).

The 'web of deterrence' concept has also been reflected in national policy. The 1993 Defence White Paper stated that 'it is likely that worthwhile deterrence [of biological weapons] could be achieved by a web of measures restricting potential violators' room for manoeuvre' (UK Ministry of Defence, 1993, p58); a 1999 Ministry of Defence publication stated that 'our policy rests on four inter-related pillars: arms control, preventing supply, deterring use and defending against use' (UK Ministry of Defence, 1999); and three years later, a UK Foreign and Commonwealth Office (2002, p5) paper stated that this four-pillar approach 'remains at the heart of our policy'.

And yet, the origin of the term 'web of deterrence' goes back further than the 1990s in relation to security discussions as a whole. It can be found in the doctrine of 'flexible response', which had been adopted by the North Atlantic Treaty Organization (NATO) in 1967 in place of its earlier strategy of massive nuclear retaliation. Flexible response sought to deter aggression by the maintenance of conventional, theatre nuclear and strategic nuclear forces that would enable the alliance to respond to any attack at an appropriate level (Legge, 1983, p9). Lawrence Freedman (1981) wrote that 'flexible response offered the notion of a seamless web of deterrence', and Williams (1983, p198) wrote that the

NATO decision in 1979 to deploy cruise and Pershing missiles in Western Europe 'will not necessarily restore the "seamless web" of deterrence as was initially hoped'. For their part, the Soviet Union also referred to its combination of strategic and theatre nuclear weapons as the 'seamless web of deterrence' (USA National Intelligence Council, 1999).

The 'web of deterrence' description was appropriate for biological weapons in the early 1990s when the Warsaw Pact was only just unravelling and when such weapons were seen mainly in the context of military conflict between the East and West. However, by the late 1990s, Pearson, by then a visiting professor at the University of Bradford, had adjusted his terminology to reflect 'an age of regional or local conflicts' and demands from the public for reassurance that governments would protect them from biological weapons, whether possessed by rogue states or non-state actors (Pearson, 2001, p8). For this reason, Pearson instead called for a 'web of reassurance' with similar but broader constituent elements, compared to his earlier 'web of deterrence': a strong international and national prohibition regime reinforcing the norm that biological weapons are totally prohibited; broad international and national controls on the handling, storage, use and transfer of dangerous pathogens; preparedness, including both active and passive protective measures and response plans that have been exercised; and determined national and international response to any use or threat of use of biological weapons, ranging from diplomatic sanctions through to armed intervention (Pearson, 2001, p8).

Today, the notion of a web of measures is often evoked in discussions on the control of biological weapons. A 1999 British Medical Association publication – *Bioweapons, Technology and Humanity* (primarily written by Pearson's Bradford colleague Malcolm Dando) – focuses on the concept of a 'web of deterrence' to prevent the acquisition and use of biological weapons (British Medical Association, 1999). In 2002, the International Committee of the Red Cross (ICRC) launched an initiative on Biotechnology, Weapons and Humanity, calling for a reaffirmation of norms against biological weapons and for better controls on potentially dangerous biotechnology (Kellenberger, 2002). Central to the initiative are awareness-raising and education activities directed at life scientists in order to contribute to what the ICRC calls a 'web of prevention'. In a 2003 publication, the ICRC stated:

> *Those in a position to help prevent biotechnology being used for hostile purposes too often focus on only one aspect of the solution, such as the Biological Weapons Convention, bio-safety rules, disease surveillance or countering 'bio-terrorism'. Seldom is synergy of action achieved between the different entities concerned. (ICRC, 2003, p6).*

Therefore, the ICRC envisages the 'web of prevention' as a 'broad and integrative approach that should be taken by all those concerned to minimize the risk'. It uses the analogy of fire prevention to explain the intention behind the web.

Interestingly, the same analogy is used in a recent report by the US National Academies (2006, p4), *Globalization, Biosecurity and the Future of the Life*

Sciences, which calls for a 'web of protection'. According to the report, 'the committee could not envision any sort of "silver bullet" capable of providing absolute protection against the malevolent application of new technologies' (US National Academies, 2006, p16). Instead, the actions and strategies recommended in the report are described as 'complementary and synergistic'.

Regimes

The notion of creating a broad and synergistic array of measures to address the problem of biological and chemical weapons is not a recent innovation. One important source of earlier thinking can be found in the international relations field of regime analysis, which emerged during the mid 1970s as scholars sought to understand the dramatic increase in cooperative arrangements between states (see Ruggie, 1975; Keohane and Nye, 1977). A widely accepted definition of a regime was put forward in 1982 by a group of American scholars: 'sets of implicit or explicit principles, norms, rules and decision-making procedures around which actors' expectations converge in a given area of international relations' (Krasner, 1982, p186).

The first scholar to apply regime analysis to the problem of chemical or biological weapons was Robinson (1985). Since then, the regime has been further extended by the coordination of national export controls among a group of like-minded countries within the Australia Group; the empowerment of the United Nations (UN) Secretary-General to investigate allegations of the use of chemical and biological weapons; the 1993 Chemical Weapons Convention (CWC); and, most recently, UN Security Council resolution 1540. In 1988, Nicholas Sims described a 'treaty regime of biological disarmament' centred on the BWC (Sims, 1988, p5) and, in a later publication, described how this regime was 'defined and developed by a process of cumulative diplomacy and accretion' (Sims, 2001, p18). Sims also illustrated how the concept of a 'treaty regime' was used by diplomats, particularly Ambassador Winfried Lang of Austria (Lang, 1990), and by academics, such as Falk (1990) and Meselson and colleagues (1990).

An attempt was made during the 1990s to develop a CWC-style comprehensive regime for biological weapons through the negotiation of a supplementary protocol to the BWC. According to the most comprehensive account of the BWC protocol negotiations, the conceptual approach taken was of a 'single treaty silver-bullet "solution" to the biological weapons problem' (Littlewood, 2005, p203). The approach adopted was modelled closely on the CWC, with a system of declarations and inspections overseen by an international organization. This has since been acknowledged by two of those who participated in the Ad Hoc Group established in 1994 with a mandate to negotiate the BWC protocol (Randin and Borrie, 2005, p101; Lennane, 2006, p7).

However, it is interesting to note that this single-treaty model was not the only possible option for creating a regime. As already mentioned above, even before the entry into force of the CWC, a fragmented regime existed against chemical weapons. Bernauer (1993, p375) noted how there were two basic options for resolving the chemical warfare problem: the comprehensive 'once-and-for-all' solution that was eventually adopted, or an incremental approach based upon partial agreements of varying formality. Outlining possibilities for the latter, Bernauer (1993, p378) mentioned the following: expanding the Australia Group; amending or supplanting the Geneva Protocol; strengthening the Geneva Protocol by developing its existing investigation and enforcement mechanisms; establishing chemical weapon-free zones; reducing chemical weapons stockpiles; or imposing chemical disarmament obligations on specific states through coercion. A similar incremental approach would also have been possible for the BWC during the 1990s. However, state parties chose to follow the single-treaty approach modelled on the CWC.

This approach ultimately failed in 2001 at the Fifth Review Conference when the 'vision text' which the Ad Hoc Group chairman had drafted was rejected by the US, with a number of other state parties more quietly not in favour. The US additionally rejected the approach taken by the Ad Hoc Group since 1995, arguing that 'the traditional approach that has worked well for many other types of weapons is not a workable structure for biological weapons' (Mahley, 2001). During the 1990s, international action against biological weapons had been focused on strengthening the BWC almost to the exclusion of everything else (see Littlewood, 2004, p14). This imbalance was evident both internationally and nationally. Within states there were few individuals or agencies with a comprehensive overview of all measures aimed at addressing biological weapons.

Networks

The sudden loss of what had been the guiding ambition for six years was quickly followed by the terrorist attacks on the US in September 2001. The dramatic rise of the combination of international terrorism and weapons of mass destruction as the main threat facing developed nations has led to much greater emphasis on building collaboration and improving synergy. Moodie (2004) notes that 'the combination of politics, science and technology, and the treaty language of the CWC and BWC ensures that these conventions will be insufficient on their own' to deal with the threat posed by international terrorism. He goes on:

> *What is needed is an approach that goes beyond the traditional modalities of arms control to new ways of thinking about how to strengthen the conventions and the norms against CBW that these conventions embody. (Moodie, 2004, p48)*

In that spirit there has been an explosion in the number of initiatives, measures, efforts and activities either directly or indirectly aimed at addressing the biological weapons problem (e.g. the Proliferation Security Initiative, the Global Health Security Initiative, the G8 Global Partnership and UN Security Council resolution 1540).

Nowhere is this more apparent than in efforts to prevent the misuse of the life sciences. Stimulated, in part, by the ICRC's Biotechnology, Weapons and

Humanity initiative, but also by the decision of BWC state parties to examine the issue of codes of conduct for life scientists in 2005, the past five years have witnessed a significant rise in the engagement with those in the life sciences. For example, in 2005 representatives of 23 international, regional and national scientific and professional bodies were allowed to participate in the BWC Meeting of Experts as 'guests of the meeting', an innovation described by one observer as 'a considerable step for a convention that had hitherto permitted only states and – with limitations – intergovernmental organizations to participate in its meetings' (Lennane, 2006). In many ways, though the initial expectations were very low, the work programme adopted by BWC state parties in 2002 has proved a significant innovation and has, in fact, shifted the BWC into a different mode of action. The annual meetings organized between 2003 and 2005 have seen the active involvement of private industry, international organizations and a wide range of civil society actors. They have also demonstrated the need for approaches across a range of areas; according to a European Union (EU) paper, this range 'goes well beyond the "national only" approach and also well beyond the "multinational" agenda as traditionally understood' (EU, 2006, p5).

Further, prior to the Sixth BWC Review Conference in November 2006, BWC President Masood Khan actively encouraged attendance by international organizations; as a result, six international organizations addressed the conference, as well as the UN Secretary-General himself. Also attending was a record number of 33 non-governmental organizations (NGOs). The review conference ended successfully with agreement on another inter-sessional work programme modelled on the 2003 to 2005 meetings and on the need to establish a small Implementation Support Unit in Geneva and to encourage state parties to create national contact points for interaction with this unit and each other. Therefore, although it is only early days, the review conference sowed the seed for a potentially significant new set of interactions.

Whether the framework of regime analysis is still adequate to conceptualize and understand this plethora of activity is debatable. Although regime analysis was, in part, intended as a shift away from realist conceptions of international relations with its acknowledgement of normative factors and of the influence of domestic politics on state behaviour, regime analysis is still a largely state-centred framework. However, the biological weapons problem is no longer (if, indeed, it ever was) one that is solely confined to or manageable by states.

As demonstrated by Rischard (2003), the world is witnessing the emergence of 'global issue networks' on topics that cannot be dealt with by one state alone. The existence of networks between governments is not novel. However, while government networks themselves are not new, a number of factors distinguish contemporary networks from their predecessors. As identified by Slaughter (2004, pp10–11), these include the 'scale, scope and type' of transgovernmental ties, the 'wider array of functions' performed than in the past, and the fact that they have 'spread far beyond regulators to judges and legislators'.

Reflecting the complexity of countering biological weapons and the rise of networks in other areas of international relations, in 2006 the UN Secretary-General proposed the creation of:

> *… a forum that will bring together the various stakeholders – Governments, industry, science, public health, security, the public writ large – into a common program, built from the bottom up, to ensure that biotechnology's advances are used for the public good and that the benefits are shared equitably around the world. (UN, 2006)*

Such a forum would be a true 'global issue network' as conceptualized by Rischard (2003). The forum has been endorsed by UN member states; but at the time of writing it has yet to be formally constituted.

The nature of diplomacy itself has also changed in recent years, meaning that diplomats themselves are now not so wedded to concepts and methods of the past. This is partly a response to the changing nature of the challenges that modern diplomats face. A key facet of the varying nature of diplomacy is the emergence of civil society as a significant actor in world politics. In its 2004 report, the Panel of Eminent Persons on United Nations–Civil Society Relations stated that 'the rise of civil society is, indeed, one of the landmark events of our times. Global governance is no longer the sole domain of governments' (UN, 2004). Another key factor is the role now played by private industry and the 'increased contemporary significance of an upward trend in the management of global affairs by economic actors' (Cutler et al, 1999, p4).

Taken together, all of these factors have led to the emergence of 'multi-stakeholder diplomacy'. Hocking (2006, p13) argues that:

> *… actors, including states – commonly identified as the generators of diplomacy – are no longer able to achieve their objectives in isolation from one another. Diplomacy is becoming an activity concerned with the creation of networks, embracing a range of state and non-state actors focusing on the management of issues that demand resources over which no single participant possesses a monopoly.*

One small example is the way in which a Geneva-based NGO, the BioWeapons Prevention Project, has been entrusted with the implementation of an outreach and assistance programme adopted by a regional organization, in this case the EU. The examples given above, such as the shift in approach demonstrated by the 2003 to 2005 work programme, the UN Secretary-General's 'bio-forum' proposal and the decisions at the Sixth BWC Review Conference, all suggest that 'multi-stakeholder diplomacy' is another vital element in international efforts to address the biological weapons problem complementary to webs, regimes or networks.

What is apparent today is that countering the development or use of biological weapons is not a matter that can be solved for all time, nor is it one that can be managed by states alone, nor can it be addressed simply through a single treaty or some other instrument of international collective action. What is required is a broad array of measures at all levels, from the individual to the international, that are complementary and synergistic. What this array is called – web, regime or network – is, in many respects, largely immaterial. The main thing is that its constituent elements are in place and are able to manage an issue that is only likely to get more complex.

Outline of the book

While the previous section provided an overview of policy and conceptual developments in relation to webs, regimes and networks to address the development and use of biological weapons overall, this book focuses on a specific and emerging priority area: the governance of life science research. A central justification for exploring this area in isolation from other elements of the web of responses initiatives is that because international law has outlawed these weapons, much of the attention needs to be placed on the components for weapons – this includes the scientific and technological components.

Because much of the same knowledge, tools and techniques needed to develop and produce biological weapons are also used in activities such as scientific research, drug and vaccine production, agriculture and industrial processing, it is essential to bring in all those who work upon, trade in, move, finance and regulate in their respective domains. A web-based approach that broadens the horizon of security concerns to incorporate technology governance, allowing relevant initiatives, measures, efforts and activities initiated for a variety of reasons by a range of stakeholders, often with no security agenda, to be linked together in the name of reducing the potential for science and technology, can be diverted to malign applications.

The need and potential for such an expansive approach is argued for in Chapter 1. During recent years, particularly because of the 2005 meetings held as part of the BWC, renewed attention has been given to the role of professional and workplace codes of conduct. Against the backdrop of existing legal rules and ethical norms proscribing the development of bioweapons, Chapter 1 argues for the importance of establishing codes to further ethical reflection, formulate agreed standards and facilitate deliberation. More than just considering the role of codes, Atlas and Somerville provide a useful background on a range of initiatives, regulations and laws currently being considered to prevent the destructive use of the life sciences.

When the application of standards of conduct is mooted, then a frequent response is the need to enact protections for those so-called ‘whistleblowers’ that point out carelessness, ignorance or intent. In a wide-ranging analysis of the experiences of past whistleblowers in Chapter 2, however, Martin contends that such official channels rarely provide the type of protection so often expected of them. Rather, much more attention needs to be given to improving the knowledge, skills and contacts of would-be whistleblowers.

Many of the options covered in this book depend upon knowledgeable and cognizant individuals or they aim to enhance individuals’ thinking. In Chapter 3, Rappert assesses what functions can be fulfilled by educating those associated with the life sciences in preventing the accidental or deliberate spread of disease. As contended, because practical attempts to educate require deciding just who needs to know what and how that understanding should come about, they can often generate contention. This is all the starker in the case of educating highly trained and specialized scientific and technical experts who are often said to be best left to govern themselves. Following on from these points about education, in Chapter 4, Finney, a practising physicist, offers his reflections on the social responsibility of scientists and the state of discussions within the physicist community to address the destructive applications of their research.

One set of responses to prevent this and the accidental spread of disease in relation to the life sciences has been to propose national and international oversight systems for research. In Chapters 7 and 8, the prospects for such systems are examined. In Chapter 7, Harris surveys prominent existing proposals for formal oversight and, in particular, outlines the rationale for the Biological Research Security System developed by her and colleagues at the Center for International and Security Studies in Maryland, US. In Chapter 8, Holohan, formerly executive director of the US National Science Advisory Board for Biosecurity, assesses the Maryland system and situates it within wider national and international considerations about oversight.

The contribution of expert advice is a well-established means by which members of the scientific community seek to shape government decision-making. Two chapters in this book address expert advice. The first, in Chapter 5, is an account by the British Royal Society of the conclusions of an international workshop of scientists, policy analysts, officials and others held at the Royal Society from 4 to 6 September 2006. Building on similar activities under the Chemical Weapons Convention, this workshop intended to identify scientific and technological developments most relevant to the BWC in order to inform deliberations at the Sixth Review Conference. In Chapter 6, Rhodes and Dando provide a wider examination of the potential for scientific expert advice in furthering the BWC and thus furthering a web.

Denying technology transfers in order to reduce the risks of proliferation and terrorism involving biological weapons is a central policy response to the problem of biological weapons. In Chapter 9, Littlewood examines the role and function of export controls in managing the threat posed by biological weapons and considers whether or not export controls represent a boundary to international science. In Chapter 10, Mathews considers the role played by the Australia Group and reflects upon the growing acceptance of the Australia Group export-control lists as an international benchmark in relation to export controls directed at CBW proliferation. In his opinion, a national export licensing system based on the Australia Group lists should be regarded as an essential component of the 'web of prevention'.

Although controls on the transfer of technology, the dissemination of information and associated monitoring of scientists to prevent harmful information being made public has been flagged positively as part of a web of prevention, Balmer notes in Chapter 11 that the spectre of undue censorship and excessive secrecy can follow rapidly in its wake. Contributing to contemporary debates about transparency and secrecy and the dissemination of certain forms of scientific research, Balmer reflects on the operation of secrecy in the British biological weapons programme, noting that secrecy can be constructed, lost and restored through the use of rumour and gossip.

In Chapter 12, McLeish offers reflections on the issue of dual use. Exploring the differing conceptualizations of dual use found in regulatory responses to the biological weapons problem and governance initiatives, McLeish details three distinct models of dual use that are currently evident. Complementary to an extent, she reflects on whether such differing conceptualizations might lead to lost governance opportunities through the exclusion of stakeholders and unhelpful competition. McLeish calls for an intellectual space to be opened where relevant security, technology and innovation experts, together with all interested stakeholders, can work together to strengthen the foundations of the web of prevention.

One example of the sort of innovative work that can be generated when traditional and non-traditional security stakeholders come together is when governance of dual use research is considered as an international health security issue. In Chapter 13, Tuerlings relates the work of the World Health Organization (WHO) and, in particular, the work being conducted as part of the Life Science Research and Development and Global Security project. This includes details of the work performed by a specially convened scientific working group consisting of a mix of public health workers, academicians, researchers, policy-makers, security experts and representatives from international organizations.

These chapters then attempt to reflect key parts of the web of prevention. Although it is recognized that many more chapters could have been included (particularly to include reflections on initiatives centred outside of the West), the topics covered span a wide-ranging set of issues that should give an illustration of what might be done.

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