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The Politics of Bio(in)security:

Science, Experts and the Dilemma of Dual-Use

Doctoral thesis

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Abstrakt

Tato práce zkoumá politiku tzv. biologické bezpečnosti a regulaci výzkumu dvojího užití. Zaměřuje na vědy o živé přírodě, jejichž rychlý rozvoj přináší nové obavy spojující témata biologických zbraní, terorismu a regulace vědeckých inovací. Práce má tři dílčí cíle: zaprvé, situovat současné dilema výzkumu dvojího užití historicky a koncepčně, zadruhé, analyzovat, jaký dopad mají snahy regulovat biologickou bezpečnost a výzkum dvojího užití na vztahy mezi vědou a bezpečností, a zatřetí, diskutovat, jaké jsou důsledky tohoto nového propojení vědy a bezpečnosti pro politiku bezpečnosti a nebezpečnosti. Práce přistupuje k tématu z pozice kritických bezpečnostních studií a studuje, jak je propojení mezi vědou a bezpečností konstruováno určitými technikami vládnutí, jež integrují různé praktiky do uchopitelného problému a strukturují vztahy mezi vědou a bezpečností. Práce zkoumá dominantní politický a expertní diskurz o biologické bezpečnosti a dále dvě empirické oblasti, které ilustrují, jak je hranice vědy a bezpečnosti řízena v "globálním" a "lokálním" kontextu: v rámci mezinárodního režimu zákazu biologických zbraní a v českém systému biologické bezpečnosti.

Výsledky práce ukazují, že snahy zabezpečit výzkum dvojího užití se zaměřují nejen na regulaci materiálů a technologií, ale také vědecké znalosti. Práce navrhuje uchopit dilema dvojího užití jako problém řízení cirkulací a argumentuje, že sledování vědecké znalosti skrz ustavení kultury vědecké odpovědnosti je součástí trendu subjektifikace znalosti a vede k tzv. etikalizaci bezpečnosti. Výzkum ukazuje, že sekuritizace vědy vytváří poptávku po nových typech bezpečnostní expertízy a posiluje tak aktéry, kteří jsou schopni

zprostředkovat znalost mezi sférou politiky, byrokracie a vědy. Na základě sociologických přístupů práce dále rozvíjí tři teoreticky odvozené mechanismy hraničení, hybridizace a stabilizace a sleduje, jak dynamika sekuritizace vědy o živé přírodě probíhá v konkrétních hraničních místech.

Klíčová slova

Biologická bezpečnost, věda, kritická teorie, výzkum dvojího užití, znalostní řízení, etika, bioterorismus

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Abstract

This thesis explores the politics of biosecurity and the governance of dual-use research. It focuses on life sciences, whose rapid development brings together the issues of biological weapons, terrorism, and the dangers of scientific innovations. The thesis has three goals: first, to situate the dilemma of dual-use research historically and conceptually, second, to analyse how the attempts to govern biosecurity and regulate dual-use research in life sciences affect the relations between science and security, and third, to discuss what implications this science-security nexus has for the politics of (in)security. Approaching the subject from critical security studies, the thesis looks at how the nexus between science and security is constructed. It does so, first, by exploring the dominant political and expert discourses on biosecurity and by looking at two distinct empirical sites, which exemplify how a regime of biosecurity governance evolves at a boundary of science and security in a 'global' and 'local' context: the international biological weapons regime and the Czech system of biosecurity management.

The thesis finds that the attempts to govern dual-use research in life sciences focus not only on materials and technologies but also on scientific knowledge. It conceptualizes dual-use as a problem of organizing circulations and suggests that policing scientific knowledge through establishing a 'culture of responsibility' can be understood as a part of subjectifying knowledge and leads to so-called ethicalization of security. The research also shows that the insecuritization of life sciences creates a demand for new types of security expertise and thus empower actors, who are able to mediate knowledge between politics,

bureaucracy, and science. Based on sociological approaches, the thesis develops three mechanisms of bordering, hybridization, and stabilization to study how the dynamic of securitizing life sciences plays out in concrete boundary sites.

Keywords

Biosecurity, science, critical theory, dual-use research, knowledge governance, ethics, bioterrorism

Thesis length

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Abbreviations

BWC	Biological Weapons Convention
BWPP	BioWeapons Prevention Project
CBRN	Chemical, biological, radiological and nuclear
CBMs	Confidence-Building Measures
CoCom	Coordinating Committee for Multilateral Export Controls
DIYbio	Do-it-yourself biology
EU	European Union
FBI	Federal Bureau of Investigation
iGEM	International Genetically Engineered Machines Competition
IGO	Intergovernmental Organization
IR	International Relations
ISU	Implementation Support Unit
MIT	Massachusetts Institute of Technology
NATO	North Atlantic Treaty Organization
NINCBP	National Institute for Nuclear, Chemical and Biological Protection
NGO	Non-Governmental Organization
NSABB	National Science Advisory Board on Biosecurity
OPCW	Organization for the Prohibition of Chemical Weapons
SONS	State Office for Nuclear Safety
STS	Science and Technology Studies
UN	United Nations
UNODA	United Nations Office for Disarmament Affairs

US	United States
VEREX	Verification Experts
WHO	World Health Organization
WMD	Weapons of Mass Destruction

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In working on the research that led to this thesis, I interviewed a number of people who are in one way or another linked to the politics of biosecurity and the governance of life sciences. Even though I keep their names anonymous, I wish to thank them for their time and for sharing with me their opinions, experience and the details of their work. I am also greatly indebted to Kateřina Straková for giving me initial insights into the functioning of the Czech life sciences, and to Zuzana Bičíková for her research assistance.

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The responsibility for all errors and omissions, though, is solely my own.

Introduction

In October 2013, Secretary General of Interpol published an essay in Foreign Affairs entitled "Keeping Science in the Right Hands: Policing the New Biological Frontier" (Noble 2013). He argues that with the advancements of scientific technologies such as synthetic biology, contemporary research in life sciences is undergoing rapid progress, but the great benefits this research brings to the society could also be misused for hostile purposes by criminals and terrorists. To reduce the risk of misuse, he suggests that Interpol as the largest international police organization has the appropriate tools and expertise to assist policymakers, public health professionals, and scientists in "confronting this threat and rais[ing] awareness of the stakes of criminal exploitation" (Noble 2013). The essay can be seen as an exemplary episode in more than two-decade efforts to exert tighter control over the potentially dangerous research in life sciences, which have gained new vigour after the 9/11 attacks and the following anthrax letter incidents in the United States in 2001. The concerns that novel biotechnologies could be misused "by hostile individuals or nations" for creating "the next generation of biological weapons" (National Research Council 2004: 1) motivated many countries to develop new policies and practices to oversee so-called dual-use research in life sciences, including scientific know-how (e.g. Bonin 2007, Rappert and Gould 2009). The attempts to balance scientific openness with national security and 'keep science in the rights hands' bring scientific and security communities together in a new way – and with significant implications for both.

Yet what processes characterize the politicization of scientific progress and the regulation of science under the logic of security? How does the emerging system of science governance shape the relations between scientific knowledge, security expertise, and political decision? And what are the consequences and costs of this move towards securing science? Drawing on these broader puzzles, this research explores the emerging governance of biosecurity and dual-use research in life sciences and critically reflects on its meanings, practices and implications. The thesis has three particular goals: first, to situate the current dilemma of dual-use research historically and conceptually, second, to analyse how the attempts to regulate biosecurity and dual-use research in life sciences affect the relations between

science and security, and third, to discuss what implications this science-security nexus has for the politics of security and insecurity.

Based on the insights from critical security studies, science and technology studies (STS) and sociology of knowledge, the study situates the dilemma of governing dual-use research in life sciences in prior debates on global terrorism, proliferation of weapons of mass destruction (WMD), and scientific social responsibility, and looks at the novel implications these connections bring about. Specifically, the thesis looks at how the nexus between science and security is constructed through certain techniques of government that integrate a diversity of practices into a governable problem and structure science-security relations. It does so, first, by exploring the regime of knowledge constructed in the Western political and expert discourses on biosecurity and dual-use research in life sciences, and second, by looking at two distinct empirical sites, which exemplify how a regime of biosecurity governance evolves at a boundary of science and security in a 'global' and 'local' context, respectively: in the international biological weapons regime and in the field of Czech non-proliferation professionals responsible for building the system of biological safety and security management in the Czech Republic.

Contemporary bio-threat narratives

The fears that research and innovation could be used to malign purposes are not new, as stories on 'mad, bad, and dangerous' scientists in popular culture demonstrate (Frayling 2013, Skal 1998, Toumey 1992). From Frankenstein to supersoldiers, from gunpowder to nuclear physics, from witchcraft to synthetic biology – the power of knowledge has often been subject to certain suspicion. These controversies have been driven not only by the fear of the unknown, incomprehensible and uncontrollable, but also by the concerns about malicious actors who may misuse this knowledge to cause harm to the society. With the changing nature of science, politics, and political violence, the conceptions of how science may be misused and consequently how it should be secured against such misuse are undergoing great changes (Godin 2015, Shapin 2008). To define what constitutes legitimate and beneficial research and where its limits are becomes a matter of politics and more and more also security.

Life sciences are currently one of the areas which attract most attention in this regard. Some of the recent controversies demonstrate which issues are most pronounced in this context and how the narratives of biological threats are concretely formulated.

The development of bioweapons by a religious sect

In 1990s, Japan-based doomsday sect Aum Shinrikyo (Shining Truth) experimented with Anthrax and Botulinum Toxin and allegedly sought to gain samples of Ebola with the aim of dispersing it in public places (Revill and Dando 2009: 56). Despite the involvement of professional bio-scientists in these experiments, the attempts to develop functional bioweapons and conduct bioterror attacks against several targets in Japan were unsuccessful. The sect later turned to using Sarin gas in an attack in Tokyo metro, which resulted in the death of twelve people and a hospitalization of thousand (Guillemin 2005: 158). In the meantime, the sect, whose ultimate goal is the destruction of the corrupted society and establishing a new world order, have gained support from over fifty thousand members all over the world and succeeded in recruiting elite scientists, who were frustrated from the rigid and authoritative culture of Japanese academia (Furukawa 2009). The case of Aum Shinrikyo thus showed that biological weapons are not obsolete, but may find their use in the post-Cold War security environment in the hands of malicious non-state actors. The portrayal of Aum Shinrikyo in this context helped shape the image of how such actors may look like: a "global web of wired, technically expert New Age zealots armed with biological weapons, driven by an apocalyptic vision of unprecedented destruction" (Kaplan and Marshall 1996: back cover).

Anthrax letter incidents

What motivated policy-makers – especially in the United States – to pronounce bioterrorism as a major threat and shift the issue to the national security agenda, though, was a series of anonymous anthrax letters sent to media and US senators after the 9/11 terrorist attacks. The anthrax letter incidents resulted in the death of five people and sickened 17 more. The Federal Bureau of Investigation (FBI) and its partners were tasked with the investigation of the incidents. The investigation under a code name 'Amerithrax', was one the most complex one in the history of the FBI and lasted eight years. The type of the purified anthrax used in the letters signalled that the sender was likely a trained scientist who must have obtained the

biological material from a state-sponsored laboratory. The FBI gathered substantial evidence that the letters were infected by biologist Bruce E. Ivins, who worked as a senior biodefense researcher at the Army's Fort Detrick biodefense lab in Frederick. Ivins allegedly hoped to "[create] a scare that would rescue what he considered his greatest achievement, an anthrax vaccine program that he had helped create but that by 2001 was in danger of failing" (Warrick 2010). One of the traces that helped the FBI identify the suspect was the inability of Ivins to explain his absences and working in unusual lab hours before the incidents. Despite several gaps in the investigation and the lack of conclusive physical evidence that would confirm the link between Ivins and the anthrax letters, FBI started preparing criminal charges against the researcher in 2008, to which he reacted by committing suicide. The case has had far-reaching implications for the regulation of biological research in the United Stated as well as elsewhere. In the post-9/11 environment, the widely medialized incident reoriented the focus of security experts towards bioterror threats coming from within the community of life scientists and motivated the adoption of new legislation on the control of biological agents as well as the emergence of new security regulations in science (Epstein 2007).

Moratorium on gain-of-functions research

In October 2014, the United States declared moratorium on so-called gain-of-function research involving highly pathogenic viruses. This type of research is based on enhancing the transmissibility and/ or pathogenicity of certain viruses so that scientists can learn more about the dynamics of pandemics. The problem is, however, that in case of an accidental or intentional release – whether via laboratory incident or deliberate misuse – these modified viruses may cause an unprecedented outbreak to which current societies are not properly prepared (cf. Rozo and Gronvall 2015). Arguing that "the risks and benefits of gain-of-function research must be evaluated (…) in order to determine which types of studies should go forward and under what conditions", the US government stopped new funding of this research and encouraged scientists to voluntarily pause ongoing studies of this type (US Government 2014a). The ongoing debate among scientists is structured in terms of whether the risks or benefits of gain-of-functions research prevail (Imperiale and Casadevall 2014, Lipsitch and Inglesby 2014) and relatedly, what 'new rules' shall be developed for this 'new game' (Lipsitch and Relman 2015).

DIYbio movement

Biological engineering is practiced not only at universities, in state laboratories or commercial biotech companies, but more and more also in citizen laboratories all over the world.[1] This DIYbio movement, or so-called biohackers, promote 'biology for people' and argue for an open-source sharing of scientific know-how. By pursuing the principles of open science, amateur biologists increasingly challenge professional researchers by showing that high-tech research may be done with minimal costs and equipment and without necessarily following the complicated career path in academia or research industry. DIY bio-scientists can now also compete at the International Genetically Engineered Machines Competition (iGEM), which is a synthetic biology competition aimed primarily at undergraduate students, who receive a kit of biological components and use them to build simple biological systems that can be operated in living cells. However, the rise of the DIYbio community as well as amateur bioengineers (such as those associated with iGEM) is not always perceived as a positive trend related to the popularization of science. The dissemination of practical scientific skills (so-called tacit knowledge) to a broad scope of amateur biologists, who do not work under the traditional institutional supervision in academia or commercial research company, is seen as a particularly problematic aspect of the rise of biohacking. While making biological engineering easier is thought of as a possible way to endorse the development of cheaper medical drugs or new biofuels, opening up the bio-sciences to literally anyone brings about many questions about the unpredictable consequences of such a move (Bennett et al. 2009). These initiatives attracted the attention of national security authorities in the United States, which have approached the community of biohackers and encouraged them to develop 'neighbourhood watch' stance based on "monitoring their own community and reporting behaviour they find threatening" (Ledford 2010).

From bioweapons to biosecurity

As the stories in the prior section demonstrate, the concerns that biological agents may be used for political violence have become a part of contemporary discourse on emerging

[1] As of April 2016, there were 79 biohacking laboratories registered with the global community of DIY biologists. 38 of these laboratories are located in the United States and Canada, 28 in Europe, 4 in Australia and New Zealand and the remaining 9 are based in Asia and Latin America (DIYbio.org 2016).

security threats. What the narratives have in common and what make them particularly powerful are several assumptions about the nature of the threat and the way they relate to the values and vulnerabilities of contemporary societies.

First, they remind us of the dangers of biological weapons, which may be as deadly as conventional weapons, yet are also indiscriminate in their effects and are difficult to detect in the first place. Biological weapons have been historically aimed mostly against non-combatants and have been designed either to kill them directly or to target livestock and crops in large-scale attacks.[2] As such, biological weapons are closely related to the doctrine of total war, in which the boundary between military and civilian actors and activities gets blurred (Guillemin 2005: 7).[3] Even through the deliberate spread of disease as a military strategy has had a long history, the idea that biological research can be exploited for military purposes may be traced to the 19th century and the birth of the microbiology and germ theory in particular. Despite the prohibition on 'the use of bacteriological methods of warfare', put forward by the Geneva Protocol of 1925, most developed industrial nations like France, United Kingdom, United States, Japan, or Soviet Union experimented with offensive biological research and developed their own biological programmes during the 20th century. The US decision to end its offensive biological programme in 1969 triggered international efforts to broaden the ban on biological warfare and led in 1972 to the signatory of the Biological Weapons Convention (BWC)[4] that bans the development, production and possession of biological and toxin weapons. Despite this ban, though, the Soviet Union as a

[2] Biological weapons may be defined as "munitions, equipment or other means of delivery including bombs, aircraft spray tanks and other devices, intended for use in the dissemination of biological agents and toxins for hostile purposes" (Guillemin 2005: 2).

[3] In fact, though, biological weapons have been used very rarely in the modern history. Guillemin (2005: viii) even argues that bioweapons may be seen as "failed military innovations", since political and military leaders did not use them during modern wars, even though these weapons were prepared for use. She argues that the non-use can be explained by the combinations of three factors: the legal restrictions on the use of biological weapons codified in the international law, the role of public opinion, and the technical characteristics of biological weapons that make them less reliable and predictable military technology (Guillemin 2005: ix).

[4] The full name of the treaty is *Convention on the Prohibition of the Development, Production and Stockpiling of Bacteriological (Biological) and Toxin Weapons and on their Destruction* (abbreviated to BWC or BTWC).

BWC signatory carried on in its massive biowarfare programme, which was revealed and closed down only after the end of the Cold War (Davis 1999).

Second, recent controversies related to the actual or hypothetical use of biological agents for political violence show how the imaginaries of biological threats and risks have changed. In particular, bioweapons have been more and more linked to new sources of threats as well as new referent objects, i.e. risk groups. From terrorist attacks using biological agents to laboratory incidents resulting in the escape of a deadly virus, dangerous pathogens or viruses may cause an unprecedented outbreak comparable with the effects of conventional weapons. While during the Cold War, biological weapons were of rather minor military and political relevance, they have started to be seen from a new perspective in the political environment characteristic by the fear of malign non-state actors and terrorists in particular. The link between biological weapons and terrorism was concretely constructed in wider political discourse during the presidency of Bill Clinton, marked by an increasing attention to new forms of terrorism in general (Wright 2006). However, it is important to contextualize the threat of bioterrorism and realize that is closely related to past as well as present state-sponsored programmes, which have generated not only stocks of harmful and weapons-capable pathogens, but also relevant scientific expertise. Especially the remnants of the huge Soviet biodefence programme are seen as very worrying, since when disseminated, they could make the bioterror threat much more likely (Wenger 2007: 203). It is in this context that the popular understanding of biological weapons as 'a poor man's atomic bomb' started to become more and more concerning.[5]

Third, the recent bio-threat narratives also focus on the evolution of life sciences and emphasise the increasing role of new technologies which make biology apparently much more powerful. The field of life sciences is seen as undergoing great changes, characterised by rising pace and power of new research. After the 'revolutionary' development of molecular biology in 1930s and genetics in 1960s and 1970s, the contemporary so-called

[5] This term was first used by Hashemi Rafsanjani, the speaker of the Iranian parliament in 1988 to describe biological and chemical weapons (IRNA 1988: 56). Since then, it became a popular label for bioweapons through which the speakers seek to highlight that bioweapons are cheaper and easier to manufacture compared to other types of WMD.

Third Revolution in life sciences is based on deepening the interdisciplinary character of modern biological research and strengthening especially the convergence of life sciences, physics, and engineering (Sharp et al. 2011). New areas of research that arise out of this collaboration, such as synthetic biology, promise many benefits for human health and welfare, but at the same are feared for their potential side-effects. Apart from ethical issues, which have accompanied the study of human body and living nature in general since its very origins, one of the key contemporary concerns related to life sciences is that biological technologies might be used by malign actors, such as terrorists, and used for political violence. Emerging technologies can thus further manipulate the characteristics of biological agents in order to make them more dangerous and more difficult to regulate (Tucker and Zilinskas 2006).

Fourth, by linking the issues of biological weapons, global terrorism, and the risks of techno-scientific progress, the current bio-threat narratives reorient the focus to new forms of political violence and new sources of security threats. In particular, these stories highlight the role of non-state actors who may wish to use biological weapons or may (whether willingly or unwillingly) assist to actors seeking to obtain such weapons. By expanding the scope of threat subjects to terrorists, criminals, hackers and other non-traditional actors, the politics of biological disarmament shift from state programmes and international talks about biological non-proliferation towards new policies and practices of biological non-proliferation that are focused on intra-state compliance and the regulation of institutions and individual practitioners. Consequently, much broader scope of social activities that are related to the production and dissemination of biological research and development become relevant for the regulatory oversight.

In sum, these concerns lead to the problem that many experts as well as policy-makes seek to tackle and that is how to prevent the misuse of biotechnologies and how to regulate this new and dynamic research field. As the concrete examples of bio-controversies demonstrate, with the increasing politicization and security framing of these issues, the problem of regulating potentially dangerous biological research and technologies becomes subject to not only expert debates, but also security politics.

As a result of this changing understanding of biological weapons, the taxonomy of biological threats increasingly include not only biological warfare, but also biological terrorism, biological crimes, laboratory incidents, as well as dual-use research (Koblentz 2010). The changing approach to biological weapons and the context of their potential production and use triggered broader transformations of the politics of biological non-proliferation and the governance of biological risks. These broader changes have been brought together under the notion of *biosecurity*. Biosecurity embodies a new complex approach to securing the society against a broad scope of naturally occurring as well as men-made biological threats and risks. As such, the politics of biosecurity brings about new understanding of biological threats and risks (such as bioterrorism or biocrime), new practices of political governance (such as health security, scientific diplomacy, scientific responsibility), and new social arrangements (such as new connections between the spheres of public health, academia, police, and security). This work will focus on those that are related to the governance to science under the logic of biosecurity and, more specifically, on the problem of dual-use research.

Dual-use dilemma and the politics of (in)security

The fear that life sciences may be converted into 'death sciences' (Atlas and Dando 2006) turns the attention to so-called 'dual-use dilemma'. Dual-use traditionally refers to technologies that have both civilian and military usage, but in the context of contemporary science, it can relate to facilities, equipment and agents as well as scientific knowledge (Atlas and Dando 2006, Buchanan and Kelley 2013, Revill and Jefferson 2013, Tucker 2012b: 22-25). With the apparently blurring line between 'offensive' and 'defensive' research and the deskilling of biological research, what receives more attention is thus how to secure 'dual-use' biological agents, equipment, and knowledge from being "misapplied for biological weapons development and production" (Atlas and Dando 2006: 276).

For example, in order to balance the desired advancement of science with the risk of misuse, the US government through its National Institutes of Health established a new category of research, which is subject to specific governmental oversight that shall "(a) mitigate risks where appropriate; and (b) collect information needed to inform the development of an updated policy" (National Institutes of Health 2012: 1). This 'dual-use research of concern' is defined as

> life sciences research that, based on current understanding, can be reasonably anticipated to provide knowledge, information, products, or technologies that could be directly misapplied to pose a significant threat with broad potential consequences to public health and safety, agricultural crops and other plants, animals, the environment, materiel, or national security (National Institutes of Health 2012: 1-2).

Compared to prior definition (NSABB 2007: 17), the reference to national security is new, which demonstrates the growing salience of the issue. As both definitions suggest, what have a dual-use potential and become a new object of security governance are not only dangerous products and technologies, but also information and scientific know-how. The oversight over dual-use research thus expands in scope and transforms in nature.

This development has attracted much attention in the scholarly literature in science studies. The problems of regulating 'dual-use' research in life sciences are extensively dealt with in policy-oriented research in STS (e.g. Lentzos 2008, McLeish and Nightingale 2007, Rappert and Gould 2009, Rappert and McLeish 2007, Suk et al. 2015, Vogel 2013). Besides, the issue has gained some attention by the scholars of international and security studies, who typically approach the developments in biosciences in the context of arms control and link the issue with the proliferation risks related to the rise of non-state actors (Atlas and Dando 2006, Chyba and Greninger 2004, Wenger and Wollenmann 2007). However, apart from the studies that look at the new links between public health and the politics of security (Elbe 2010, Lakoff and Collier 2008) and explore the implications of the techno-scientific progress in life sciences and medicine for contemporary societies and their modes of governance (e.g. Dillon and Lobo-Guerrero 2008, Rose 2007), more specific works critically reflecting on the new links between terrorism, biological weapons, and scientific innovations are rather rare (cf. Caduff 2012, Cooper 2006).

In order to fill this gap, this thesis seeks to bring the contemporary debate on regulating life sciences to critical security studies and contextualize it in a broader research problematizing contemporary security rationalities and practices. The dynamics of securitizing bioterrorism and securing life sciences resonates with the findings of scholars who argue that through 'widening', security rhetoric and practices have in the past decades moved from the exclusively military realm to other areas of human life (e.g. Baldwin 1995, Buzan et al. 1998, Krause and Williams 1996, Ullman 1983). Specifically, migration and adaptation of

security practices to new fields is discussed by scholars in International Political Sociology, who analyse this dynamic on the merger of practices governing terrorism, crime, migration, and asylum (Bigo 1996, 2002, Bigo and Tsoukala 2008, Huysmans 2006), reconfiguration of the structures of political governance resulting from the privatization of security (Abrahamsen and Williams 2011, Hönke 2013, Leander 2005), or new bridges between security and public health (Elbe 2008, 2012, McInnes and Rushton 2012), among else.

Critical scholars of security studies have so far focused greatly on the construction of so-called new threats and the politics of (in)securitization that is related to the expansion of threats images and security practices to new social spheres. The analysis of foreign policy, the social construction of national identity and interests or the study of how the politics of threat construction structures the relations among states and regions have also been prominently linked to the critical scholarship (Buzan and Wæver 2003, 2009, Campbell 1992, Hagmann 2015, Hansen 2006, Wæver 1996, Williams 2007a, Williams and Neumann 2000). However, what may be seen as 'traditional' agenda of Security and Strategic Studies has had somehow uneasy position in the critical security research and has been given relatively less attention in this strand of scholarship. In fact, arms control and proliferation issues have been closely studied by scholars associated with Peace Research, who questioned the rationality of Strategic Studies and its key concepts like deterrence, while arguing for overcoming the security dilemma among great powers and opening up for more inclusive understanding of peace and security (Bull 1968, Galtung 1969). Peace Research thus laid the foundations of a critical inquiry into the conceptualizations of war, violence, and peace, which later became the key research agenda for scholars within critical security studies. Even though critical security research exploring the politics of arms control and the governance of WMD has been quite rare (Mutimer 1998), recent works looking at these issues demonstrate that such topics can fruitfully be analysed with the help of theoretical concepts and analytical tools of critical security studies (Bourne 2012, Oren and Solomon 2015, van Munster and Sylvest 2016).

This work seeks to contribute to the critical research in security studies in several ways. First, it broadens the empirical focus of this research and analyses the expansion of security logic and practices to the sphere of science policy, which has received more and more attention in the context of the war on terror and the fight against extremism in particular. However, the

thesis moves beyond more general debates about how the war on terror affects science and academia (cf. Carvalho and Downing 2010, O'Neil 2003) and looks specifically at a specific trend in this regard that relates to the attempts to regulate emerging technologies – the subjectification and securitization of scientific knowledge. This trend arguably relates to a broader phenomenon described initially in sociology by Nico Stehr, who asserts that contemporary societies witness growing surveillance and regulation of new knowledge, which is a result of increasing concerns about the power of scientific and technological innovations (Stehr 2003, 2004a, 2005).

Second, by exploring the context and implications of the changing approach to the governance of life sciences, the work analyses the rise of boundary actors in science-security governance and the new models of security expertise that are related to this move. Through the initial exploration of the topic, the thesis seeks to contribute to the growing research on knowledge and expertise in security governance (e.g. Aradau and Van Munster 2011, Berling and Bueger 2015b, Hagmann and Dunn Cavelty 2012, Leander 2014) and explore the reconfigurations of security expertise at the boundary between science and security politics. Finally, the work aims to contribute to the growing dialogue between International Relations and STS in general (Mayer et al. 2014a, 2014b). Compared to the IR literature that borrows from STS its methods and the emphasis on materiality, which is understood as making specific actions in the social world possible (Aradau 2010, Aradau, Coward, et al. 2014, Salter 2015, 2016, Voelkner 2011), this work connects STS and political science by looking at the politics of expertise related to the governance of security and analysing how redesigning of scientific practices is envisioned in the emerging biosecurity discourses.

Theoretical framework of the study

This work is based on the social constructivist tradition in political science and draws specifically on the critical approaches to the study of international politics and security (Aradau, Huysmans, et al. 2014a, C.A.S.E. 2006, Fierke 2007, Krause and Williams 1997, Salter and Mutlu 2013). Despite the heterogeneity of theoretical and analytical approaches associated with this type of research, critical security studies are based on the assumption that security does not have any stable content and thus that the meaning and practice of security is subject to constant flux. Critical scholars of security studies typically look at the

transformations of security governance and scrutinize how referent objects are constructed in order to be 'secured' from security threats (Buzan et al. 1998). In particular, the research associated with critical approaches to security studies has recently focused on studying the practices of insecuritization, new techniques of governing security issues and the related discourses and practices of exceptionalism as well as debates on balancing security and liberty in the contemporary societies (Bigo 1996, Huysmans 2006).

In this work, I approach the politics of biosecurity and dual-use from a similar perspective and depart from the idea that security threats are socially constructed and embedded in certain understanding and practices of the political. Specifically, this research looks at the dual-use dilemma in life sciences as a by-product of the securitization of bioterrorism which have affected the sphere of science politics. I will briefly review the IR literature related to the issue of science and technology and several prior models of science-security relations in order to point out different theoretical and political approaches to the opportunities, dangers and ways of regulating scientific research. Drawing on critical theory and its application in security studies, I put forward the claim the securitization of life science and the construction of dual-use dilemma in life sciences may be understood as an expansion of circulatory governance, characterized by drawing a boundary between desired and undesired circulation of people, things and ideas, and policing this boundary through novel governmental techniques and by new actors with a specific type of expertise. To demonstrate this approach, the thesis briefly looks at the practices of scientific research and scrutinize how their governance is envisioned in the emerging policy discourse. As such, I draw on STS and its emphasis on opening the black-box of science and focusing on how governmental rationalities are embedded in the very practices of knowledge production and circulation.

The effect of the changing approach to biological threats and risks on the relations between science and security will be explored by analysing the practices that evolve in specific sites in between scientific and security fields. These spaces are approached as symbolizing the construction of new 'boundary' between science and security, which is embedded in the overlapping and interacting network of practices and discourses between distinct fields, whose interaction is a result of securitization dynamic. Theoretically, the thesis builds on the sociological approach to securitization, yet enriches this perspective by the notion of boundary work, borrowed from the sociology of science. This reading allows for analysing

securitization as two-directional dynamic of constructing a hybrid order in a sphere where different rules of the game overlap and create a specific new structure of social relations. Drawing on critical security studies and the approaches associated with International Political Sociology, I look at the problematization of security that is related to the changes these sites are undergoing and analyse the situatedness and further implications of these transformations. Concretely, the research will focus on the international biological weapons regime and the sphere of non-proliferation professionals in the Czech Republic. By studying the practices of (in)securitization related to these boundary sites, I wish to shed more light on how the relations between science and security are constructed and re-constructed and what implications this dynamic brings about to the democratic accountability of science, the politics of expertise as well as knowledge governance in science.

Content and structure

At the theoretical level, the thesis seeks to contribute to the growing dialogue between security studies and science and technology studies, to the critical research on new threats and changing security agendas, and to security theory in general. In particular, it aims to open up the debate of regulating knowledge and know-how in contemporary security governance. It does so by drawing on the International Political Sociology of security, critical theory, and sociology of knowledge. The problem of dual-use research in life sciences demonstrates how some of the key concerns of international politics – terrorism and the proliferation of weapons of mass destruction – translate into a specific social sphere of science and shape the practices of producing and circulating scientific knowledge. The research thus speaks to the critical scholarship within security studies, which has in the past two decades greatly focused on the 'widening' of security and the expansion of security practices to new areas of human life.

At the methodological level, the thesis seeks to elaborate on the analytical tools used in critical security studies and develops a framework for analysing the 'boundary work' related to the processes of securitization. This framework seeks to point out different aspects linked with the transformative impact of framing something as a security issue and outlines a three-stage model for analyzing concrete mechanisms associated with the re-structuring of social practices in a process of (in)securitization.

Finally, at the empirical level, the thesis wishes to contribute to the discussion on biosecurity and dual-use dilemma by focusing on the security rationality and security practices underlying the contemporary attempts to 'secure' science. In particular, the research highlights how the emerging science-security nexus is made possible not only due to the novelty of modern biology, but also due to the understanding of international security environment and the underlying rationality of security politics. In this context, the thesis argues for more comprehensive conceptual clarification and more serious political and societal deliberation about what issues are at stake, who or what is affected by them, who shall decide on them, and how. Concretely, the thesis proceeds as follows.

Chapter 1 deals with the relations between science and security, with a specific focus on modern life sciences and the changes in governing this area. The aim of the chapter is to look at how scholars of International Relations have dealt with the role of science and technology in international politics and how the sociological approaches related to science studies enrich this type of inquiry. To demonstrate the complexity of science-security relations, the chapter shows several examples of how the boundary between science and security has been constructed under different paradigms of national security and how this has affected the way science has been governed and practiced.

Chapter 2 approaches the problem of dual-use research from the perspective of critical security studies and suggests that it can be understood as an expansion of security governance to the realm of science. The chapter argues that the attempts to secure life sciences and scientific knowledge in particular may be analysed as a process of (in)securitization, through which the meaning of scientific practices is modified and the boundaries of science and security are redefined. The theoretical framework of the study, based on the mechanisms of bordering, hybridization, and stabilization related the transformative (in)securitization processes is developed and discussed in this chapter as well.

Chapter 3 briefly historicizes the notion of dual-use and, based on critical theory, conceptualizes dual-use dilemma as a problem of governing circulations. The chapter discusses the changing meaning of the concept of dual-use and points out that it increasingly refers not only to material and technology, but also to what is seen as a key productive force in the modern societies – knowledge. It situates this trend in a broader move towards

regulating and policing knowledge by the state, which has been discussed in sociology in relation to the rise of knowledge societies under the label of knowledge politics or knowledge governance.

Chapters 4 and 5 zoom in concrete examples of the changing relations between science and security. Based on the analytical framework developed in Chapter 2, these chapters analyse the emerging security practices in regulating life sciences in the international biological weapons regime (Chapter 4) and the system of biological safety and security management, developed by non-proliferation professionals in the Czech Republic (Chapter 5).

The findings of the study and their implications for the politics of (in)security are discussed in Chapter 6. The chapter highlights that the new regulatory practices in life sciences open up new possibilities for the state to police – either directly via its institutions or indirectly via scientific authorities – scientific knowledge. Concretely, the chapter argues that the converging political rationalities and governmental techniques of responsible science and security risk management can be understood as an 'ethicalization' of security and discusses the implications of this trend for science and security politics. Specifically, it points out how ethicalization affects the politicization of security expertise, the prospects of resistance to the new security practices in science, and democratic accountability of science.

The concluding chapter summarizes the key tenets of study and proposes new avenues for further research. It focuses especially on the role of critical security studies in researching the politics of science and technology as well as on new research agenda for security studies.

1 International Relations and the politics of science and technology

Scientific discoveries and technological innovations are typically seen as the key drivers of social progress in the modern age. Based on this assumption, many political thinkers as well as policy-makers have endorsed the advancements in science and technology for their beneficial impact on not only social and economic welfare, but also military strength and consequently on national security. This chapter places this vision under scrutiny and engages in a more critical and empiricist understanding of science and technology in political and security studies. It focuses first on how science and technology are conceptualized in International Relations (IR) and security studies and contrasts the progressivist notion of science, which is embedded in modern political theories, with more critical perspectives on scientific progress developed in science studies. To demonstrate the complexity of science-security relations, the chapter briefly looks at how the science-security relations have been constructed historically and based on what vision of science in the society. The chapter then moves on to discuss how the broader rationalities of national security affected the organization of science and the regulation of the knowledge production process. Finally, the chapter introduces the contemporary controversy related to the governance of potentially dangerous research in life sciences and thus situates this work in the existing social scientific literature on biological weapons and bioterrorism.

Science, technology and international politics

Science and technology have always been present in the research on international politics and security. For instance, liberal IR scholars assert that the advances in transportation and communication technologies have made the interactions among different types of actors faster, cheaper and easier and have thus shaped the prospects of cooperation and conflict in international politics (Keohane and Nye 1977). In strategic and security studies, science and technology have played even greater role, as scientific discoveries and technological innovations are typically thought of strategic tools in the capacities of the state. Most prominently, the issue of nuclear weapons in world politics has stirred up heated debates among scholars and practitioners alike since the World War II. Despite their disagreement

over the benefits of nuclear weapons to the international peace and security, most authors acknowledge the revolutionary character of these novel technologies to the politics of international security (Mearsheimer 1990, Sagan 1994, Waltz 1993).

Scholars of International Relations and security studies thus usually draw on certain understanding of science and technology when explaining different social and political processes, but they rarely do so in an explicit manner. Recent project engaging the study of science and technology in political science and IR comprehensively reviews the key debates and research topics related to the 'global politics of science and technology' (Mayer et al. 2014a, 2014b) and point outs that despite the rich intellectual history of studying science and technology in the society and the role of scientists in politics, IR literature has mostly adopted a very narrow and optimistic vision of techno-scientific progress, ignoring the very politics of science and technology (Mayer et al. 2014c). Specifically, the authors argue that "IR has little explored, and much less theorized, the variety of forms of power and sites of politics related to modern sciences and all kinds of technologies" (Mayer et al. 2014c: 14-15). In their reading of the key IR works, this proposition holds for all major theoretical traditions in the discipline – realism, liberalism, social constructivism as well as post-structuralism (Mayer et al. 2014c: 17).

Early realist thinkers such as Hans J. Morgenthau are among the few exceptions in this regard who critically discuss the relationship between scientific development and politics (for recent examples, see e.g. Scheuerman 2009, van Munster and Sylvest 2016). Morgenthau's criticism is targeted at the overly optimistic believes in the role of nuclear weapons in international politics and the technocratic organization of modern states as well as at the rise of behavioralism in political science and IR in general. Especially in his book *Scientific Man vs. Power Politics*, Morgenthau (1946) argues against the understanding of science as a key driver of modernity and against historical optimism and progressivism in IR. In his view, science and technology *per se* are not the ultimate solutions to modern social and political problems, as many dogmatic scientists believe, and their evolution shall not be perceived as detached from politics and history.[6]

[6] For a critical reading of Morgenthau's work and his legacy for IR theory, see e.g. Williams (2007b).

Despite the promise of this scholarship and the expectations of post-war IR scholars who predicted the rise in theorizing the role of technology in international politics (Ogburn 1949), the discipline of IR evolved differently. In the theoretical approach that has dominated the scholarly field in the following decades, science and technology have been mostly reduced to an element of state capacity, thus degrading science to an 'intervening variable' and reinforcing the evolutionary view on scientific progress. In the rationalist paradigm, states are seen as primary actors, which make their decisions based on the principles of instrumental rationality. What is seen as a crucial factor that determines how states are successful in preserving their national security and pursuing their interests in international politics is the state power. Despite different notions of power used in this context (cf. Hart 1976, Keohane and Nye 1977, Waltz 1979), scientific advancements and technological innovations are usually perceived as a more-or-less exogenous factor, which positively contributes to the power of the state, its material capacities, and consequently, its ability to compete with other actors in the international arena.

This understanding of science and technology is particularly, yet not exclusively pronounced by liberal thinkers and authors associated with strategic studies. Among the many works that praise the value of advancing science and technology as a way to gain power in international politics, Nye and Owens (1996: 20), for instance, suggest that "[k]nowledge, more than ever before, is power". As they explain, even though the United States can rely after the end of the Cold War on its great military and economic power, "its more subtle comparative advantage is its ability to collect, process, act upon, and disseminate information, an edge that will almost certainly grow over the next decade" (Nye and Owens 1996: 20). Paarlberg (2004) goes even further and argues that scientific hegemony, which translates to weapons quality, is the key to military dominance under the conditions of globalization. The so-called revolution in military affairs is based on similar ideas and is further believed to make warfare more precise and less inhuman, bringing thus benefits to more stakeholders (Arkin 2010, for critique, see Der Derian 2009). This image of science and technology is directly related to the realm of policy-making. Investments into cutting-edge research and emerging technologies, whether in civilian or military area, are thus endorsed by a broad scope of stakeholders as a desired contribution not only to economic growth, but also national security.

More specific approaches in IR look at how scientists and experts in general shape the national interests of states and indirectly thus also their behaviour in international politics. Perhaps the most famous contribution in this regard is the epistemic community approach developed by Peter M. Haas (1992). This approach relies on understanding science and politics as distinct social spheres, which are related through the activity of experts. According to Haas, networks of recognized experts, which he calls 'epistemic communities', have the capacity to influence the interests of states and consequently the process of policy-making. Specifically, he argues that "control over knowledge and information is an important dimension of power and that the diffusion of new ideas and information can lead to new patterns of behaviour and prove to be an important determinant of international policy coordination" (Haas 1992: 2-3). What becomes the key subject of research are the conditions under which this is possible and the nature of the expert knowledge that could appeal the policy-makers (Haas 2004). In order to become credible, experts shall arguably gain as much independence as possible, reach consensus on a specific issue in the expert community, and then transfer this knowledge to the decision-makers.

Beyond the progressivist vision of science

From the perspective of science studies, IR scholars are typical proponents of the image of science as 'speaking truth to power' (cf. Wildavsky 1979), which is based on the idea that scientists can assist policy-makers by providing expertise and helping them solve political problems. In this vision, science must be separated from politics so that scientific experts can first reach consensus on the 'truth' and then connect to policy-makers in order to provide meaningful policy advice (Jasanoff 2003: 225). The validity of this model, though, has been criticized for its factual inaccuracy as well as problematic normative implications (e.g. Lidskog and Sundqvist 2015). As scholars have shown on numerous examples, not only does this image of sciences poorly reflect the complex relationship between science and policy, but it also suggests that politics shall be informed by expertise rather than values and interests that are formulated in the democratic process of policy-making (Turner 2003).

The idea of neutral science, though, has rather complex roots. In fact, the vision of science as a key source of political power and social progress is intrinsically linked with the linear-progressive understanding of history and the notion of perfectible society, which can be

traced to the Enlightenment. The works of Enlightenment philosophers, such Immanuel Kant or Jean-Jacques Rousseau, and modern social evolutionists, such as Karl Marx or Georg W. F. Hegel exemplify how such worldview is pronounced. Compared to popular explanations, according to which the early modern turn to empiricism, materialism, and positivism and the rise of modern sciences may be best understood as an intellectual endeavour, Toulmin (1990) shows that this move can in fact be understood as motivated by the attempts to separate culture and identity from politics and thus overcome the violence and turmoil related to religious conflicts of the seventeenth-century Europe. From this perspective, the newly formulated ideal of scientific rationality was a way to acknowledge the possibility of developing an 'objective', ideologically neutral knowledge, which can inform the conduct of politics and thus eliminate irrationality and conflict from public life (Williams 2007a: 8-21). In other words, in the attempt to downplay the role of ideational factors, faith was separated from and replaced by scientific knowledge built on apparently apolitical material factors and calculations.

The special status that science – and especially natural science – has enjoyed in Western societies since the Enlightenment is based on popular beliefs in progress, scientific freedom and political neutrality. Even though political and security studies have greatly relied on this progressive, optimistic notion of science and technology as factors contributing to state capacity and thus national security, this image is in fact rather simplistic and in many respects misleading, as many scholars have shown. The popular assumptions about the neutrality of science and its detachment from politics and ideology were subjected to critical scrutiny not only by philosophers and sociologists of science (Gieryn 1983, Kuhn 1962, Latour 1987, Latour and Woolgar 1986), but also by the main figures of critical social theory (Bourdieu 1975, 1988, 2004, Foucault 1970, 1980a).

For instance, Bourdieu challenges the duality of theory versus practice and argues that despite its relative autonomy, science cannot be separated from other areas of human life, including politics. This also implies that science cannot produce knowledge detached from political practice:

> The idea of a neutral science is a fiction, an interested fiction which enables its authors to present a version of the dominant representation of the social world,

> neutralised and euphemised into a particularly misrecognisable and symbolically, therefore, particularly effective form, and to call it scientific. (Bourdieu 1975: 36)

In particular, science is in constant dialogue with the 'reality' it seeks to describe and explain. Scientific knowledge expressed through theories and concepts thus helps constitute and structure the 'objects' it looks at, which "means that the distinction between subject and object is put under pressure – the philosophical 'view from nowhere' is suddenly replaced by the impossibility of a nowhere" (Berling 2013: 63). As such, the production of scientific knowledge cannot be understood as a 'disinterested act', since knowledge is always political (Bourdieu 1998: 75-91).

Foucault is similarly suspicious of any grand theoretical narratives explaining the role of science in the political and economic structures of society. Even though the relationship of power and knowledge is at the heart of his theoretical inquiry, he suggests that it is only possible to describe the development and stabilization of specific epistemic and political practices in particular historical context without the ambition to generalize such findings (Foucault 1977). Informed by these broader trends in critical theory, STS scholars expand the study of how social and political context shape the production of knowledge in science (and the other way round) and point out that scientific knowledge is in fact best understood as 'negotiated' between science and society (e.g. Callon 1999, Jasanoff 2004, Knorr Cetina 1999).

Are these critical perspectives on the role of science in the society and its links with political ideology and practice relevant for IR and security studies, as disciplines that focus on different objects of study? What is the added value of these fields in approaching the boundary between science and (security) politics not as given and fixed, but as socially constructed, consisting of diverse constellations of actors, objects, and ideas, and constantly changing? By understanding the political role of scientists and technologists, political and security scholars can move beyond the simplistic notion of science and technology as either threats or benefits to the society and may more comprehensively and critically reflect on the implications of dealing with them as such. To do so, it is necessary to take more critical and empiricist stance towards studying science-security relations.

The evolution of science-security relations and research governance

In order to critically reflect on how science-security relations are organized, it is useful to understand them in the historical context. Concrete examples can better demonstrate the complexity of relations through which the role of science in the society is established and can thus highlight the importance of exploring science-security relations from a broader perspective. There is a large volume of published studies in the history, philosophy and sociology of science that scrutinize from many angles the evolution of science in the society and the role of scientists in political and military affairs, pointing out the many diverse rationalities and practices that have characterized the conduct of science throughout the history (Hackett et al. 2008, Merton 1938, Sarton 1927–48, Shapin 1986).

Instead of mapping the evolution of science-security relations throughout different historical and cultural contexts, though, which would be beyond the scope of this study, this section will demonstrate on concrete examples how research and innovation got politicized and become subject to security politics. Since this study is centred around the question of security governance of science, the discussion will point specifically to what understanding of the political is embedded in the efforts to govern science and what debates and dilemmas have been introduced in this regard. The following examples are certainly not exhaustive, yet they shall help contextualize the current debate on biosecurity and science governance.

The science of destruction: Manhattan Project and beyond

In the twentieth century, science and technology became a vital strategic ally for the military. During the World War I, for instance, scientists on both sides of the front sought to contribute to the 'total war' by improving the capacities of the fighting parties, while often joining the military purely out of their patriotic sentiment. From tanks and planes to machine guns and chemical weapons as the symbols of the trench warfare, the newly developed instruments of war became produced industrially and thus found their way to the battlefields on a large scale (Haber 1986, Hartcup 1988).

In the World War II, some scientists continued in the efforts to perfect the art of mass killing. Apart from the infamous use of science in the Nazi concentration camps, perhaps the best known scientific involvement in the war is the Manhattan Project and the research related to

the development of nuclear weapons. In fact, the US decision to pursue the nuclear programme was greatly affected by scientists who fled Europe and warned the US government about the ambitions of the Nazi Germany to build atomic weapons. In the attempt to counter this military development, the US government launched its own research and development plan called Manhattan Project to produce nuclear weapons. Compared to prior military research, Manhattan Project was unprecedented in scale. Nuclear historian Alex Wellerstein estimates that almost half a million people were employed in the United States during the war to make the nuclear bomb (Wellerstein 2013). However, the project was not only secret, but also compartmentalized, which means that most people involved in it did not know what they were working on. As such, the scientists who had helped build the bomb started to put the pieces together and realized what purpose their research served only after the war ended.

The involvement of scientists in the development of nuclear weapons triggered further debates about the moral integrity of scientists and their responsibility for the development of nuclear weapons. In particular, the role of science in security apparatus of the modern state started to be explicitly discussed. Having realized the destructive potential of new technologies, many scientists attempted to influence political leaders and society more broadly in order to create more informed and responsible social environment for the application of scientific knowledge in developing and using new technologies. Loyalty to the state and national security interests were contrasted to scientific integrity and the responsibility to educate the public about the dangers of nuclear weapons and emerging technologies. Leading scientists including Albert Einstein, Hans Bethe, or Niels Bohr publicly campaigned for the international regulation of nuclear energy (Schweber 2000) and a broader group of concerned scientists advocated for greater public control over emerging technologies through establishing policy-oriented research on weapons of mass destruction, prominently published in the *Bulletin of the Atomic Scientists* (Rabinowitch and Grodzins 1963). This debate was important especially from two perspectives: first, it opened up the discussion on the responsibility of scientists, especially for ‘protecting science from the state’, and second, it gave rise to an unprecedented political activity of scientists. The public engagement as well as the critical ethos associated with this generation of scientists, though, considerably declined as the Cold War proceeded (Shapin 2008).

The politics of scientific openness and secrecy in the Cold War era

The second example is the politics of balancing national security with scientific openness during the Cold War. Reflecting the evolving rationalities of national security, the fears that science may be misused played out specifically in the politics of protecting military technologies from foreign espionage. The key emphasis in this regard was on protecting advanced military technologies and nuclear research from falling to the hands of the enemy states. For that purpose, dangerous materiel, technologies and research activities were clearly delimited and subjected to specific regulation under the logic of 'command and control' governance, leading to the division of civilian and military/'secret' science (Balmer 2013, Kwik et al. 2003: 30-31). This regulation mostly covered areas such as nuclear physics, cryptography, lasers, computer science etc., while life sciences were excluded from these concerns. However, controlling the flow of research information became more and more difficult with the ambition to keep the technological supremacy on the one hand and the fear that open scientific communication could be used by adversaries for gaining military advantage on the other hand.

A specific episode in this period was the attempt by the US government to expand the regulatory oversight of science over the circulation of scientific knowledge. In 1982, at the height of the Cold War, the US administration started to fear that the Soviet Union exploits American science and technology for strengthening their military capacities. As written in an expert report called *Scientific Communication and National Security*,

> concern has arisen that the characteristically open U.S. scientific community has served as one of the channels through which critical information and know-how are flowing to the Soviet Union and to other potential adversary countries; openness in science is thus perceived to present short-term national security risks in addition to its longer-term national security benefits in improved U.S. military technology (National Academy of Sciences 1982: 9).

The report suggested tightening the security regulation of science, including for instance strengthening the criteria for information classification, restricting the communication with foreign scientists, introducing the procedure of pre-publication review by the government authorities etc. (National Academy of Sciences 1982: 2-3). As described by Gieryn (1983),

this move may be understood as an attempt to renegotiate the boundary between the process of knowledge production in science and knowledge 'consumption' by non-scientists and consequently, as a way to redefine the scope of scientific responsibility for their research. However, this move was not successful, since the expert panel that was tasked to discuss these issues rejected the suggested measures, delimiting strictly the areas of basic scientific research and technological application and arguing that free communication is needed for the advancements of science and its consequent contribution to the security of the state.

The rise of risk management and scientific self-governance in biology

The current debate in life sciences focuses on how to secure research and innovation in life sciences from their possible misuse by unknown and unpredictable actors. These concerns are clearly situated in the context of 'war on terror', yet follow in fact older debates about the rise of biology in modern societies and the need to regulate biotechnologies. These debates can be traced to 1970s and the broader discourse on systemic vulnerability, when the emergence of genetic engineering stirred fears of potential hazards and side-effects of this novel research and led to temporary moratorium on these studies. To save the field from legal restrictions, life scientists voluntarily agreed on safety guidelines related to recombinant DNA research at the international conference in Asilomar in 1975, which became a symbol of scientific consensus and the ability of science to govern itself (Barinaga 2000, Hindmarsh and Gottweis 2005). Practices of self-regulation and risk assessment were introduced into life sciences, underlined initially by the notion of risk, yet later, in order to depolitize the debate, replaced by the language of scientific ethics. Bioethics thus became a new technology of science governance under a broader political rationality of scientific responsibility (Braun et al. 2010, Jonsen 2003).

However, life sciences became subject to security concerns only during 1990s. In fact, expert debates on bioterrorism and the dangers of life sciences can be traced to late 1990s (cf. e.g. Dando 1999, Henderson 1999, Tucker and Sands 1999), but the issue go the US national security agenda only after 9/11 and the following anthrax letters incidents, when the US security politics has been reoriented towards new forms of political violence and new vulnerabilities (National Research Council 2004). This move also enabled revising the dichotomy of classified vs. unclassified research and introducing new regulatory practices

in a much broader area of 'sensitive but unclassified' research (Masco 2010, National Research Council 2009).

The challenges of modern life sciences

The interest of social scientists in the evolution of bio-sciences and bio-innovations is not new. Many scholars have studied how the developments in medicine, biotechnology and life sciences relate to broader shifts in social and political institutions and practices under neoliberal governmentality, focusing especially at the attempts to overcome the natural limits of life and growth (e.g. Agathangelou 2014, Cooper 2008, Dillon 2003, Flower and Heath 1993, Jasanoff 2005, Petersen and Lupton 1996, Petersen and Bunton 2002). In this context, Rose and Rabinow speak of the 'molecularization' of life, which is characterized by a changing understanding of human body, the prospects of its enhancement, possibilities of its (self-)governance, and ultimately by a molecule-centred rather than population-centred biopower and biopolitics (Rabinow and Rose 2006, Rose 2001, 2007). Dillon and Lobo-Guerrero (2008) bring this debate to the realm of security and discuss what it means for the biopolitics of security to replace population as a referent object with 'life'.

While certain order of biological life is supported through novel forms of governmentality, different political technologies and powers are employed in the governance of an undesired *disorder* of the molecular life (Braun 2007, 2013, Cooper 2006, Raman and Tutton 2010). Contextualized in the discourses on globalization and unpredictable risks, what becomes of particular political concern is a broad scope of naturally occurring as well as men-made biological risks and threats, which are increasingly brought together under the notion of biosecurity (Collier et al. 2004, Koblentz 2010, Lakoff and Collier 2008, Rappert and Gould 2009). Biosecurity, though, links molecular biopolitics with more traditional security logic as well as manifestations of sovereign power, as it "[justifies] a continuous state of emergency at the level of political life by reference to a continuous state of emergence at the level of molecular life" (Braun 2007: 23).

This logic has so far prominently resonated in two areas: public health and the governance of biological weapons. The former has been affected by the fear of unpredictable, dangerous pathogens whose dissemination is made easier by the 'forces of globalization' and the intensified global circulations of bodies. In this context, scholars have focused on the rise of

(global) health security and scrutinized different aspects related to the changing relations between medicine, public health and security politics (Davies 2008, Elbe 2008, 2010, 2012, Howell 2014, Ingram 2005, McInnes and Lee 2012). The latter, namely the governance of biological weapons, has reflected this rationality with even closer emphasis on security issues.

Biological weapons have gained greater prominence on the political agenda after 2001 as a part of broader concerns that non-state actors may seek to obtain and use weapons of mass destruction. In fact, the fears of bioterrorism precede 9/11 (Guillemin 2005, Henderson 1999, Tucker 1996), but the securitization of global terrorism and the evolution in infectious disease research reinforced these concerns. These concerns have been further underlined by the fears that rapid advances in life sciences make bioweapons apparently more attractive for terrorists due to the increasing accessibility of biological material as well as technology and know-how (Vogel 2008, 2013). This US-driven 'biological turn in the war on terror' (Cooper 2006) brought about many implications. It shifted the attention from state programmes and inter-state politics of biological disarmament to the individual level, focusing thus on emergent risks from unknown actors using unpredictable technologies. To prepare for an act of bioterrorism, the US government has massively invested in biodefence research (Sell and Watson 2013), bringing together life sciences, biomedicine and military in a new way.

With the apparently blurring line between 'offensive' and 'defensive' research and the deskilling of biological research, what receives more attention is how to secure the 'dual-use' scientific knowledge (Kwik et al. 2003) – in other words, how to prevent that "the generation and dissemination of scientific knowledge (…) could be misapplied for biological weapons development and production" (Atlas and Dando 2006: 276). In response, many scholars have warned of the link between biological proliferation and terrorism, pointing out the potential accessibility and attractiveness of bioweapons for hostile non-state actors (Atlas and Dando 2006, Chyba and Greninger 2004, Dando 1999, Henderson 1999, Tucker 1996, Wheelis 2004).

The issue has so far received a lot of attention in policy-oriented literature. For instance, scientific journal *Biosecurity and Bioterrorism* (recently renamed to *Health Security*),

established in 2003, publishes works from life sciences, bioethics, and science policy targeted on safety researchers and security professionals. *The Bulletin of the Atomic Scientists* has also published many articles on biological threats and bioterrorism as a part of its broadening focus on the regulation of emerging technologies (Barletta et al. 2002, Cameron et al. 2001, Schwellenbach 2005). Apart from works that deal with the expanding scope of biological threats and risks and introduce the notion of biosecurity (e.g. Fidler and Gostin 2008, Rappert and Gould 2009, Wenger and Wollenmann 2007), extensive policy-oriented research deals with the problem of how to govern life sciences in the contemporary world (Lentzos 2008, Lentzos and Rose 2009, Mukunda et al. 2009, Rappert 2010, Rappert and McLeish 2007, Tucker 2012a). Most of this literature highlights the importance of greater societal control over modern life sciences and argue for educating scientists and shaping the scientific practice in such a way that any systematic misuse of research is minimized. Critical voices are rather unusual in this strand of research and typically argue against hyping the threat of bioterrorism (Tucker and Sands 1999, Wright 2004).

More reflexive studies in this regard are quite rare (Buchanan and Kelley 2013, Collier et al. 2004). Science and technology studies provide more complex understanding of bioterrorism and the dangers of dual-use research. In particular, they highlight the role of tacit knowledge and shift the attention to the complexity and embeddedness of scientific activities. Scientific knowledge is understood as a combination of codified (formalized) knowledge and practical (tacit) knowledge, the latter of which cannot be expressed in formal terms, such as through text or language, but is acquired through experience – i.e. practice. Informed by Latourian sociology, Vogel (2008, 2013) and Ouagrham-Gormley (2013, Ouagrham-Gormley and Vogel 2010) then argue that biotechnology is a sociotechnical assemblage and therefore, social and technical dimensions of developing scientific knowledge on biological weapons are interconnected. Consequently, they point out the overlooked role of tacit knowledge that is needed for the development of biological weapons, downplay the argument on deskilling of biology, and criticize the prevailing cost-benefit approaches to dual-use research. Similarly, Revill and Jefferson (2013) point out that despite the challenges posed by information and communications technology, the role of tacit knowledge and scientific skills in biological weapons development is crucial and the risk of misuse thus shall not be overestimated.

It could be argued that the main strength of the existing research on biosecurity and the governance of contemporary life sciences lies in 'unpacking' the world of science in the new science-security nexus. Especially the STS literature goes into the detail of scientific practice and criticizes the simplicity of narratives on dual-use research as well as the apparent ease with which life sciences can be turned into 'death sciences'. The prevailing ethos of this research, though, goes hand in hand with the political discourse which constructs biological research as a security threat and which creates the connection between biological weapons and biological disarmament, global terrorism, and the governance of life sciences. The approach that this thesis seeks to take is different in several respects.

First, this work does not take the threat of bioterrorism and the dangers associated with 'uncontrollable research and innovation' as given, but perceives it as a product of social construction. For that reason, it understands the politics of biosecurity as a complex of discourses, practices, and social arrangements through which the link between bioweapons, terrorism, and dangerous research is forged and which create a background against which it becomes possible to take action in the name of securing life sciences and tackling biological threats and risks.

Second, the thesis approaches the politics of biosecurity from the security studies angle and from the perspective of critical security studies in particular. This is, however, not only a claim about disciplinary allegiance, but primarily an ontological and epistemological position, whose essence is focusing on the very *problematization of security* as an object of research. In effect, this means that the thesis is more interested in exploring the politics of security and insecurity related to the construction of 'biosecurity' and the dilemma of so-called dual-use research in life sciences rather than in answering questions about how dangerous biological threats and risks are or how the politics of biosecurity shall be conducted more effectively.

Third, as will be explained in the following chapter, this work is specifically interested in researching the practices that define the politics of biosecurity in concrete empirical settings. One of the aims of this research is thus to better understand how the broader rationalities and power techniques play out in practice – in other words, what effect the politics of biosecurity has on concrete actors, institutions, policies, social actions, and their transformation and

interpretation. In fact, the way security is understood and practiced is of the key interest for critical security scholars, since how security is conceptualized and how it is exercised is inherently linked with much broader and more basic questions about the nature of politics and the exercise of power in the society. Studying the practices of biosecurity thus provides an insight into the construction of these broader categories, which define the contemporary security governance and which include issues such as values and vulnerabilities, sources of threat, techniques of dealing with the security threats, as well as the space for formulating alternative vision of politics and proposing different solutions.

In brief, this thesis aims to critically reflect on the politics of biosecurity and the issue of dual-use dilemma and identify and analyse the novel trends that this turn brings to the political governance. The following chapters seek to make a step in this direction.

2 Mapping the boundaries of science and security

To analyse security, IR scholars are equipped with a specific theoretical, conceptual, and methodological toolbox, which to large extent determines how they think of security and what they look at when studying it (cf. Leander 2008). As such, science and scientific practices *per se* are not typically of great interest for most security analysts. However, looking at the contemporary efforts to regulate scientific research through the lenses of critical theory, it is possible to situate this trend in a less explicit, yet profound transformation of security governance and thus better understand the implications it brings about for both science and security. The following chapters will explore the key features of the current politics of biosecurity, as promoted in the political and expert discourse especially in the United States, and then zoom in to the dynamic of changing science-security relations in two more specific empirical settings. To prepare a ground for this analysis, this chapter will introduce the key concepts and 'thinking tools' of this study and situate it in broader scholarly debates on the transformation of security practices.

Inspired by constructivist scholarship in science studies and political science, this chapter will argue that biological threats and risks are socially constructed and suggest focusing on the structuring effects of different technologies through which biosecurity is governed (Buzan et al. 1998, Huysmans 2006, Wæver 1995). Specifically, the chapter will assert that securitization may be seen as one of the mechanisms, through which the understanding of science in the society changes. Inspired by the notion of boundary work used in the traditional sociology of science to study how science is distinguished from ideology and politics through boundary discourses and practices (Gieryn 1983, 1999), the chapter will suggest that the techniques of governing biosecurity may be seen as examples of 'boundary work', through which a new sphere marking a boundary between science and security is creates and where new security practices evolve. Based on these approaches, this chapter will introduce the analytical tools for studying how the boundary between science and security is constructed and re-constructed in the process of securitization and with what effects for the politics of security and insecurity. In doing so, it will draw on the principles of interpretive research design and on constructivist and critical security studies.

Interpretive research design

Traditionally, methods of scientific inquiry are seen as mere tools and techniques through which scientists translate their theoretical frameworks and concepts to concrete empirical contexts which they wish to research. However, for interpretive scholars, methods have a more powerful role to play in the process of constructing scientific knowledge. From this perspective, we could argue that methods tell us what objects to study, whose voices to listen to, and how to compare, contrast, and connect these observations. Methods are thus inherently constitutive of our research. In this sense, they are not 'innocent', but they influence how we go about studying the world and consequently, what picture of the world we provide as researchers to our audience. Such a critical reflection, though, shall not be read as a call for more data, increasing the number of cases under study, or redefining our theoretical concepts to increase their validity. Instead, it may be seen an invitation to rethink the methodological principles and guidelines which shape the process of designing and doing research (cf. Aradau, Huysmans, et al. 2014a, Yanow and Schwartz-Shea 2006).

IR have long been immune to this type of critique. Despite the increasing popularity of critical theory and the rise of post-structuralist approaches to IR and security analysis since 1990s, the questions of methods and methodology have started to play a more prominent role only relative recently (Lynch 2013, Shepherd 2013). Lene Hansen (2006) is one of the first scholars in IR who argues for an explicit engagement of interpretive researchers with methodology. For her, post-positivists scholars shall be open about the way they do research, since methodology is a "way of communicating choices and strategies that all writing, deconstructivist and poststructuralist, must make" (Hansen 2006: xix). Similarly to Hansen, other scholars have sought to advance the debate on methods in interpretive research by reformulating the established principles of positivist research and adjusting them the specificities of interpretive research (Balzacq 2011a, Salter and Mutlu 2013). The most recent debate relates to the broader political implications of methods. Such as critical security scholars look at the political nature of technical and scientific expertise and seemingly neutral expert methods and practices (Aradau and Van Munster 2011, Berling and Bueger 2015b), they start to do so do also with regard to their own practices and techniques of studying the world (cf. Aradau, Huysmans, et al. 2014a).

How does this reflection affect concretely our understanding of politics as a subject of social scientific research? "Social and political life is messy", Salter (2013a: 2) argues, and the attempts to approach it in its complexity must necessarily reflect this messiness. In practice, this means to move beyond the traditional notion of causality as a linear and ideally generalizable process that may be captured via universally applicable concepts and theoretical frameworks, and to acknowledge that agency is not limited to a pre-defined set of actors or structures, but may be found in individuals, groups, ideas as well as material objects (Salter 2013a: 2-3). By doing so, though, scholars soon come up to the limits of traditional models of social scientific inquiry. How to replace them and reflect the specific epistemologies of interpretive research when designing our studies?

Interpretive research is based on "making meaning out of the meaning-making of other humans" (Pachirat 2006). Since interpretive scholars are typically interested in studying "specific, situated meanings and meaning-making practices of actors in a given context" (Schwartz-Shea and Yanow 2012: 1), they favour not theoretically, but rather empirically driven research. Putting a strong emphasis on empiricism is based on the assumption that meaning-making activities are unique and shall be approached as such. To learn about their objects of study in context, many interpretive scholars prefer engaging with them from a close proximity, via fieldwork and typically abandon the ambition of most scientific research in general, which is the ability to compare and contrast cases and develop robust theoretical schemes for explaining social and political processes (cf. King et al. 1994, Waltz 1979). The theory straitjacket is criticized by interpretive scholars for constraining the way we study the world and limiting thus the prospects for developing innovative knowledge. Arguing against the reductionism of positivist research strategies, Neal (2013: 44) asserts that "[t]he most exciting work (…) describes rich empirical landscapes, unseen practices, and diverse knowledge systems.." On this ground, he encourages critical security scholars to "reclaim empiricism as a methodology that prioritizes the collection and analysis of data rather than its subordination to theory" (Neal 2013: 43).

Second, interpretive scholars abandon the positivist ideas that the researcher and the researched – the knower and the known – can be clearly distinguished in practice and that there is a simple relation between them in the process of building knowledge (Hawkesworth 2006: 29). Instead, they take hermeneutic approach to research, also called abduction, which

seeks to bridge standard scientific methodology and the mode of knowledge production derived from our everyday social practice (Schwartz-Shea and Yanow 2012: 27-34). Abduction is defined by a continuous dialogue between theory and empirics, by oscillating between the general and the particular during the process of designing, conducting, and interpreting research. In practice, interpretive researchers tend to read and reread theoretical literature and empirical data "until (…) something makes sense in a new way" (Yanow 2006: 72). Such a strategy shall lead to the convergence between observing and experiencing 'the world around us' on the one hand and reflecting on this experience in an abstract manner on the other hand and, ultimately, to constructing a meaningful framework for interpreting the social and political processes, events, and phenomena that are of interest to us.

This also means, however, that interpretive scholars shall critically reflect on their research not only when putting together the findings of their study, but during the whole research process (Guillaume 2013). Reflexivity is about questioning how our worldviews, our theories and concepts, and our position in the research (especially when involving also fieldwork) affect the way we study and make sense of the world. When assuming that meaning is socially constructed, researchers who seek to study the meaning-making activities cannot be seen as merely describing the world, but rather as actively engaging in the 'making' of the world (cf. Goodman 1978). As such, scholars shall be aware of and critically reflect on the political and social context in which they produce knowledge themselves (Salter 2013a: 21).

This research builds in many respects on the abovementioned principles. It has evolved through what Lobo-Guerrero (2013) calls poetically 'wondering as research attitude'. This wondering includes letting oneself exposed to 'surprises' coming from the field that defy what we expect to encounter and seeking to analyse the sources of our surprise and tension between the expected and the encountered. Yet wondering includes sometimes also getting lost and ending up in blind-alleys. It can be thus rather complex and exhausting process, which does not necessarily make sense from the beginning, as we may be able to 'connect the dots' only once there are enough of them. This study is a good example in this regard. It started with a theoretical puzzle related to the politics of macro-level securitization and the diffusion of security practices in the governance of transnational security issues. However, in the search for an empirical material that could be 'applied' in this research, I came across

a whole new empirical landscape that seemed less appropriate for testing my frameworks for analysis and more intriguing as a source of novel security practices, institutions, and knowledges – that is what I call 'the politics of bio(in)security'. In a process of learning about the 'local' and 'global' approaches to biosecurity both from secondary literature and from an initial round of formal and informal interviews with life scientists and non-proliferation bureaucrats, it became clear that studying the developments in the field through my originally developed theoretical lenses is not very helpful, as I tended to look for processes that were either non-existent or rather marginal. Instead of focusing on the diffusion of securitization of biological threats and risks, I became fascinated by the very politics of (in)securitization, both in the international and national context. Consequently, I tried to gradually adapt the conceptual framework of my study to the observations from the field about what actors are most vocal about biosecurity, what structure of social relations they are embedded in, what vision of security and what techniques of government they propose, how they link previously separate practices etc.

Having turned my attention to this arena and having shaped my research design a couple more times, I cannot say that my initial interest and the key elements of my original 'theoretical baggage' would be abandoned completely, though. The way I have approached the empirical material has certainly been influenced by it and by the current debates in critical security studies and securitization theory in particular. This theoretical point of departure oriented my interested towards studying the changes in the governance of security, the development of new security practices, and the implications of this dynamics to the understanding of the political, to power relations, and the possibilities of resistance. Instead of liberating myself completely from my initial theoretical frameworks, I have tried to widen my perspective and incorporate further tools to the conceptual and methodological toolbox of the study, while leaving out those that eventually turned out as less relevant. As a result, I have focused both on explicating puzzles 'coming from the field' as well as relating these puzzles to more general trends and processes in security politics, moving thus up and down the ladder of abstraction. Therefore, rather than empiricist, this project may be read as empirically-inspired, yet with the ambition to contribute to broader scholarly debates in security studies and science studies. In the following sections, I discuss the main sources of its theoretical inspiration as well as concrete work with data and methods.

Securitization and the analysis of security practices

This research is situated in critical security studies, a strand of security studies that approaches security as a set of specific social practices and critically reflects on them. Critical security studies are based on the assumption that "security threats and insecurities are not simply objects to be studied or problems to be solved, but the product of social and political practices" (Aradau, Huysmans, et al. 2014b: 1). Scholars working in this tradition seek to understand how these practices emerge, evolve, and dissolve and how they shape and are shaped by the social and political context. In this understanding, security does not have any fixed meaning, but is socially constructed. What threatens security? Whose security matters? Who shall provide security, through what means, and under what conditions? And who and how shall decide on these issues? These are questions that could be answered differently in different times and places (Bubandt 2005, Ciută 2009), yet instead of seeking answers to such questions, critical scholars look at how different political communities deal with them and with what implications (e.g., Bigo and Tsoukala 2008, Buzan et al. 1998, Campbell 1998, Hansen 2006, Huysmans 2006).

Being critical about security has a specific meaning in this context, which has its roots in social theory. "Criticality is a self-conscious posture", which requires us to be reflexive as well as attentive to the way knowledge is developed (Guillaume 2013: 29). As Foucault (1988: 154) famously stated, "critique is not a matter of saying that things are not right as they are. It is a matter of pointing out on what kinds of assumptions, what kinds of familiar, unchallenged, unconsidered modes of thought the practices that we accept rest." Following this proposition, critical social theorists seek to highlight the importance of developing an alternative 'vocabulary' for exploring the social world, which shall prevent researchers from reproducing the established categories and concepts and thus also the power structures in which they are embedded. According to Guillaume (2013: 29), criticality is even more important when studying international politics and security, since IR scholars typically work with the same concepts that are used by policy-makers and can therefore tend to reinforce rather than scrutinize the dominant notions of power and politics even more than in other fields.

In the search for alternative 'thinking tools' that could be used productively for studying politics and security, critical security scholars have adopted many concepts and methods from other disciplines. An explicit move towards greater interdisciplinarity has been made by scholars associating themselves with so-called International Political Sociology, who seek to integrate international and security research with sociology and social theory (Berling 2015, Bigo 2008, Bigo and Walker 2007). Moving beyond the traditional 'levels of analysis' used in IR literature (Singer 1961), International Political Sociology seeks to scrutinize how the 'international', 'political', and 'social' interact in practice and thus better reflect on complex problems of (international) politics (Bigo and Walker 2007). Consequently, this approach favours studying practices, i.e. what people do rather than just say. In this context, *practice* can be understood as

> a routinised type of behaviour which consists of several elements, interconnected to one another: forms of bodily activities, forms of mental activities, 'things' and their use, a background knowledge in the form of understanding and know-how, states of emotion and motivational knowledge (Reckwitz 2002: 249).

By exploring from proximity the practices of international politics, how the 'global' and 'local' relate at diverse sites, events, and through diverse processes, researchers can provide a different picture of politics and security (Huysmans and Nogueira 2012). This type of analysis attracts scholars mainly because of its ability to uncover how practices (re)draw the boundaries of social fields, (re)structure power relations, and (re)produce social orders and hierarchies. In other words, since "practices are the result of inarticulate, practical knowledge that makes what is to be done appear 'self-evident' or commonsensical" (Pouliot 2008: 256), then "[l]ooking at practices (…) involves looking at what kind of order a specific practice (re)produces" (Leander 2010). To apply practice analysis in security studies thus means to adopt an empiricist approach, "non-reducible to a core meaning or/and a linguistic formulation" of security (Balzacq et al. 2010: 2).

This reflexive turn in security studies has its roots in 1990s and is most significantly linked with a new framework for security analysis developed by a group of scholars associated with the so-called Copenhagen School (Buzan et al. 1998, Wæver 1995). The Copenhagen School reacted to a debate among security practitioners as well as analysts about the nature of international security environment after the end of the Cold War. While traditionalists

suggested focusing on the issues of great power politics, military conflicts and national security in general (Walt 1991), alternative conceptions were formulated that proposed either 'widening' the perspective on what is national security and what issues constitute threats to it or 'deepening' the notion of security referent and looking thus at the security interests of not only states, but also communities, regions, or even individuals (cf. Buzan and Hansen 2009). The Copenhagen School intervenes in this debate in a very specific manner. Instead of focusing on what security *is*, it looks at what it *does*. The Copenhagen School thus dismisses the search for an ultimate conceptualization of security, claiming that security issues do not have any objective essence which only needs to be 'discovered'. It asserts instead that security is an intersubjective concept, socially constructed through discourse (specifically, via speech acts) in a process called *securitization*. Securitization is defined as a process when a socially relevant securitizing actor proclaims something to be an existential threat for a valued referent object. If this move is accepted by a relevant audience, the securitizing actor may apply extraordinary measures in order to tackle the threat. Consequently, securitization moves an issue from the realm of politics, which allows democratic deliberation about political problems and solutions to them, and turns it into a matter of exceptional politics (Buzan et al. 1998). The central idea of this framework, suggesting to reflect on the political usage of the concept of security, speaks to many students and scholars in security studies. Whether understood as "a conceptual move, a framework of analysis, [or] an empirical and political theory of security" (Guzzini 2011: 330), the notion of securitization has taken its own route and has been elaborated and adjusted by several strands of critical security scholarship.

However, many scholars point out that the framework for analysis developed by the Copenhagen School provides rather limited view on the practice of security. Apart from the problematically narrow definition of security it works with, it offers rather restricted perspective on *who* is involved in securitization, *what* is the object of securitization, *how* securitization operates, and with what *effect*. Securitization theory has been thus adjusted and reformulated in several ways, both theoretically and methodologically, which has further trigger further debate on the role of methods in studying securitization (Balzacq and Guzzini 2015, Williams 2011).

For instance, so-called second generation of securitization scholars (e.g. Balzacq 2005, 2011b, Ciută 2009, McDonald 2008, Roe 2008, Salter 2008a, Stritzel 2007, Wilkinson 2007) support more constructivist, contextual and externalist reading of securitization. In particular, they argue for overcoming the fixed understanding of social roles and relations of securitization actors and reject the assumption of performativity of security discourse (speech acts) as suggested by the Copenhagen School. This enables understanding securitization as a more complex social process, in which the roles of securitization actors and the meaning of the key concepts are dynamically constructed and reconstructed.

An inspiring re-reading of securitization theory is offered by a group of scholars who seek to cope with the deficiencies of securitization and especially its narrow conceptualization of the social context by integrating certain insights from critical social theory and in particular the theory of practice developed by Pierre Bourdieu. This approach is based on using Bourdieusian concepts to rethink issues of (international) politics and security from a new perspective and with a new form of reflexivity (Adler-Nissen 2014, Bigo 1996, Williams 2007a). In brief, Bourdieu's theory of practice (Bourdieu 1977, 1990a) suggests dissolving the established agent-structure and material-ideational dichotomies in social theory and shows instead how social structures, concepts, and values are in fact a product of practices performed by actors on the basis of their socially defined positions in social fields and their habitus, i.e. "system of lasting, transposable dispositions which, integrating past experiences, functions at every moment as a matrix of perceptions, appreciations, and actions" (Bourdieu 1977: 82-83). Building on structuralist and constructivist ontology, Bourdieu argues for an analysis that can grasp "dialectical relations between the objective structures to which the objectivist mode of knowledge gives access and the structured dispositions within which those structures are actualized and which tend to reproduce them" (Bourdieu 1977: 3).

This type of inquiry has its roots in the seminal work by Bigo and his colleagues (Bigo 1996, 2001, 2002, Bigo et al. 2010, Bigo and Tsoukala 2008), who use Bourdieusian concepts to analyse the 'changing landscape of European liberty and security'. Specifically, they argue that

> the label "security" cannot be considered as a concept which can capture a coherent set of practices. Security is, instead, the result of a process of (in)securitization. It is

> a kaleidoscope of practices non-reducible to a core meaning or/and a linguistic formulation. The label "security" appears rather to work as a slogan, as a peculiar method through which a dominant group justifies and imposes a political program by assessing who needs to be protected and who can be sacrificed, who can be designated as an object of fear, control, coercion. (…) The process of securitization – or rather (in)securitization – is central to the understanding of all of those practices, both discursive and non-discursive, drawing lines between groups and categorizing what is threat, what is fear, what is danger, what is unease, what is fate and destiny, what is protection, what is security. (Balzacq et al. 2010)

Based on this conceptualization of securitization, they analyse the emergence of a new transnational field of 'professionals of (in)security', which merged internal and external security, brought together actors and issues from previously separate fields and gave rise to a new system of security governance based on policing and surveillance – 'governmentality of unease'. However, Bigo (2008: 12) notes that "[t]hese professions do not share the same logics of experience or practice and do not converge neatly into a single function under the rubric of security." What he finds, instead, is the change of practical knowledge through the establishment of "a network of heterogeneous and transversal practices (…) [which] makes sense as a form of (in)security at the transnational level" (Bigo 2008: 32) and which gives rise to a specific 'transversal dispositif' and 'transnational regime of truth'. Similarly, Abrahamsen and Williams (2009, 2011) study the transformation of security practices that result from the privatization security and expansion of security agenda in the context of changing political governance. They argue that security practices are connected through so-called 'global security assemblages' that redraw the boundaries between public and private as well as global and local practices and bring about new tensions and new forms of struggles in the reconfigured security field (Abrahamsen and Williams 2011: 3).

Whether coming from the perspective of Bourdieusian or Latourian sociology, Foucauldian or Derridian philosophy, or building explicitly on securitization theory, scholars associated with International Political Sociology share the interest in researching how security practices evolve and expand to new areas of social life. The inspiration in the original approach of the Copenhagen School is indisputable, though. Scholars studying security critically perceive security as a product of social construction: "[f]or something to become a security concern,

institutional, political, technological, and various other work is performed that makes it a matter of insecurity" (Aradau, Huysmans, et al. 2014b: 3). However, to study security critically is not only about exploring the contesting visions of insecurity, but also about looking at different regimes of practices and what mode of governing and organizing the social and the political they promote (Huysmans 2006). Compared to the Copenhagen School, scholars of International Political Sociology focus on a broader scope of problems and phenomena related to changing problematization of security and adopt thus also a broader scope of analytical tools for studying these issues. In the words of Bigo, this type of inquiry departs from analysing the performative (securitizing) speech acts and looks at

> how the series of discourses are usually forged as forms of ex post facto justification of the everyday practices that enact a governmentality of fear and unease, and to analyse the correlation between these rationalizations via practical justifications and the (in)securitization practices of the actors – practices that vary greatly, depending on the field or social universe in which they are deployed. (Bigo 2014: 211)

Even though these works differ in their concrete application of theoretical concepts, they highlight several key points about security practices. First, how practices from different social spheres are connected is crucial for understanding what 'order' they bring about, i.e. how they (re)structure the social sphere. Second, the background knowledge and practical sense of actors significantly affects the process of transforming and restructuring social practices. Finally, whether using the Foucauldian notion of dispositif, or the concept of assemblage, critical scholars emphasise that practices relate to each other, giving rise to specific 'regimes of truth', through which actors interpret the world and which they uphold through practice.

New sites of security expertise

The perception of risks associated with the rise of life sciences and the consequent efforts to regulate scientific research in this field are not only linked with a new vision of science and its governance, but are also related to the problematization of security that has dominated the Western societies especially in the wake of the 9/11 attacks. This problematization is characterized by an increasing focus on the management of risks that come from unknown and unpredictable actors – typically terrorists. With the emphasis on uncertainty as the

defining feature of the current security environment (e.g. Aradau et al. 2008, Petersen 2011), new models of governing security are developed. One particular novum is the increasing role of experts, whose role is to distinguish between positive and negative circulations (as discussed in the previous chapter) and contribute to developing specific techniques of governing the circulations. The involvement of experts in the emerging security governance of life sciences is no exception in this regard. In this section, I will explain why studying new sites of security expertise is a productive way of exploring the changing governance of security in general.

The research on experts and expertise has been the traditional domain of sociology and STS, which typically look at how scientific knowledge translates to the realm of policy-making as a part of its general focus on the role of science in public sphere (Maasen and Weingart 2005, Stehr and Grundmann 2011). However, more and more scholars focus on the dynamics of expertise in political and security governance. In IR, this topic can be situated within a broader debate on expertise, science and politics. This debate has many dimension, from how to distinguish expert/ scientific knowledge from political knowledge to normative and ethical concerns related to the role of science and expertise in the society and the interplay of knowledge and power in general. However, whether looking at the causal influence of expert communities in politics (Haas 1992), the social construction of expertise (Litfin 1994), or the practices of expertise (Bigo and Tsoukala 2008, Huysmans 2006), IR scholars have always been interested in reflecting on the role of scientists and experts (including themselves) in politics (Bueger 2014a).

Yet why is expertise relevant for security studies? Interpretive scholars perceive expertise on security as a source of knowledge that plays a role not only in finding solutions to security threats, but also in the very construction of threats (Berling and Bueger 2015a). Security expertise thus becomes an interesting object of study on its own both from theoretical as well as empirical perspective.

On the one hand, experts take part in the struggle for power and interpreting 'the political', even though it is not necessarily on an explicit manner. The focus on 'technocratic' politics and less visible sites of security politics departs from traditional political science, which is preoccupied with studying states and entities that derive their power from states, whether in

the international or domestic arena. This perspective is based on a specific conceptualization of politics, which is based from equating political power with state sovereignty and the hierarchical, top-down forms of exercising state sovereignty. However, there are also different models of power, as Foucault (2007) demonstrates, and sovereignty is only one of them. While *sovereign power* is defined by the obedience to state authorities and is exercised mostly through the rule of law, Foucault talks about two other techniques of government: discipline and governmentality. Institutions such as prisons, hospitals, schools or factories exemplify the exercise of *disciplinary power*, which regulates the behaviour of individual bodies in the society, whether through the organization of space, time, or people's activity. On the contrary, *governmentality* is understood as a 'conduct of conduct' and relates to the governance of whole populations through a broad variety of techniques. Governmentality is a form of power that is perhaps least explicit, as it is embedded in different knowledges and practices. In most efficient forms, it takes form of self-governance, which is a way of governing subjects by enabling them to govern themselves (Foucault 2007). Rejecting the Hobbesian "model of power with a single center", Foucault suggests analysing power "at its multiple and local points of material manifestation" (Neal 2004: 383). It is in this context that he argues for "a political philosophy that isn't erected around the problem of sovereignty. (…) We need to cut off the King's head" (Foucault 1980b: 121).

When adopting this conception of power, according to which power is dispersed in mundane practices, knowledges, and techniques, we come to see the governance of security from a more complex perspective. Inspired by the Foucauldian reading of power, critical security scholars have developed a 'technocratic' view on security making. This strand of research looks at how not only political elites, but also technocrats, practitioners, and other professionals redefine the politics of security and insecurity through diverse discursive and non-discursive practices. This involves also moving beyond threat-focused analysis of security to the study of different domains of insecurity and modes of governing (in)security (Huysmans 2006). As such, despite the popular understanding of scientific and technical knowledge as apolitical and value-neutral, critical research shows that expertise is in fact political in the sense that it is embedded in certain understanding of the political. Through the production of authoritative knowledge, experts get involved in the discursive struggles

over the interpretation of specific issues and may shape the subjectivity of the governed subjects.

One the other hand, new experts provide knowledge on security and thus get involved in the security governance. With the securitization of new issues and introducing the practices of security to new fields, experts from different areas are asked to distinguish between the positive and negative circulations of actors, things, and ideas, and as such become engaged in the politics of security and insecurity. Their involvement may concretely take many forms, from explicitly taking part in the political decision-making process, serving as advisors, expressing their opinion in media, or even implementing (security) policies. Similar to the sociology of science, critical security studies have started to study knowledge activities, yet focus specifically on *security knowledge*. Its relevance it discussed for instance by Huysmans, who maintains that

> security knowledge is politically significant in three ways. First, it can be an instrument in struggles for political power and legitimacy. Second, security knowledge is also an important resource in the policy-making and implementation process. Finally, security knowledge frames certain understandings of the location and nature of political community and practice. It is in this latter sense that state-centric categories have their most significant impact on security studies (Huysmans 2006: 42-43).

Based on a broader understanding of this phenomenon, critical security scholars have moved on the focus on *security expertise*, which can be understood as knowledges and techniques through which risks and threats are identified, measured, weighted, and assessed and the dangerousness of future is estimated (Berling and Bueger 2015a). In this context, the role of expertise has been approached mainly from two perspectives. While some look at this issue through the lenses of Foucauldian analysis and study how expert knowledge becomes a key tool of risk governance (Aradau and Van Munster 2007, 2011, Hagmann and Dunn Cavelty 2012, Leander and Van Munster 2007), sociologically-oriented scholars read these changes in security governance as a transformation of knowledge practices in the security field, which enable bureaucrats and (in)security professionals use their technical knowledge to construct the 'truth' on threats and risks (Bigo 2002, Bigo and Tsoukala 2008, Huysmans 2006, Stampnitzky 2013, Williams 2007a). These studies suggest that this development

contributes to the emergence of new types of security expertize, mixing of liberal and illiberal practices in security governance, objectivation of dangers (Berling 2011) and so-called security scientism, i.e. belief that dangers can be 'measured' and 'calculated' (Hagmann and Dunn Cavelty 2012), and ultimately, to the depoliticization of security.

An interesting reading of security expertise is offered by Berling and Bueger (2015b), who draw on science studies and suggest understanding expertise as a boundary position, which bridges science and policy. Inspired by sociologists such as Bourdieu or Luhmann, the sociology of science has come to perceive experts as actors who bridge distinct domains that are defined by different rules and structured by different logics of action. In this view, experts may be seen as intermediaries who occupy 'spaces between fields' and are able to translate scientific knowledge into the domain of politics (Eyal 2013). In the words of Berling and Bueger (2015a: 1), "[e]xpertise mediates between different forms of knowledge: scientific and technological knowledge, legal and economic knowledge, or political knowledge." From this perspective, "[e]xpertise occupies a boundary position. It is transgressing, translating between different domains and sometimes even policing the boundary between them" (Berling and Bueger 2015a: 6). As such, they argue, the research on security expertise shall focus on the practices of expertise and the related questions of power and knowledge production at the boundary of science and (security) policy.

To sum up, while critical social theory points out the role of dispersed practices of power and supports more technocratic perspective on the analysis of security governance, security scholars have recently looked at how expertise as 'politics by other means' shapes current security policies and practices. Sociological reading of security expertise then highlights the boundary position that experts hold and thus opens up a new interpretation of the role of expertise in security politics.

Science, security, and boundary work

Science-security relations have been of little interest to IR and security studies and if so, then from the perspective of how science affects politics, as discussed in Chapter 1. In critical security studies, the role of science is discussed especially with regard to securitization, which may be read as a specific type of policy-making process in which extraordinary threats are invoked and exceptional political practices employed. By expanding the contextual

reading of securitization, one approach is to look at how securitization operates in science as a specific sociological setting and how scientists and experts perceive specific securitizing moves (Salter 2008a). Besides, scholars have also demonstrated how scientific facts, both from natural (Trombetta 2008, 2011) and social sciences (Bueger and Villumsen 2007), are mobilized in the process of securitization. Based on a Bourdieu-inspired reading of securitization theory, Berling (2011) discusses three mechanisms of how science plays out in the process of securitization: first, through constructing social and political problems and objectivation of facts, second, through influencing the authority of a speaker in securitization, and third, through the mobilization of scientific facts in securitization.

Instead of focusing on how science and scientific knowledge affect the processes of securitization and the construction of security knowledge, however, this research looks at the securitization of science and scientific knowledge and at the implications of this move. From this perspective, what is puzzling is the dynamic and effects of securing science, i.e. how science becomes subject to security governance. By employing a broader conceptual vocabulary of the International Political Sociology going beyond securitization studies, we may ask how the nexus between science and security is constructed (and reconstructed) through certain techniques of government that integrate a diversity of practices into a governable problem and structure science-security relations (cf. Huysmans 2006). The next chapter will seek to describe some of the main features of this trend and look at the underlying rationalities of this broader move. In order to provide more concrete insight into the construction of life science as a security concern, this research focuses also on concrete empirical sites in which the ban on biological weapons is interpreted and implemented into practice and which thus exemplify how specific techniques of governing dual-use are developed.

Yet what do we mean when we talk about ‘science’ in this context? Science studies, which refer to history, sociology and philosophy of science together, have since 1970s adopted a social constructivist approach to conceptualizing science, the key object of their interest. In this view, science is a *social activity*, a field of practice, that is embedded in broader social and political structures and systems of meaning (Pickering 1992). From a sociological perspective, science can be understood as a social field with its own norms, rules, hierarchies, as well as conflicts – ‘struggles for intellectual legitimation’ (Swartz 1997: 250).

As any other field, it is reproduced through practices, including knowledgeable practices. In fact, scientific knowledge is so deeply connected with the context in which it produced, it becomes primarily "a practical ability embodied in skilful behaviour, rather than an intellectual capacity" (Gerrans 2005: 53). Rejecting the idea that knowledge is an entity on its own, detached from agents' experience and the social sphere in which they operate, scientific knowledge is conceptualized as a set of field-specific practices.

A prominent strand of research in science studies is based on the idea that the status of science and policy and the boundaries between these two domains are not fixed, but rather subject to change – so-called *boundary work* (Gieryn 1983, 1999). Drawing on the notion of science as practice, Gieryn asserts that science is delineated from other intellectual activities and non-science in general through the rhetorical usage of professional scientific ideologies:

> "Boundary-work describes an ideological style found in scientists' attempts to create a public image for science by contrasting it favorably to non-scientific intellectual or technical activities. (…) Thus, "science" is no single thing: its boundaries are drawn and redrawn in flexible, historically changing and sometimes ambiguous ways (Gieryn 1983: 781).

Through boundary work, scientists distinguish between scientific and non-scientific activities, between "legitimate and illegitimate inputs into esoteric scientific knowledge-making" (Collins and Evans 2002: 246). Gieryn advances the basic constructivist argument about concepts, that 'science is what we make of it', by drawing on cultural understanding of science and on spatial metaphors:

> Science becomes a "cultural space": it is made locatable (and interpretable) by spatial segregations that highlight contrasts to other kinds of knowledge, fact-making methods, and expertise; boundaries define insiders and outsiders, while labeled landmarks give distinctive illustrations of each side; scale is enlarged to show internal differentiations within science or reduced to make science a single spot . . . coordinates tell us where we end up when we move away from science in various directions – toward faith to the East perhaps, politics to the West, techno-wonders to the South, error and ignorance to the North. We arrive at meaningful understandings of science (its products, people, practices, and potentials) by seeing or hearing about its place on a map, and we form images of its contents and

> capabilities by remembering where it has been located in spatial relation to places it is not. (Gieryn 1999: 10-11)

The effects of delineating the cultural boundaries of science may be several: from *expulsion*, which is characterized by a contest between different authoritative visions of science, to an *expansion* of scientific authority to a new terrain, and the *protection of the autonomy* of science, typically from private actors or governmental control (Gieryn 1999: 15-17).[9] To understand the boundary work in more detail, science scholars have introduced further concepts and analytical tools to study the boundary work of science – including, for instance, the analysis of boundary organization (Guston 1999), and so on.[10]

Yet how are the constructivist, practice-oriented understanding of science and the concept of boundary work in particular useful for the analysis of changing governance of security? This research takes its inspiration from the abovementioned approaches to science studies in three respects.

First, the concept of boundary work encourages us to rethink the social processes related to (in)securitization. If security is a technique of government, which contributes to ordering of social practices and thus reconfiguring power relations in the society, what does it mean to introduce security logic in new contexts? When approaching securitization as a type of boundary work – and boundary work as a specific mechanism of securitization – we could argue that securitization does not only change the meaning of a specific problem or phenomena, but also contributes to re-structuring the boundaries of security and other systems of meaning and domains of practice.

Second, since science is defined by practices, then the way scientific practices are regulated matter for the functioning of the scientific field and the dynamics of knowledge production. As Karin Knorr Cetina asserts, "understanding knowledge societies will have to include understanding knowledge practices" (2001: 186). In line with this logic, it can be argued that

[9] For a critique of the relational or networked conceptualization of science and expertise, see e.g. Collins and Evans (2002).

[10] Star and Griesemer (1989) introduced the concept of 'boundary object' in sociology, which however refers to objects used differently by different communities and does not relate directly to the notion of boundary work.

to comprehend the broader changes in the understanding of science-security relations, it is useful to look at the governance of concrete practices. Scientific research and the process of knowledge production and circulation are defined by a broad set of practices, which include, among else, education, hiring, training, funding, conduct of research, material transfer, scientific collaboration, peer-review, publication, etc. In the attempt to 'secure' research, these practices become in themselves an object of security governance, with the result of new regulatory mechanisms being introduced and new actors getting involved in the process of knowledge production and dissemination in science (see e.g. Williams-Jones et al. 2013: 11-12).

Third, if experts are understood as intermediaries who link the domains of science and policy, then the politics of expertise and expert practices become a crucial object of analysis for studying the broader changes in the science-security relations. Experts not only cross the boundary and translate knowledge from one domain to another, but they may be also involved in the governance of this boundary. As such, focusing on experts may be seen as a way to understand how the boundary between science and (security) policy is practiced and what power hierarchies and rationalities are embedded in it. In brief, the changing practices of expertise then may indicate broader changes related to redrawing the boundary of science and policy.

In sum, to understand securitization as a potential boundary mechanism, through which science-security relations are shaped moves our attention to how this boundary is envisioned, performed, and governed, and what regimes of knowledge are created through the practices evolved at the boundary of security. This approach enables us to see the security-driven changes in the governance of science from a more complex perspective, involving multiple actors, routes, and sites of securitization, and thus also understand the broader implications of this process.

Analysing the boundaries of security

This section develops a more specific analytical framework that captures the 'boundary work' of securitization. The framework draws an inspiration from the concept of boundary work, which was introduced in the prior section and which has been widely used in the sociology of science. However, it departs from the traditional sociological reading of

boundary work as a process of drawing clear lines between social spheres (such as science and politics) and focuses instead on the construction of 'thick boundaries' that mark the overlaps between different fields and which are related to the process of (in)securitization.

In line with the sociological reading of securitization (Balzacq 2011b, Balzacq et al. 2010), securitization can be understood as a result of dispersed social practices, which have transformative effect on political governance. This approach directs the analyst' attention towards the production and manifestation of security practices and the effect of these practices on social relations. When conceptualizing securitization in these terms, we may argue that securitization is often related to the interaction between different spheres of practices – typically, between the practices of security professionals and practices characterizing e.g. the politics of environmental protection, public health, migration etc. As such, securitization may be seen as creating new overlaps between different spheres of social practices, pushing towards the hybridization of these practices, and leading to the construction of new rules for the functioning of this boundary zone. Metaphorically, this process may be perceived as the construction of new 'thick boundaries' between overlapping spheres, or as the creation of 'spaces between fields' (Eyal 2013), through which specific social spheres start to interact with each other in a new way. In this reading, *boundary* signifies the overlapping and interacting network of practices and discourses between distinct fields, which are characterized by being new, unexploited and unregulated.

Adopting this perspective in critical security study shifts out attention to new questions and new objects of inquiry. How is the new boundary performed? Through what techniques of government, through what technologies? Which actors take part in the practices at the new boundary and how do their roles change during the transformation of political governance? What regimes of knowledge are created through the practices produced in the overlapping spheres, i.e. at the boundary? As border studies show, how boundaries are enacted can be seen as indicative of the broader structure of social relations that in which the boundaries are situated (e.g. Johnson et al. 2011).

Studying the processes of (in)securitization from this perspective means to explore how the boundaries of security are redrawn with an effect on concepts, rationalities, practices and techniques of security governance. Based on the notion of boundary, I discuss how the

emerging security concepts, practices, and structures can be systematically studied with the help of the 'thinking tools' employed from critical social theory. Specifically, I argue that the social dynamic resulting from *bordering*, *hybridization*, and *stabilization* illustrates the construction (and reconstruction) of security boundaries and demonstrates thus the boundary work related to security. The proposed framework is based on three mutually reinforcing mechanisms (see and Table 1). As the references to the original securitization framework developed by the Copenhagen School indicate, the three mechanisms are conceptualized as three following stages. Therefore, the stabilization can be thought of as the highest stage of the boundary work of securitization, which is reached only after bordering and hybridization.[12]

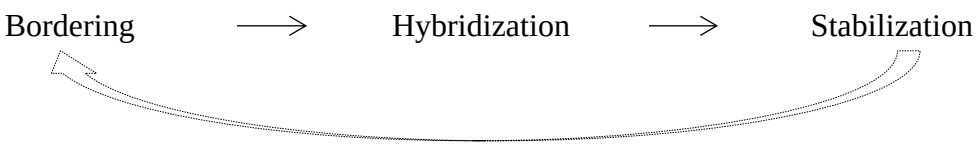

Figure 1: Boundary mechanisms of securitization

The first mechanism is termed *bordering* and it is based on challenging the established boundaries between issue areas and/or social spheres and formulating and enacting new connections and hierarchies between them. In the terminology of the securitization theory, bordering may be understood as a securitizing move made by a securitizing actor who pronounced some issue as an extraordinary threat to a valued referent object. However, this conceptualization is seen too narrow, since it restricts securitization to discursively-driven processes of framing policy issues as security problems. Drawing on the sociological approaches to securitization, which show that the construction of a certain phenomenon or an issue area as matter of insecurity may be in fact triggered by structural factors, the notion of bordering seeks to cover a broader scope of aspects that trigger the setting in motion of the three mechanisms. Bordering shall thus e.g. refer to situations when a new security

[12] This perspective comes close to reading securitization as a causal mechanism (Guzzini 2011).

problem, an unregulated area is identified and/ or when certain issues related to security governance start be connected in a new way due to different factors. As such, bordering can be characterized as a destabilization of established social practices and rationalities of security. This destabilization is accompanied by a subsequent search for new 'boundaries' that connect previously separate – or differently structured – systems of meaning, such as science and security politics. Drawing on Bourdieusian topographic thinking on social fields, bordering can be seen as an initial stage of two (or potentially more) fields that start to be connected in a new way or spill over into one another, as phrased by Hirsch (2009). Finally, this mechanism also potentially creates new hierarchies between the fields and thus make possible which 'edge' would be more expanding into the other field and which logic would inform the way the new issue would be interpreted and dealt with practically.

Mechanism	Description	Effect
Bordering	Challenging the established boundaries between issue areas and/or social spheres, formulating and enacting new connections and hierarchies	De-stabilizing the meaning of specific issues, practices, and institutions
Hybridization	Expanding the scope of security regulation, translating and mingling of discourses and practices from one sphere to another (potentially two-directional dynamics)	Interaction, transformation, and re-ordering of practices, generating new meaning of concepts, changing social roles of securitization agents
Stabilization	Stabilization of new social arrangements, embedding new security discourse in social practices, producing new norms and rules for governing a new area	Institutionalization, emerging regulation, creating new opportunities for actors to govern the boundary

Table 1: Conceptualizing the boundary mechanisms of securitization

The second mechanism, *hybridization*, seeks to capture a potentially broad scope of activities through which security images and practices expand to a different social sphere and vice versa and thus make possible the re-ordering of social practices. In other words,

hybridization highlights the transformative process defined by the interaction, transformation, and re-ordering of social practices, which enables the generation of new concepts, rules, norms, connections, and power hierarchies as a part of the process of (in)securitization. With regard to the framework for securitization analysis, this mechanism seeks to open up questions about the contextualization of security frames, the construction of security measures, their role in redefining what is normal and what is exceptional, as well as about the changing role of securitization agents.

This conceptualization departs from the notion of security translation used in security studies to denote the process of localizing threat texts into new contexts (Stritzel 2014), yet it is again made more flexible to accommodate non-discursive processes of securitization characterized by the involvement of more actors, routes and practices of (in)securitization. Besides, the concept of hybridization explicitly highlights that these transformative processes may be seen as not only one-directional, but potentially also two-directional. As such, it is not only security discourse and practice that 'expands' to other spheres, but also the other way round - they actually merge with the other field's discourses and practices, translate to this field, and may contribute to changing its discourse, practices, and structures (Balzacq 2011c). The process thus entails certain degree of transformation of meaning and practice, involving also the transformation of the boundary, its meaning and the practice of its governance. This conceptualization again reacts to prior research in critical security studies focused e.g. on the construction of new security assemblages, which shows that not only do security discourses and practices travel to new spheres, but also that the very 'logic of security' changes in the interaction with different concepts and techniques of government. It is in this context that, for instance, Elbe (2012) speaks about the medicalization of security related to the insecuritization of public health issues, Trombetta (2008) about the changes in the practices of security resulting from the securitization of environment, and Abrahamsen and Williams (2011) about the reconfigured performance of security governance connected to the rise of private security actors.

Using again the spatial metaphor, hybridization may be imagined as the expansion or encroachment of the edge of one field into another, which enables some actors to take over potentially new agendas and policies. This perspective can be related to the discussion by Adler and Pouliot (2011: 18-21), who argue that the interaction of different sets of practices

is one possible driver behind social change. Concretely, they recognize four types of relationships among practices: parallel existence, symbiosis, hybridization, and subordination. From the perspective of securitization theory, more significant are the latter two: via hybridization, "interacting practices combine and form a new type of competent performance", rearranging thus elements of old practices, while via subordination, "practices are variously positioned in a hierarchical relationship" (Adler and Pouliot 2011: 20). Even though these categories might be difficult to distinguish empirically, especially due to presumed complexity of relationships among practices, they are thought of as a good starting point for further discussion on how practices 'produce ordering and hierarchization' (cf. Leander 2010) in the context of hybridization.

The third mechanism, *stabilization*, refers to the stabilization of new social arrangements, embedding new security discourse in social practices, producing new norms and rules for governing a new area. For the Copenhagen School, a successful securitization is defined by the adoption of exceptional measures (or making this move possible), which emphasises the role of certain formalization and institutionalization of change in the problematization of security. The concept of stabilization is again more open to the possible effects of securitization and draws explicitly on the notion of change defined by Bruno Latour, who suggests that the emergence of new practices and their institutionalization are a way to stabilize new structures of relations between actors, discourses and practices (Latour 2005). Hönke (2013: 11) asserts that "governance refers to the intentional ordering of practices that affect a collective or social group" and the mechanism of stabilization may be seen as a temporary fix of such re-ordering, which is reflected in a new model of governance. The dynamic was in different words described for instance in the research Bigo (2008), who analysed the changing field of security professionals in Europe and pointed out that a new system of governance has emerged from linking previously separate fields that brought together different logics of action and resulted in the mix of liberal and illiberal practices. Similarly, Hirsch (2009) speaks of stabilizing the 'zone of interaction' between different social systems. Metaphorically, stabilization symbolizes the colonization of the new, unexplored lands in the American West and the way the life at the frontier was regulated. There, new challenges, new lands, and new intellectual endeavours were ripe for human exploitation and development. As such, the previously 'lawless area' is identified as an

object that needs to be regulated and thus new actors, institutions, and systems of regulation may arise through which the boundary is governed, secured, and consequently stabilized.

Research design of the study

Building on the theoretical principles and the analytical framework outlined in this chapter, the research concretely proceeds in three steps, which are summarized in .

Object of analysis	Concepts	Data	Methods
How can the current dual-use dilemma be situated historically and conceptually?			
Political and expert discourse on dual-use research and its regulation	Securitization, circulation	Secondary literature, sampled policy documents	Discourse and policy analysis
How do the attempts to govern biosecurity and dual-use research in life sciences affect the relations between science and security?			
Practices at the boundary of science-security fields related to biosecurity and the regulation of dual-use research in life sciences	Practices, boundary mechanisms of securitization	Policy documents, meeting reports, educational materials, interviews, field notes, secondary literature	Discourse and policy analysis, interviews, participant observation
What are the implications of this science-security nexus for the politics of (in)security?			
Techniques of governing dual-use research and biosecurity, practices at the boundary of scientific and security spheres	Securitization, responsibilization, ethicalization	Findings from the prior analysis	Interpretive analysis

Table 2: Research design

The first part of the research is interested in situating historically and conceptually the construction of the dual-use dilemma in life sciences. For that purpose, I briefly historicize the notion of dual-use and then look at the key features of the contemporary discourse on dual-use in life sciences. Specifically, I explore the rationalities in which this discourse is embedded and the type of techniques for governing dual-use that are being developed and implemented. In this regard, I focus especially on a powerful boundary organization in the United States, the National Scientific Advisory Board for Biosecurity, which pioneers these activities and promotes their internationalization. By analysing how knowledge practices are transformed and what vision of responsibility, ethics, and security these changes are embedded in, it is possible to uncover how different types of regulation and political powers come together and how the governed subjects are constructed. Besides, to focus on how scientific practices are envisioned and how their transformation is justified instead of studying political discourse on dual-use research (only) is in line with the proclaimed necessity to shift the burden of security regulation and responsibility to scientists themselves. In other words, since the emerging governance of life sciences links the state-centric, top-down logic of security with the ethics-based, networked system of science (self-)regulation, it is productive to look at how scientific practices are regulated and how they embody the vision of science-security relations.

The second part of the research is described in Chapters 4 and 5 and engages in the mapping of science-security boundaries and their transformations related to the securitization of biological threats and risks. The analysis of these transformative processes will follow the three-stage model outlined above. Concretely, the study first looks at how the security framing of biological risks and the regulation of scientific research in life sciences plays out in the destabilization of the established governance structures and practices and contributes to the bordering of science and security politics. Then, it scrutinizes the hybridization of social and political practices which make the issues of biosecurity and dual-use governable through the emergence of new techniques of government and the construction and recognition of new type of expertise that bridges the boundary between science and security realm. The analysis also looks at through what practices is the network of actors upheld, by which practices is the network ordered, and whether we can observe strengthening of internal homogeneity of regulatory approach to the governance of dual-use research among the

relevant actors. The analysis of these aspects shall shed light on what type of science-security relations the emerging practices and orders create and to what extent they are embedded in social practices and thus stabilized.

Concretely, the logic of the case studies is based on so-called 'site ontology', which is a praxiographic approach taking 'site' (i.e. certain place composed of practices) as the starting point for an analysis (Bueger 2014b). This approach is characterized by identifying and studying in detail an empirically relevant site which is a natural 'centre of calculation' organizing different types of flows in the Latourian sense (Latour 1987). Centres of calculation can be seen as sites "where information is being created, collected, assembled, transcribed, transported to, simplified and juxtaposed in a single location, where everything that is relevant can be seen" (Law 2003: 8).[13] Bueger (2014b: 13) introduces this concept to the critical security methods toolbox and explains that the aim of site strategy is to "focus attention on centres of calculation and oligoptica as those sites where structure is made and ordering practices take place." This research draws an inspiration from the very understanding of certain empirical sites as being key 'nodal points' for a broader set of flows and exemplifying thus platforms where the transformation of social practices can more easily translate to other contexts due to the social networks in which this site is situated. Nonetheless, it does not aim to engage in a typically Latourian type of research, which would follow the 'flat ontology' and pursue a strictly empirically-driven research mapping of the structure of relations and flows among the key entities under analysis (Latour 2005).

This research works with different types of data and thus a brief explanation on how these sources have been selected and analysed should be provided. The empirical research started with a broader interest in the transforming political governance of public health, which was then narrowed down to the inquiry into the new connections between public health and the

[13] For Latour, the model for developing the concept was originally a scientific laboratory. In his research, he showed that laboratory is a place where scientific concepts are developed, objects, subjects and tools of scientific inquiry are defined and constructed as a part of a web of relations between the researcher, society, and the 'nature' (Latour 1987). To expand this notion to other sites where relations are created and maintained, Latour developed the concept of *oligopticon*. Oligopticon refer to "sites where literal and not simply metaphorical *calculations* are made possible by the mathematical or at least arithmetic format of the documents being brought back and forth" (Latour 2005: 181, emphasis in original).

changes towards the international politics of biological disarmament. It is in this context that I became familiar with the growing scholarly literature and policy-oriented research about the politics of biosecurity and especially about dual-use research in life sciences. Coming from the perspective of critical security studies, I found the security framing of scientific research that was present in this literature as well as the links between the research and innovations in life sciences, disarmament, 'new threats' and terrorism particularly intriguing. This nurtured my interest in, on the one hand, providing a critical perspective on this politics as a whole, its narratives, underlying assumptions about the nature of security, as well as policies and practices proposed to 'secure' dual-use research in life sciences, and one the one hand, exploring whether, how and with what effect this politics resonates 'on the ground', in concrete empirical settings.

Towards the former goal, I have sought to explore what could be called dominant Western expert and political discourse on biosecurity and dual-use research in life sciences. Specifically, I have started to look at the scholarly literature from STS, IR and political science which deals with biosecurity and the dangers of life sciences. Apart from rather marginal exceptions, these works are often related to political advisory and consultancy, as they seek to provide recommendation on how these issues are to be dealt with politically. Many authors of these works also serve as internationally recognized experts, associated with NGOs, which take an active part in the meetings of the biological weapons regime and develop their own projects towards improving the implementation of the BWC and educating students and scientists about biosecurity and dual-use, as will be further discussed. To be more concrete, these works include monographs and edited volumes (e.g. Fidler and Gostin 2008, Rappert and Gould 2009, Ryan and Glarum 2008, Wenger and Wollenmann 2007) as well as articles published in scholarly journals such as *Biosecurity and Bioterrorism*, *The Bulletin of the Atomic Scientists*, *International Security*, *BioSocieties*, *Science and Public Policy* etc. I have expanded this corpus of data by tracing the explicit references in these works to policy sources and other scholarly literature and then I have specifically focused on the empirical context in which this politics is perhaps most developed so far – the US policy towards dual-use research in life sciences.

The latter part of the research is focused on studying social practices related to the politics of biosecurity and their transformation and interpretation. This part of the study is also based

on data whose generation has evolved during the course of the research, without pre-defined limits of the empirical analysis. This holds especially for the 'local' (Czech) case, which draws on a very empirically-driven research. In the Czech case, neither biological disarmament, nor the risks of life sciences and science governance belong to issues that would be given attention by media or political elites in the public discourse. The issue area is seen as purely 'technical' and is shaped by actors from the sphere of state bureaucracy. Therefore, the key part of the research in this context relies on interviews with actors from the sphere of non-proliferation bureaucracy, foreign policy bureaucracy, as well as scientists and public health officials. The field research evolved from background research on the institutions, legislation and regulation, educational materials and history of the life sciences and the Czech policy towards biological disarmament to mapping the structure of relations among the actors and institutions and studying the social practices in the field through interviews and participant observation. Especially the interviews helped me understand the nature of interactions among the actors and institutions and thus define the boundaries of the field. In the analysis of the BWC regime, the methodological process is similar, with the exception that the empirical site is delimited by the actors taking part in the BWC meetings and conferences, from the diplomatic and bureaucratic representatives of State Parties, to the representatives of NGOs, scientific community, private sphere, and UN bureaucrats. In both cases, though, an important limit of the empirical analysis has been the access to the interviewees. For instance, during the BWC field research, only a very limited number of actors representing non-Western/ non-European states were willing to take part in the research.

As already outlined, the analysis will specifically focus on two cases, empirical sites in which the ban on biological weapons is interpreted and implemented into practice – first, the international biological weapons regime, and second, the field of non-proliferation professionals in the Czech Republic. The case studies shall demonstrate how the rationalities and practices of biosecurity politics are reflected in concrete empirical contexts and with what effect on the structure of relations between science and security politics. The motivation for the case selection can be explained with reference to several reasons. As the chapter 3 will show, the (in)securitization of life sciences and the rise of security practices focused on the management of biological risks and threats are so far mostly driven in the US

context. The US government is most active in dealing with biosecurity politically and the transformation of scientific practices underlined by the attempts to secure life sciences is also most developed in the field of life sciences in the United States. However, the thesis seeks to go beyond the sole focus on the Unites States and looks rather at whether, how and with what effects the politics of biosecurity resonates in different settings. Such as so many other security issues nowadays, the arguments about biological threats and risks are usually supported by reference to the globalized circulations of people, materials and technologies that are related to tourism, trade, academic mobility and so forth. The reference to globalization is thus unequivocally linked with the call for *global* solution, which begs the question of whether and how such calls succeed in mobilizing the broader international audience and whether and how the biosecurity practices translate to local contexts and affect the structure of relations between science and security politics. The two case studies from the BWC and the Czech environment therefore exemplify the resonance of biosecurity in the context of a 'global' and a 'local' governance. However, the study shall not be read as a comparative analysis in the traditional sense. In line with the logic of interpretive design, as discussed at the beginning of this chapter, the aim of this research is to show the multiplicity of models, sites and actors that are involved in the security governance of life sciences rather than to compare the cases and draw some generalizing conclusions from the particular findings.

The choice of the biological weapons regime as a case has been very straight-forward, since the BWC regime has dealt with the agenda of biological disarmament for a long time and, due to its almost universal membership, it represents a prime example of an international institution delegated with the task of designing norms and rules for legitimate and illegitimate handling of biological agents and toxins.[14] The Czech case shall provide a perspective on how the governance of biosecurity and dual-use research in life sciences look like in a specific national context. However, most studies that focus on this level do so via studying the policies of biosecurity in either the United States and other Western states,

[14] The choice of Interpol, World Health Organization or some international scientific organization may also be possible in this regard, yet the traditional security agenda related to biological weapons is strongest pursued in the BWC regime and the BWC is therefore seen as a best case for studying the transformations of science-security relations from a 'global' perspective.

which are seen as the leaders in this policy realm, or, on the contrary, 'beyond the West' – in states that are seen as typical recipients of international norms or as somehow special in the international comparison, e.g. for their history or experience with biological weapons (Huang 2011, Rappert and Gould 2009, Smithson 2007). States like the Czech Republic thus receive relatively little attention in this context – both politically as well as academically. However, what happens in states that are neither leaders in designing biosecurity practices, nor recipients of these new policies and practices? How does the securitization of life sciences play out there?

Albeit the findings – especially from a single case study from such context – should not be exaggerated, they may give us a hint of how the politics of biosecurity designed in the post-socialist security environment look like and what rationalities and governmental techniques define it. Another advantage of this case selection is that the politics of biosecurity in this specific context is not made or implemented with a direct assistance of international organizations, global NGOs or internationally recognized experts – it is conducted by local actors. The issue of foreign/ international influence on the local arrangements and practices is thus implicit and exploring it is a part of the research. Further, the relevance of the Czech case can also be supported by the role of life sciences in the Czech Republic – in fact, there is a strong tradition of biological, chemical and medical sciences, and both public and private research of this type are currently given a lot of attention and funding by the Czech government as well as the EU. As such, the potential for politicizing and securitizing the dangers of biological research is certainly present in this context. On a more practical level, the obvious advantage of studying this case is the accessibility of the object of study to the

researcher, who lives in the Czech Republic, which consequently enables an easier access to the field. [15]

The third part of the research is devoted to discussing the findings from the empirical study and drawing conclusions from them regarding the effects of the changing approach to biosecurity and dual-use to the politics of security and insecurity. The Chapter 6, which represents this part of the research, does so by engaging in an interpretive analysis based on concepts from critical theory and critical security studies and thus provides a theoretically-informed commentary to the findings.

A few reflections on wearing and not wearing 'the securitization hat'

"What are the costs of wearing a hat or not wearing a hat?", asks Neal (2013: 42) and explains that by 'hat' he means a scholar's role, identity, and more specifically, a specific theory or discipline that s/he is associated with. He discusses the possible constraining effects that wearing a theory hat may have on one's research and, in a similar vein as Aradau, Huysmans, et al. (2014b), argues for a greater role of empirics and methodological experimentation in research. This chapter has sought to explain what theoretical tools it works with and why they might be useful for studying the science-security nexus related to the dual-use dilemma, but this final sub-section shall reflect more explicitly on the theoretical and methodological choices made in this research.

As discussed above, this study is based on a constructivist approach to security, according to which the meaning and practices of security are seen as contextual and subject to change, especially through processes that the Copenhagen School calls securitization. Securitization brings about many consequences, from closing off democratic deliberation, empowering – or downplaying – the role of specific actors, to shifting the meaning of social and political issues. Nevertheless, securitization does not only occur in the realm of high-politics, but to

[15] An advantage of the Czech case is that the politics of biosecurity in this specific context is not created or implemented with a direct assistance of international organizations, globally active NGOs or internationally recognized experts – it is conducted by local actors.
Another interesting perspective that might be worth researching, apart from the 'local' and 'global', is regional, i.e. how regional organizations – such as the EU – practice biosecurity and how it shapes the structure of relations between science and security governance in this particular context.

great extent also in other spheres, where it may take different forms. With the securitization of new social and political issues, more and more actors from diverse fields provide their expertise in questions related to 'new threats and risks' and their management, and thus become indirectly involved in security governance. How these experts shape the politics of security and insecurity has become one of the questions that current critical security studies as well as this research focus on.

This work is to great extent inspired by securitization studies, but in many respects it departs from or expands the original theoretical and analytical framework of the Copenhagen School. In line with securitization theory, this study deals with a *change in the problematization of security*, which can be characterized as linking 'traditional' security concerns about national security and the threat of WMD with 'newer' issues of techno-scientific progress, pandemics, terrorism and so forth. Whether or not this change takes place is not the question this research would ask, though. Even a brief inquiry into the official discourse on biological weapons in the BWC or in the United States, for instance, provides many examples of changes in this regard. What is subject of interest for this study, however, is the specific dynamic of this change – how it shapes the meaning of broader concepts and categories (such as science, security, responsibility), how it affects the governmental techniques related to the regulation of science and technology, whom these changes empower and whom they marginalize, and what potential for contesting this problematization of security is there.

By doing so, the research departs from the threat-centric framework for analysis presented by the Copenhagen School, which focuses on the changing meaning of specific (political) issues and its shifting status as a non-politicized, politicized, or securitized issue. Albeit using the some of the conceptual vocabulary presented in securitization theory, this study adopts a broader perspective on constructing (in)security. In fact, biosecurity – perhaps similarly to cybersecurity[16] – is a prime example of a very broad agenda that includes issues as diverse as the ban of biological weapons, managing the risks of bioterrorism and bio-crimes, regulating dual-use research, and for many also dealing with some public health problems, epidemics and pandemics of infectious diseases etc. The threat-centric model of

[16] For a similar discussion on the notion of cybersecurity, see e.g. Dunn Cavelty (2008, 2013).

analysis would provide only a limited perspective on these issues and would thus not be very suitable for exploring this complicated empirical landscape. On these grounds, I draw on the sociology-inspired reformulation of (in)securitization, which highlights less the exceptional nature of security and focuses more on the multiple sources of the change in the problematization of security and the contested vision of the political that is related to the practices of (in)securitization.

Obviously, this is not to argue that the analytical tools outlined above have no flaws. In order to comply with the standards of the discipline as well as to assist the researcher in gathering and making sense of the data, the research must be based on a certain understanding of what is the object of the study, what is puzzling about it and why it is relevant for a broader field of scholarly inquiry. The initial *framing* of the research certainly affects how the research is conducted and what findings can be drawn from it. The title of this chapter refers to the mapping of science-security boundaries and further talks about the construction and re-construction of these boundaries and the rise of actors who govern the boundary. Yet what does this particular research framing do? From what perspective does it allow us to observe the world and what data and findings does it help us generate? First, it emphasises that the securitization of science is not a one-directional process of translating 'security practices' to the realm of science, but more complex dynamic that shapes the meanings and practices associated both with science as well as security. Second, it highlights that the research looks specifically at the imaginaries and practices of the science-security boundary: what is the role of scientists in the society, how shall science be regulated and by whom, who decides on these issues and shapes the practices of science governance etc. Third, it looks at the changing problematization of science-security relations as a three-stage process that may be distinguished according to the type of structuring effects it brings about.

3 Dual-use dilemma and the rise of knowledge governance

The prior chapters sought to highlight that science can be seen as a specific social sphere characterized by certain norms, rules, and practices. To understand science as a social activity rather than as a truth-producing machine has many implications for the study of science in the society and politics, though. Primarily, it is a way to acknowledge that science – and consequently the process of knowledge production – operates in certain social context and therefore, it is constantly shaped by various influences coming from outside of the very scientific field. Of course, as the STS reminds us, science also constantly affects the functioning of the society, through steps such as the way we measure, categorize, classify, and ultimately deal with certain phenomena. In this perspective, the governance of science may be seen as a result of multiple emergent causal paths that shape the meanings, practices, as well as social arrangements of science.

Thinking on values and vulnerabilities is undoubtedly related to the practice of science. Diverse mechanisms through which desired and undesired developments are distinguished and regulated have been at the heart of scientific practice since its very beginning, reflecting precisely the broader understanding of social values and vulnerabilities. Along similar lines, the present study seeks to emphasise that the politics of dual-use research is actually situated in this larger context and related to the rationalities and practices of contemporary security governance. To better understand how the current dual-use dilemma is governed and how it has been made governable, it is important to look at what logic of security and what notion of the political it is embedded in.

The aims of this chapter are three-fold: first, to briefly historicize the notion of dual-use and point out the changing meaning of the concept, second, to examine the current narrative on dual-use dilemma and situate it in broader concerns about the rise of science and technology, and third, to approach the problem of dual use from the perspective of critical theory and propose a new conceptualization of the issue based on the Foucauldian notion of circulatory governance. Based on this analysis, the chapter will argue that the contemporary dual-use dilemma in life sciences can be seen as a result of politicization of scientific progress and securitization of its potential ‘dark side’. A prominent feature of the dual-use dilemma is the

debate on the governability of scientific knowledge, which will be discussed in the context of knowledge governance in contemporary societies and on concrete examples of the emerging US security regulation of life sciences.

A brief history of dual-use

As explained in the first chapter, the idea that scientific innovations and technological developments may be used not only for good, but also for causing harm, has had a long history. The very concept of 'dual-use' reflects these changing concerns related to the use and misuse of research and technology well. However, the concept does not have a stable meaning and its use in the political and legal discourse is highly inconsistent. In particular, different interpretations of the concept draw on diverse meaning of 'use': civilian vs. military use, benevolent vs. malevolent use, peaceful vs. non-peaceful use, legitimate vs. illegitimate use, and something that may be termed as use for 'good military and good civilian purpose' (Rath et al. 2014). Therefore, as McLeish (2007: 192) argues, the term may be seen to describe "the ability of any technology to be put to a purpose other than that which it was originally intended for." Of course, though, different conceptualizations of dual-use also create different political subjects and make possible the use of different governmental techniques and practices.

Perhaps the first known author who recognized that science and scientific knowledge may be used for different purposes, some of which may clash with the intentions of their original creators, was Francis Bacon. In the age of geographical discoveries and colonial expansion, European philosophers dreamt of new lands to which they may escape from religious wars and intolerance in the old continent and where they may live in free societies. English philosopher and scientist Francis Bacon, representing one of these thinkers, elaborated on the role of science in this ideal society and expressed thus his vison of human discovery and knowledge. Bacon is best known for his works on methodology of science, in which he argued for inductive reasoning and empirical research, but his writings on how science shall be organized, funded, and governed profoundly influenced the European science and inspired future generations of philosophers and well as practitioners of science. Prominently, Bacon, who is attributed the phrase *ipsa scientia potestas est* [knowledge itself is power], is

known for promoting the progressivist vision of science and equating scientific progress with social progress, which was rather novel approach to science.

In his utopian novel *New Atlantis*, Bacon writes about a mythical land called Bensalem, in which science shall ultimately bring new knowledge for the betterment of the society. For that reason, he suggests that science is conducted and organized in a completely new way, in order to incorporate more experimental and analytical methods. Interestingly, he also touches upon the issue of scientific openness and secrecy, when he writes about the scientific community in the New Atlantis:

> we have consultations, which of the inventions and experiences which we have discovered shall be published, and which not; and take all an oath of secrecy for the concealing of those which we think fit to keep secret; though some of those we do reveal sometime to the State, and some not. (Bacon 1626)

As such, Bacon acknowledges the limits of scientific openness in the name of 'greater good' and highlights the role of scientific self-governance.

In fact, the history of science gives many examples of how knowledge production was balanced against other values and interests and how secrecy was practiced in science (Galison 2004, Reppy 1999). However, scientific secrecy has not been always motivated by security concerns. For instance, scientific secrecy was historically linked with the question of ownership, or what we would nowadays understand as the problem of intellectual property (Long 2001).[17]

The very concept of dual-use and the related policies od dual-use are much younger, though. According to Reppy (2006: 1), the term of dual-use is actually "rooted in the dichotomies of the Cold War." The first references to the notion of dual-use emerged in the 1940s as the United States sought to rearrange its export control policy towards the Soviet Union. The commercial opportunities of technology transfer started to be weighed against the dangers of spreading dual-use exports to the enemy. In is in this context that the United States initiated the establishment of Coordinating Committee for Multilateral Export Controls

[17] For further works dealing with the practice of secrecy in science that is related to the governance of biological weapons, see for instance Wright and Wallace (2002) and Balmer (2013).

(CoCom), which was a Western multilateral organization coordinating export policies and especially the politics of arms embargo towards the countries of the Soviet bloc. CoCom specifically oversaw a list of items that required licencing in order to be exported to the Soviet bloc.

By 1980s, the concept gained additional meaning. Driven by the attempts to increase competitiveness of the US products on the international markets, the debate turned on how to create better conditions for commercial technologies to be re-used for military purposes – and other way round. In order to bolster the opportunities for military sector to re-use the technologies developed in civilian research and industry, the production of dual-use technologies started to be actively supported, among else, through stimulating "government-industry collaboration at the early, 'pre-competitive,' research stage" and "technology diffusion between government and industrial research centers" (Reppy 2006: 2-3).

In the changing political context after the end of the Cold War, the practice of dual-use research and development and the so-called 'dual-use relationship' between military and commercial sectors in this regard started to be debated by scholars and practitioners alike (Alic et al. 1992, Cowan and Foray 1995, Molas-Gallart 1997). With the increasing use of the dual-use concept in the context of non-proliferation and export controls, the negative connotations have prevailed (Atlas and Dando 2006). However, in the new strategic environment, it has become more and difficult to uphold the black-and-white categories such as dual-use, which were based on a clear perception of the friendly vs. enemy states and military vs. civilian technologies.

In the words of Rath et al. (2014: 772), the conceptualization of dual-use has changed dramatically with the transformations of security policies after 9/11, when "multilateral export regimes went beyond the traditional civilian versus military dichotomy (and state proliferation concerns) to also include antiterrorism provisions (and non-state-actors proliferation concerns)." Concretely, the contemporary interpretation of dual-use focuses increasingly on "non-military end-uses and end-users of concern" and even "considerations of foreign policy (…), international sanctions and embargoes, and violations of internationally recognized human rights or religious freedom" (Rath et al. 2014: 774).

Constructing the globalized bio(in)security and the dual-use dilemma in life sciences

Currently, the concept of dual-use is dominantly used with regard to life sciences, in which it denotes the dilemma between 'promoting good' while allowing for 'causing harm' – i.e., the problem that some facilities, equipment, agents and knowledge may be used for 'legitimate' research, but also for the development of biological weapons and exploited in bioterrorism or biowarfare (Atlas and Dando 2006, McLeish and Nightingale 2007, Miller and Selgelid 2007, Tucker 2012a, van der Bruggen 2012). However, as Forge (2010: 116) notes, "[t]o classify something as dual use should not simply be to flag that the item *could* have some bad use, that some bad use is in theory possible. (…) The question is how to define dual use so as to restrict its membership." In defining dual-use, what plays a key role are thus contextual factors that shape the underlying notions of threats, risks, fears, and vulnerabilities related to the imaginaries of the potential malign use.

The construction of life sciences as 'dual-use' is closely related to rise of biotechnologies since 1990s, which started to bring more social attention to life sciences in general, as well as to the changes in the dominant security rationalities and the politics of governing terrorism in particular. The link between these aspects was made for instance by Matthew Meselson, a prominent life scientist, who warned his colleagues of the potential misapplication biotechnologies in his address at the annual meeting of the US National Academy of Sciences already in 2000:

> Every major technology—metallurgy, explosives, internal combustion, aviation, electronics, nuclear energy—has been intensively exploited, not only for peaceful purposes but also for hostile ones. Must this also happen with biotechnology, certain to be a dominant technology of the coming century? During the century just begun, as our ability to modify fundamental life processes continues its rapid advance, we will be able not only to devise additional ways to destroy life but will also be able to manipulate it—including the processes of cognition, development, reproduction, and inheritance. A world in which these capabilities are widely employed for hostile purposes would be a world in which the very nature of conflict has radically changed. Therein could lie unprecedented opportunities for violence, coercion, repression, or subjugation (Meselson 2000).

Similar concerns about the rising power of biotechnologies and the potential risks of their misuse for the development of biological weapons were expressed by some scientific experts (Dando 1999, Dennis 2001, Henderson 1999, Tucker and Sands 1999) as well as among security professionals (Department of Defence 1997) already before the 9/11 and the consequent securitization of global terrorism. However, the policy recommendations by the early bio-alarmists mostly emphasised strengthening rather than transforming the system of oversight and focused on restricting the access to dangerous biological agents and their transfer. After the 9/11 attacks, the United States and many other countries responded to these calls and enhanced the regulation of the movement of pathogens.

At the same time, though, more and more attention started to be paid to the character of biological research. Security experts began to point out the expanding scope of research in life sciences that is or can easily become dangerous and could thus be potentially misused by terrorists. What became of particular interest were several scientific publications that apparently presented sensitive information, whose public dissemination started to be perceived as a security concern (see below). In this context, the US government through its *Homeland Security Act of 2002* established a new and rather vague category of 'sensitive but unclassified information' and thus opened a debate on how to secure the production and diffusion of this type of information.

Of crucial importance in this regard was the publication of a report called *Biotechnology Research in an Age of Terrorism* (National Research Council 2004), prepared by the US National Academies. In the summary, the report identifies the dual-use dilemma created in life sciences:

> The great achievements of molecular biology and genetics over the last 50 years have produced advances in agriculture and industrial processes and have revolutionized the practice of medicine. The very technologies that fueled these benefits to society, however, pose a potential risk as well — the possibility that these technologies could also be used to create the next generation of biological weapons. Biotechnology represents a "dual use" dilemma in which the same technologies can be used legitimately for human betterment and misused for bioterrorism. (National Research Council 2004: 1)

In particular, the report focuses on two particular risks of misuse:

> (1) the risk that dangerous agents that are the subject of research will be stolen or diverted for malevolent purposes; and (2) the risk that the research results, knowledge, or techniques could facilitate the creation of "novel" pathogens with unique properties or create entirely new classes of threat agents. (National Research Council 2004: 1)

The report further identified several specific areas of dual-use research in life sciences and called for an increased security oversight in life sciences, while placing a great emphasis on the greater involvement of scientists and their self-governance in conducting research. The principles presented in the report started to be gradually translated to a novel system of governing life sciences in the United States, prepared especially by newly established National Science Advisory Board on Biosecurity (NSABB), which brought together scientific experts and security professionals and in the following years prepared several important regulatory frameworks for securing the production and dissemination of scientific knowledge (see below).

At the same time, though, the report highlighted the globalized nature of biological research and the global circulation of material, technologies, and know-how related to this potentially dangerous research. Therefore, the report emphasises the importance of building new regulatory measures globally and through international consensus:

> Although the focus of the report is on the United States, this country is only one of many pursuing biotechnology research at the highest level. The techniques, reagents, and information that could be used for offensive purposes are readily available and accessible. Moreover, the expertise and know how to use or misuse them is distributed across the globe. Without international consensus and consistent guidelines for overseeing research in advanced biotechnology, limitations on certain types of research in the United States would only impede the progress of biomedical research here and undermine our own national interests. (National Research Council 2004: 2)

However, new policies targeted at the dual-use research in life science have been gradually developed and adopted also in other countries (Rappert and Gould 2009) and promoted by international organizations (e.g. WHO 2005) and scientific associations (e.g. World Medical Association 2003). An important support for the legitimacy of these policies was provided

by the UN Security Council Resolution 1540 (UN 2004), which addressed the issue of WMD non-proliferation and linked this threats with the activity of non-state actors. In order to prevent the misuse of materials and technologies that may be used for the development of WMD by terrorists, the resolutions created new obligations for the states as regards the trade in dual-use items (Bosch and van Ham 2007).

With the increasing attention to the threat of bioterrorism, the debate on balancing opportunities and dangers of dual-use technologies started to affect in an unprecedented way the issues of science policy – and concretely the debate on governing life sciences (McLeish and Nightingale 2007: 1636). This has led to the rise of biosecurity experts, who mediate the knowledge between the field of security and politics. These biosecurity experts nowadays seem to share the idea that life sciences are inherently dual use, since the very same activities and items may be used for research with both 'good' and 'bad' purposes. For instance, as Gronvall states, "life sciences are inherently 'dual use' in that a great deal of the scientific knowledge, materials, and techniques required for legitimate, beneficent biological research could also be used to make a biological weapon" (Gronvall 2012: 73). This dilemma is then seen to influence the possible ways of governing life sciences:

> Bioweapons development cannot be prevented using the same strategies developed to prevent nuclear terrorism, because, unlike highly enriched uranium, the building blocks of biological weapons are globally accessible. Pathogens can be harvested from sick people and animals, found in laboratory freezers, and collected in the natural environment. Like most information on biological research, information on how to find and genetically manipulate pathogens is widely available on the Internet, and training in legitimate life sciences research yields skills equally useful for development of biological weapons (Gronvall 2012: 73-74).

The international agreement on these issues, though, is so far non-existent. The BWC, whose full name is the *Convention on the Prohibition of the Development, Production and Stockpiling of Bacteriological (Biological) and Toxin Weapons and on Their Destruction*, as a first multilateral disarmament treaty bans the development, production, stockpiling, and use of a whole category of weapons – specifically, biological weapons. However, the convention allows for preventive biodefense activities, referred to in Article I of the treaty:

> Each State Party to this Convention undertakes never in any circumstances to develop, produce, stockpile or otherwise acquire or retain:
> 1. 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;
> 2. Weapons, equipment or means of delivery designed to use such agents or toxins for hostile purposes or in armed conflict.

The dual-use in this context thus refers to delimiting what constitutes 'prophylactic, protective or other peaceful purposes' and what not. Albeit initially considered during the negotiations on the treaty, however, the BWC in its final form does not contain any explicit provisions that would address the regulation of scientific research (Atlas and Dando 2006: 277). The interpretation of this rather brief treaty provision and the attempts to expand and reformulate what the ban on biological weapons means in the context of dual-use research has thus became subject to much expert as well as political debates from 1990s on and is still an unresolved problem (van der Bruggen 2012: 743-744).

Dual-use as a dilemma of governing circulations

The broader logic behind the contemporary notion of dual-use *dilemma*, however, is more complex, as explained on the example of biotechnologies:

> "The major vehicles of bioterrorism, at least in the near term, are likely to be based on materials and techniques that are available throughout the world and are easily acquired. (…) Since the development of biotechnology is facilitated by the sharing of ideas and materials, open communication offers the best security against bioterrorism. The tension between the spread of technologies that protect us and the spread of technologies that threaten us is the crux of the dilemma." (National Research Council 2004: vii)

This understanding of dual-use dilemma can be read in the context of more general modality of circulation, which has been increasingly used as a technology of governance for monitoring and regulating specific mobilities of people, things, and ideas (cf. Aradau and Blanke 2010). For Foucault, "organizing circulation, eliminating its dangerous elements, making a division between good and bad circulation, and maximizing the good circulation

by diminishing the bad" is in fact at the heart of modern security governance, constituting freedom and security as two complementary parts of the same system (Foucault 2007: 18).

The reformulation of the dual-use policies thus may be read as a changing approach to negative molecular circulations that are associated with biological weapons and the practices of distinguishing positive and negative circulations in this regard. While the positive flows are related to the circulation of people, ideas, and technologies that contribute to scientific and technological progress and consequently to economy and security, negative circulations come to be related with 'unruly' movements and emerging dangers and thus become subject to security politics. When balancing positive and negative circulations, the transparency and autonomy of science are contrasted with secrecy and the subjection of science to the state.

What is interesting in this context is how the boundary between the positive and negative circulations, between 'scientific freedom' and 'national security' is defined, enacted, and policed in specific empirical settings. The way this boundary is constructed and governed arguably epitomizes how the construction of the dual-use dilemma shapes the broader understanding of science-security nexus.

The logic of governing circulation informs many contemporary political and security practices, as numerous examples from finance, public health, migration and other areas demonstrate. Security scholars have in this context focused especially on the policies and practices that emerged in the context of the war on terror. They point out that management of circulations brings about the introduction of normalizing as well as exceptional practices, which in turn shape the subjectivity of governed bodies and lead to exclusionary effects (e.g. Neal 2006, Salter 2008b, 2013b, Vaughan-Williams 2009). Aradau and Blanke (2010) in this regard suggest focusing on how disciplinary and sovereign power are exercised in the governance of circulation, arguing thus for more complex analysis of power relations that are in play. Apart from problematizing the governance of negative circulations, scholars focus also on the problem of how positive and negative circulations are distinguished in practice and with what effects, focusing especially on the politics of security expertise, discussed in the prior chapter.

When approaching dual-use as a problem of organizing circulations, two distinct features can be identified in the contemporary conceptualization of dual-use dilemma: first, it relates

the positive circulations with social progress and economic growth, and second, it defines the desirability of circulations in terms of the context of (research) consumption. The former is based on a broader neoliberal understanding of secular science and scientific knowledge as a source of social and economic progress, which is typical for the post-industrial era and post-WWII era in particular. This vision of science was made explicit in a famous report *Science – The Endless Frontier*, written by MIT scientist and US presidential advisor Vannevar Bush (1945), which is considered to have formulated a 'social contract for science' in the United States after the Second World War (Jasanoff 2003: 227). The report describes expanding the frontiers of scientific knowledge as a precondition for insuring health, prosperity and security of the nation and, in exchange for contributing to the social progress, demands autonomy of science under the patronage of the government. This metaphor of 'frontier' related to the vision of science as a source of progress and prosperity is nowadays often used with regard to biotechnologies. However, the benefits of the good circulations are contrasted with insecurity that results from the bad circulations, concretely the misuse of research for hostile purposes by criminals or terrorists. In this regard, we can read comments by security experts about the need to 'police' or 'patrol' the biological frontier (Eldridge 2003, Noble 2013).

The latter feature relates to the argument about the impossibility to clearly delimit and regulate potentially dangerous research and technologies. In biosciences, this proposition is supported by the contingency and unpredictability of molecular life, which poses new challenges to the management of circulations (cf. Braun 2007, Caduff 2012, Rose 2001). As such, facilities, equipment, agents and know-how used for legitimate research may be also used for the development of biological weapons (Atlas and Dando 2006). For instance, benign biological agents may become pathogenic through genetic manipulation, the lethality of mildly dangerous pathogens or viruses can be magnified etc. Yet since the legitimate research is seen as a source of progress, any system of governance that would be too extensive or too restrictive is undesired (National Research Council 2004: 73). Therefore, instead of focusing on the context of research production – typically military research – and imposing or strengthening a system of top-down governance, a new regime of practices is developed to regulate and police how research and technologies are used and 'consumed'.

This understanding of dual-use dilemma has profound implications for the way science is governed. The emerging system of managing dual-use circulations builds on several principles which reflect broader rationalities and practices of contemporary political and security governance. First, the scope of people, things, technologies, and know-how subject to security oversight becomes very broad and in fact expanding. For instance, Atlas and Reppy (2005: 52) note that "in the current paradigm, all infectious disease research is potentially relevant to bioterrorism." The problematic attempts to establish categories of 'sensitive but unclassified' research or 'dual-use research of concern' only reflect more general challenges of drawing a line between regulated and unregulated subjects (Caduff 2012: 346-350, Shapiro and Siegel 2010).

Second, not actual threats, but potential risks become the key concern of biosecurity governance. For instance Wenger (2007) asserts that "a good part of the problem of understanding bioterrorism resides in the uncertainties about the potential actors and their potential capabilities." As the moratorium on gain-of-functions research shows, the debate on governing dual-use research is currently structured in terms of weighting the benefits of research against potential risks. The understanding of dual-use dilemma as a problem of balancing openness and profit vs. secrecy and security endorses the system of risk governance, which is based on the efforts to forecast the future and predict the probabilities and potential costs of misuse of research. Consequently, this way of governing science assigns new responsibilities to the experts from the field – scientists themselves. As such, this creates a new structure of relations between experts, governed bodies etc.

Finally, this also shifts the burden of regulation to the scientific community itself and reinforces the responsibilization of scientists. With biosciences becoming seemingly more and more powerful and potentially dangerous on the one hand and biological material and technologies more and more accessible and difficult to regulate on the other hand, an increasing focus in this regard is on actors who are capable of assembling all these components and connections together – i.e. scientists themselves. In effect, this focus translates into regulating the process of knowledge production and circulation in the community of scientists. This feature is particularly pronounced in the governance of knowledge.

Expanding the notion of dual-use: the rise of knowledge governance

In contemporary science, which relies more and more on advanced technologies and consequently on situated know-how, the attempts to govern dual-use research focus increasingly not only on materials and technologies, but also on scientific knowledge (Atlas and Dando 2006, Caduff 2012).[18] This trend plays out prominently in life sciences, but occurs also in other fields, such as chemistry, nanotechnology, neurosciences or (geo)engineering (Oltmann 2015, Stilgoe et al. 2013, Tucker 2012a).

In fact, though, this development can be seen as a part of broader social, political, moral, and economic pressures to control new knowledge, which is related to the politicization of scientific and technological progress and the concerns that science knows 'too much' rather than 'too little'. From a critic or a producer of world-views, since 19th century, science has started to be treated as a productive force on its own, embodying a specific source of power in the society (Stehr and Grundmann 2011). Having recognized that knowledge has an effect on the economic system, however, contemporary societies have come to see knowledge not only as a factor of production, related especially to human capital, but also as a novel object of political and security governance. The agency of knowledge, i.e. its capacity to act, is thus what these societies starts to deal with in intensive way (Stehr 2001).

For Stehr (2003, 2005), the efforts to explicitly regulate and police knowledge is a relatively new phenomenon related to the rise of *knowledge societies*, which are characterized by the capitalization of knowledge, fading exclusivity of scientific expertise, and blurring boundaries between science and other social spheres in general (cf. Bell 1973, Drucker 1994, Stehr 1994). Yet as scientific and technical knowledge penetrates all spheres of the society, the social consequences of the accumulated knowledge accessible to a broad scope of people start to be questioned and feared, leading to calls for regulating knowledge.[19] It is in this context that Stehr suggests that we experience the rise of so-called *knowledge politics*:

[18] The focus on regulating knowledge is understood here in the context of policy discourse, even though from the STS perspective, it is quite problematic to distinguish between knowledge and technology (e.g. Latour, 1987).

[19] That 'external' forces affect science is nothing new – STS scholars have for long pointed out that scientific knowledge is best understood as 'negotiated' between science and society (e.g. Jasanoff, 2004).

> Knowledge politics, or governance of knowledge, as a new field of political activity and policy is about attempts to deliberately channel the social role of knowledge, to generate rules and enforce sanctions pertaining the relevant actors and organizations, to affix certain attributes (such as property restrictions) to knowledge and – likely the most controversial strategy – to restrict the application of new knowledge and technical artifacts. For the main part the governance of knowledge will consist of political, economic, and legal means and efforts located for the most part *outside* the immediate boundaries of the scientific community. (Stehr 2004b: ix-x, emphasis in original)

Stehr makes these observations with regard to the changing model of science in the society and especially the more and more valued role of knowledge in the organization of contemporary societies, which Stehr analyses in his prior works. These works highlight, among else, the increasing role of scientific knowledge in most spheres of human activity, which is accompanied by the rise of new areas of expertise. In effect, these developments trigger broader changes in social relations and consequently put pressure to the transformation of social and political institutions, which seek to accommodate the increasingly knowledgeable citizens on the one hand and the address the novel type of social conflicts and vulnerabilities on the other hand (Böhme and Stehr 1986, Stehr 1994).

However, Stehr also puts forward the claim that the motivation to produce new knowledge cannot be explained by mere human curiosity, but rather by economic and military interests. These developments then come at cost, which are nonetheless "treated as exogenous and ex-post-developments" (Stehr 2004b: xix). In response, Stehr argues, states will develop new forms of regulation of knowledge, whereas the focus of this knowledge politics will be "on efforts to anticipate the effects of new knowledge on social relations, and attempts to control its impact" (Stehr 2003: 643). Therefore, two particular features distinguish prior models of science politics and the emerging knowledge politics: the pressure to regulate new knowledge comes mostly from outside of academia and what is perceived as a problem is not the actual knowledge, but its anticipated consequences (Stehr 2005).

The shift from understanding knowledge as power to seeing knowledge as risk brings about new attempts to re-negotiate the social contract for science. This debate gained great salience, especially in the United States and in Europe. With the assumed unpredictability

and potential dangerousness of emerging technologies, prior models of science governance, based on post hoc regulation, formal risk assessment, or voluntary self-regulation have been challenged and instead, the attention has been paid to future-oriented and more inclusive models of science governance (Stilgoe et al. 2013). Under the label of 'responsible research and innovation', three principles of science governance have been promoted in the policy discourse: opening up the debate on governing the purpose of research and innovation to a broader scope of stakeholders, institutionalizing the regulation of research and innovation, and redefining the notion of social responsibility of science (Owen et al. 2012). Despite different meanings attached to 'responsibility' in this context (Glerup and Horst 2014), promoting the rationality of responsible science at the level of structure opened up new ways of organizing the circulation of scientific knowledge in many fields.

With the securitization of bioterrorism, life sciences exemplify an area where the security concerns over the control of dual-use knowledge found great resonance with the discourse on scientific responsibility and the envisaged principles of science governance. The principles of responsible research and innovation have been translated into an emerging system of governance in life sciences, but in practice, the meaning of scientific responsibility, inclusiveness and institutionalization of responsiveness have been greatly shaped by security logic. In fact, the prevailing approach to discipline scientific knowledge in life sciences, supported also by science experts, is to incorporate security practices to the scientific field through shaping the existing behavioural norms in science and make scientists responsible for securing the circulation of knowledge (e.g. Lentzos 2008, Rappert and McLeish 2007, Tucker 2012a). This move is justified with reference to scientific *expertise* as well as social *responsibility*.

On the one hand, scientific knowledge is seen a hardly governable subject, whose policing requires advanced expertise and field-specific tacit knowledge (Revill and Jefferson 2013). Therefore, soft law and informal measures such as codes of conduct or risk education are typically preferred over hard-law regulations (Jefferson 2012: 126-127). Albeit prepared in close cooperation with security professionals, the new practices are to be implemented by scientific authorities and integrated into many areas of scientific practice, using the existing institutional architecture and procedures (McLeish and Nightingale 2007, Williams-Jones et al. 2013). To facilitate this process, scientific elites – such as professional societies, funding

agencies, publishers etc. – are intensively educated about the dangers of dual-use and motivated – or directly forced – to develop new or adjust the existing social norms and community-based practices to the logic of security (Rappert 2010). As expressed in the US *National Strategy for Countering Biological Threats*,

> [l]ife scientists are best positioned to develop, document, and reinforce norms regarding the beneficial intent of their contribution to the global community as well as those activities that are fundamentally intolerable. Although other communities can make meaningful contributions, only the concerted and deliberate effort of distinguished and respected life scientists to develop, document, and ultimately promulgate such norms will enable them to be fully endorsed by their peers and colleagues (National Security Council 2009: 8).

On the other hand, the new regime of practices is developed not only to effectively address the scientific audience, but also to responsibilize scientists for the risks associated with the implications of their research. In line with broader trends in the contemporary management of circulations, the efforts to establish social and political control of new knowledge builds on the technology of responsibilization (Rose 1999), an approach adopted from criminology to many other spheres of life, increasingly including also security politics (Petersen 2008). Under the auspices of the state apparatus, scientific elites together with security professionals define a new 'culture of responsibility' and 'good research practices' in life sciences, through which they seek to reinterpret the responsibilities of scientists for their work (cf. NSABB 2011). A telling example is provided by the educational brochure for life scientists issued by the US government and called 'Does your research have dual use potential?,' according to which

> [s]cientists have a professional responsibility to: [u]nderstand dual use research issues and concerns, [b]e aware of the implications of their work and the various ways in which information and products from their work could be misused, and [t]ake steps to minimize misuse of their work (National Institutes of Health 2010).

In practice, the case of life sciences shows that the attempts to expand security intervention from material and technologies to scientists' minds and discipline new knowledge may translate into the problem of integrating sovereign security practices with the existing networked system of science governance. Redefining the principles and practices of

responsible research by state authorities so that it complies with the newly formulated security interests, justifying this politics through the language scientific responsibility and transforming an ethics-based system of self-governance into a technology of security are novel shifts in the governance of science.

Securing the circulation of knowledge: the case of 'responsible bio-science'

This section presents three brief examples of how scientific practices are redefined in the attempts to secure scientific knowledge. Each example will briefly contextualize one set of practices and analyse their transformation. The analysis is primarily illustrative and draws on the examples from the new US regulation, which represents the most advanced biosecurity governance of science. Specifically, the analysis is based on the policy recommendations by the NSABB, which is an increasingly important federal committee that bridges science and national security and gives advice "on strategies for dealing with the generation and communication of information and new technologies from life sciences research that have the potential for both benevolent and malevolent application" – i.e. dual-use research (NSABB 2007: ii). It was established in response to an influential report called *Biotechnology Research in an Age of Terrorism* (National Research Council 2004).

The NSABB policies apply to any life science research that is (co-)funded from the US federal sources and involves specifically defined biological agents and toxins (US Government 2014b: 8). Nonetheless, the relevance of the cases goes beyond this context in several ways. First, biosecurity education and awareness-raising are aimed at all life science students, researchers and scientific elites, exposing thus a broad scope of actors to this logic of security. Second, the regulatory practices suggested by the NSABB are exported by governmental and non-governmental organizations (such as the FBI or the American Association for the Advancement of Science) to other regions in the world, as envisaged in the US *National Strategy for Countering Biological Threats* (National Security Council 2009: 8), and seek thus to inspire the development of biosecurity policies elsewhere. Third, similar approaches to regulating life sciences are supported for instance in the international biological weapons regime as a part of its changing approach to bioweapons non-proliferation (UN 2012a) or by the European Union (EU), which spreads the practices of

biosecurity governance for instance via its CBRN[20] Centres of Excellence established in more than 50 partner countries (Tucker 2005).

Education

Education and awareness-raising about the responsibilities of scientists regarding dual-use research are the key tools in the emerging framework for governing scientific knowledge (cf. National Research Council 2004). Supported by surveys on unsatisfactory awareness of dual-use issues among scientists, there have been rising efforts to establish networks of 'concerned scientists' and promote biosecurity education on the national as well as international level (e.g. Rappert 2010). Science experts even call for integrating dual-use education into the 'confidence-building measures' under the biological weapons regime, which would oblige state parties to report on its implementation and progress (Whitby and Dando 2010).

As the NSABB acknowledges, educational programmes "help foster a culture of responsibility, which is important to cultivate early in the development of future scientific talent" (NSABB 2007: 31). Therefore, it stimulates the creation of new educational tools, course curricula and case studies, but the implementation of concrete educational practices shall be in the competence of scientific associations and professional societies (NSABB 2007: 31). The key principle of this education is to teach scientists that they are ethically responsible for preventing the misuse of their research, since "scientists themselves are the most critical tool for oversight" (NSABB 2012: 30). For instance, in the educational tutorial by the Federation of American Scientists, this principle is explained like this:

> scientists not only have a moral obligation to prevent the misapplication of research technologies or findings, they are also in the best position to understand the potential for misuse. (…) The risk of not becoming engaged may be governmental actions that impose blanket restrictions and cumbersome rules for scientists that have little impact on real security and could slow legitimate research. (Federation of American Scientists 2014)

[20] CBRN stands for "chemical, biological, radiological and nuclear", typically in the context of CBRN (risk) management. Similar to the notion of WMD, it may be seen as a concept linking together different aspects of regulating biological, chemical, radiological and nuclear materials and risks associated with them.

Concretely, the issues of biosecurity and dual-use research shall get incorporated to the existing ethical training on responsible conduct of research (NSABB 2011), which is an established part of scientific education. In fact, though, the outreach of the educational practices shall be much broader, as the NSABB suggests focusing also on high school students, public health professionals, journalists, or general public (NSABB 2008).

Research

The NSABB develops a broad set of practices related to the conduct of research, i.e. the production of scientific knowledge. Under the label of 'culture of responsibility', these practices are to be promoted by actors that supervise, oversee, or play other important roles in the research process as well as through international roundtables, seminars, trainings and educational materials among researchers all over the world (NSABB 2008). The key idea is to establish a complex system of 'checks and balances' in life sciences – in the words of experts, a 'web of prevention' (Rappert and McLeish 2007) – through which it shall become much more difficult to misuse potentially dangerous research.

Scientists are encouraged to embrace the culture of responsibility particularly through the development of 'good research practices' and security-based self-governance. Both principles are addressed by the NSABB:

> knowledge can be used for good as well as for evil (…). in the pursuit of knowledge and truth, all scientists—especially those working in the life sciences—are called to cultivate among themselves a culture of responsibility (…). Their beliefs, attitudes, and values must reflect a heightened consciousness of the implications of research (…). They must consciously live and demonstrate these beliefs, attitudes, and values through day-to-day practices of mindful research. With transparency, they must examine their own research with consideration of its potential for misuse, and they must conduct and communicate their research in ways that mitigate any risks of misuse. (…) They must hold themselves and their peers accountable—collegially and with a shared commitment to advancing science and maintaining public trust. (NSABB 2011: 8)

In a report called *Guidance for Enhancing Personnel Reliability and Strengthening the Culture of Responsibility*, the NSABB (2011) recommends concrete 'good practices' of

knowledge production in life sciences. It defines responsible hiring and employment practices, promotes the development of codes of conduct, and highlights the importance of a strong institutional and laboratory leadership as a way to empower role models in the development of the culture of responsibility. In research on select biological agents, the NSABB suggests paying attention to reporting of concerning behaviours and supports the institutionalization of reporting practices. Concrete examples of concerning behaviour include e.g. "sending inappropriate emails", "working in 'off hours' without justification or documentation" or "unexplained absences" (NSABB 2011: 23-25). Albeit not for a broad implementation, the application of personnel reliability practices such as video-monitoring, two-person rule in laboratory, mental health assessment, or drug testing can also be considered (NSABB 2011: 31-35).

Furthermore, an important element of this new culture is the emphasis on self-governance. The NSABB argues that it is a core responsibility of life scientists to "assess their own research efforts for dual use potential and report as appropriate" (2012: 144). For that reason, scientists are encouraged to evaluate the potential dangerousness of their research via risk-benefit analysis and estimate thus the 'costs', 'benefits' and potential misapplications of their research (NSABB 2007, 2012). However, even though these policies are prepared in close cooperation with the national security community, they shall be put in practice by scientific authorities at the international, national or institutional level, at best as voluntarily grass-root activities, and to great extent based on existing ethical and safety practices, such as training in responsible conduct of research or oversight by the Institutional Biosafety Committees (cf. NSABB 2012).

Publication

Publishing is a key step in the process of knowledge dissemination, yet the controversies about publishing most explicitly demonstrate how the conflict between scientific freedom and biosecurity has been defined. Soon after 9/11, security experts started to argue that terrorists may benefit from open scientific communication to gain knowledge on WMD. Life sciences were identified as a particularly sensitive area due to the apparent accessibility of biological material and technology, compared to nuclear or chemical sciences (Wallerstein 2002). Several scientific publications were discussed in this regard and their potential

dangerousness pointed out (Selgelid 2009). Under the threat that sensitive scientific data is "found in a cave in Afghanistan with sections highlighted in yellow", as a US security expert warned, the publication of several papers on potentially dual-use research stirred great public controversy and led to changing publication policies and practices in life sciences (Malakoff 2003).

The result of these efforts is a framework for "responsible communication of life sciences research with dual use potential", developed by the NSABB (2007b) as a part of the promoted 'culture of responsibility' in life sciences. The attempts to secure the dissemination of scientific knowledge are based on shaping the practices of peer-review and assigning new responsibilities to the key decision-makers involved in communicating scientific knowledge, i.e. journal editors, reviewers, and publishers, who shall assess risks and benefits of communicating results of research with dual-use potential (NSABB, 2011: 83-84; 2012: 146-147). For that purpose, the NSABB outlined specific strategies for mitigating or eliminating risks of 'irresponsible' communication of research (2007a; 2007b). These include potential changes in content, timing, and extent of the distribution of research results and enable thus publishing authorities to modify the scope of published results, delay their publication, limit the target audience, or reject to publish the manuscript for security reasons (NSABB, 2007b: 10). Despite their disagreement on concrete procedures of biosecurity review, scientific authorities apparently accept these new responsibilities (cf. Patrone et al., 2012).

The disputed publication of papers by teams of Fouchier and Kawaoka (Herfst et al. 2012, Imai et al. 2012) on a highly pathogenic version of H5N1 avian influenza virus, also known as 'bird flu', is an example of how these policies may be applied in practice. The US National Institute of Health intervened in the publishing procedure and send the papers to the National Science Advisory Board on Biosecurity (NSABB), which recommended against publishing the full manuscripts due to national security concerns. Dutch government further decided and subsequent court ruling confirmed that to publish these findings, Ron Fouchier as a Dutch researcher had to apply for an EU export license for dual-use items and technologies. The papers were finally published, yet raised a lot of controversy and motivated the US government to develop more specific policy framework for funding and regulating dual-use research in life sciences. The new regulations, among else, enable shifting dangerous

research in life sciences under the institutional leadership of the Department of Defence or the Department of Homeland Security (Vogel 2013/14).

Summary

The brief analysis of the emerging governance of life sciences developed by the US agency NSABB indicates that despite the securitization of bioterrorism, the new regulatory practices related to dual-use research are constructed as very field-specific and to great extent related to the discourses and practices of scientific ethics. As such, the 'command and control' governance of dual-use research, typical for nuclear science, is being replaced by the practices of risk management and surveillance, including self-governance and self-surveillance. As such, this development arguably embraces cost-benefit thinking in the governance of security as well as in the production and dissemination of scientific knowledge, empowers new actors to act as security agents, contributes to the diffusion of responsibility for security governance, and consequently shifts the attention from understanding the issues at stake towards action. Ultimately, the emerging link between science and security creates a great potential not only for changing the 'rules of the game' in life sciences, but also for establishing a new model of science-security relations based on the logic of risk management and the convergence of scientific and security expertise.

4 Biosecurity governance in a 'global' context: the BWC regime

Having introduced and situated the contemporary narrative on dual-use dilemma in life sciences, the fourth and fifth chapters of this thesis seek to look at the politics of bio(in)security and dual-use from closer proximity and explore how the securitization of life sciences plays out in concrete empirical contexts. The analysis focuses on two sites, which link the sphere of science with (security) politics in the context of 'global' and 'local' governance. Arguably, by analysing the practices associated with these sites, it is possible to understand broader shifts in the structure of power relations that are diffused and embodied in the discourses and practices of political governance (Foucault 1977).

In this chapter, the research centres on the new practices of biological disarmament and specifically on the emerging governance of science, technology and dual-use research in the international biological weapons regime. The biological weapons regime is based on the Biological Weapons Convention – the first multilateral treaty banning an entire category of weapons. Having entered into force in 1975, the BWC was for a long time seen as a 'typical Cold War disarmament treaty', aimed at easing the East-West tensions during the period of *détente*, yet with rather limited practical relevance. The comparably short treaty lacks verification mechanism as well as any organizational body that would oversee the implementation of the treaty provisions and facilitate communications among State Parties. After the end of the Cold War, the perceived rising military significance of biological weapons motivated State Parties to strengthen the international regime based on the BWC. However, the attempts to negotiate a legally-binding verification protocol failed in July 2001, when the United States rejected the protocol. This event marked an important turning point in the functioning of the regime and led to searching for new ways how to address biological non-proliferation and stabilize the BWC after the collapse of decade-long negotiations (Revill and Dando 2009: 43). This is where the role of expert politics and relatedly a new agenda involving bioterrorism, biosecurity, and dual-use research come into play. The aim of this chapter is to map this development and look at the practices that have defined the relations between the actors of the BWC regime.

Situating the BWC regime

This chapter will work with the notion of 'regime', which has been in relation to the BWC used first by Robinson (1985). Even though the concept of regime holds a prominent place in liberal IR theory, its use in this work is different, driven empirically with the aim to describe the scope of actors, practices, and social arrangements connected at the BWC meetings.[21] As such, the use of the term regime is rather loose in this study and is motivated without the theoretical connotations to IR theory. In the area of biological disarmament, the term 'BWC regime' resonates with a broad range of actors: diplomats, experts, and NGOs associated with the agenda of biological weapons disarmament as well as scholars writing about biological non-proliferation use the term regime to describe what the BWC stands for in their perspective. Therefore, even though critical scholars typically problematize rather than apply concepts used in the policy world (such as national interest, security etc.) in order not to reinforce the meanings and power relations in the area they study, I will use the concept of regime to define the boundaries of my study. In fact, the recognition of the regime and the self-identification with the regime by a variety of actors demonstrate that the heterogeneous arrangement of binding and non-binding norms, rules, and practices is

[21] In IR theory, international regimes are traditionally understood as "principles, norms, rules, and decision-making procedures around which actor expectations converge in a given issue area" (Krasner 1982: 185) or "networks of rules, norms, and procedures that regularize behavior and control its effects" (Keohane and Nye 1977: 19). Concretely, IR theories of regimes combine the focus on ideational as well as material factors underlying international cooperation and examine how norms and principles are embedded in institutional arrangements. Research on international regimes typically looks at how regimes emerge and evolve, how they affect the behaviour of states and structure the relations among them, and how they enable the rise of new actors in international politics (e.g. Finnemore and Sikkink 1998, Hasenclever et al. 1997, Young 1982). For examples, international regimes may coordinate the behaviour of states in areas such as monetary politics (e.g. Bretton Woods System), international trade (e.g. General Agreement on Tariffs and Trade), treatment of global commons (e.g. Antarctic regime based on Antarctic Treaty and several other treaties), or arms control and disarmament (e.g. nuclear weapons regime based on the Nuclear Non-Proliferation Treaty, chemical weapons regime based on the Chemical Weapons Convention and the Organization for the Prohibition of Chemical Weapons), among else.

perceived as comprising one stable whole. Therefore, what is seen as a regime by the actors under study helps define the boundaries of the study itself.

From a methodological perspective, the empirical use of the term also goes hand in hand with approaching the BWC as a 'site of practices', as discussed in the second chapter. Even through the abbreviation BWC originally stands for the international convention signed and ratified by the State Parties, it has been used also – or perhaps even primarily – as a label for the practices of biological disarmament. As such, it mostly refers to the very conferences and meetings organized for the purpose of reviewing how State Parties fulfil the obligations contained in the treaty and interpreting what these obligations mean, through what measures and practices they should be fulfilled, by whom and how. Thus, instead of looking at the interplay of power and ideas from a macro-level perspective, as typical IR research on international regimes would do, this study focuses of the regime of practices of governing biological weapons in the BWC.[22]

International regimes, as outlined above, comprise of a broad scope of procedures, discourses, formal and informal rules, norms and practices, as well as actors and institutions. Formally, this also means that international regimes usually bring together not only states, but also relevant international organizations, non-state actors (such as civil society representatives), and experts. Given the typically very narrow (sometimes even 'technical') focus of these regimes, experts play an important role there. They may be a part of national delegations, may be present in various advisory bodies associated to the regime, or may provide their expertise to the regime on an ad-hoc basis. The models of cooperation between (scientific) experts and policy-makers differ greatly from one regime to another, as Haas and Stevens (2011) demonstrate.

The biological weapons regime is no exception in this regard. It is a typical 'treaty regime', which is based on the Biological Weapons Convention – an international treaty with almost universal membership. The formal agreement, though, has been put in practice through a range of activities and arrangements. The representatives of States Parties meet regularly every five years at so-called Review Conferences to discuss the progress of biological

[22] In fact, the Foucauldian term 'regime of practices', which characterize how conduct is governed and ways of producing knowledge organized, comes close to the meaning of regime in this context.

disarmament and review the operation of the regime. These conferences, which have been for a long time the main 'tangible' representation of biological disarmament in practice, bring together primarily career diplomats from permanent missions in Geneva as well as diplomats from national ministries and are typically attended by many experts and bureaucrats, who take care of the national implementation in their respective countries. In 2003, so-called Intersessional Process was established, which shall ensure more intensive cooperation among the actors involved in the regime in between the Review Conferences. The intersessional meetings take place twice a year, as the Meetings of State Parties and the Meetings of Experts. Both types of meetings are attended by diplomats as well as experts, yet what differs is the key focus of the agenda – whether primarily political or rather expert issues. The organization of the meetings and conferences is arranged by a chair(wo)man. In 2006, a bureaucratic body called Implementation Support Unit (ISU) was established to assist the chair in organizing the meetings and perform other tasks.

To characterize the functioning of biological weapons regime by referring to the politics among states in the area of biological disarmament would be insufficient, though. On the one hand, there are other types of international cooperation in the area of biological disarmament and biosecurity that expand beyond the provisions of the BWC. On the other hand, when looking at the actors who participate in the BWC meetings and conferences, it becomes clear that the agenda of the biological weapons regime is of interest not only to states, but increasingly also to a broad scope of diverse actors and organizations which primarily deal with different issues. The analysis of participation of non-state actors in the BWC meetings demonstrates this trend well. Apart from the establishment of ISU – a small bureaucratic body that shall support the organization of the BWC meetings and coordinate projects related to the BWC agenda, we may see an increasing level of participation by the observers from international organizations and especially by scientific experts associated with NGOs.

The trends in the participation of non-state actors with an observer status in the BWC meetings are depicted in Figures 2, 3, and 4.[23] The figures show that intergovernmental

[23] The graphs summarize the participation of specialized agencies and intergovernmental organizations (IGOs), UN-related organizations and institutions (UN), non-governmental organizations (NGOs), and guests, such as

organizations, specialized agencies and, most significantly, representatives of civil society have been more present in the BWC meetings especially since the Sixth Review Conference, which was held in 2001. This trend is particularly remarkable with regard to the Review Conferences.

Based on the analysis of the lists of meetings' participants, we can see that the scope of agencies and international organizations that cooperate with the BWC is in fact very broad and diverse and includes actors such as EU, World Health Organization (WHO), Interpol, International Committee of the Red Cross, International Council for Science, etc. The actors registered as NGOs at the BWC meetings and conferences include also many diverse organizations and institutions, from 'traditional' type of NGOs such as Pax Christi International, Pugwash Conferences on Science and World Affairs or International Network of Engineers and Scientists for Global Responsibility, to researchers working primarily at universities, such as the University of Bradford, University of Sussex, or King's College London. This is caused by the fact that scientists and experts cannot attend the meetings as representatives of the scientific community, but have to be officially registered as NGOs. A special type of civil society actor is the BioWeapons Prevention Project, which represents a network of NGOs interested in the agenda of biological weapons and which was established in 2003 after the failure of the State Parties to negotiate a verification protocol.

The cooperation of these actors with the BWC has taken many forms, from mere participation at the conferences as observers to giving talks at the meetings or even taking over some agenda of the BWC. The securitization of bioterrorism and the following reframing of the BWC agenda have played an important role in these developments. The following section will look at this process from a closer perspective.

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the representatives of pharmaceutical companies or scientific associations. As such, the figures do not refer to the participation of observer states, such as non-signatories of the BWC. The classification of these actors is adopted from the BWC as used in their lists of meetings' participants. The graphs are based on the lists of participants that are available on the official websites of the BWC http://www.unog.ch/bwc (accessed 10-05-2016).

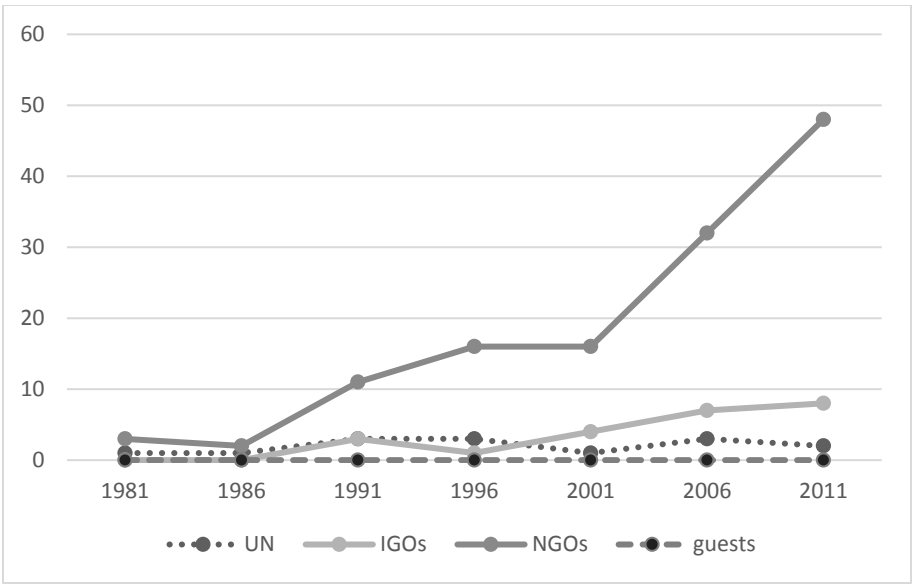

Figure 2: Non-state actors at the BWC Review Conferences

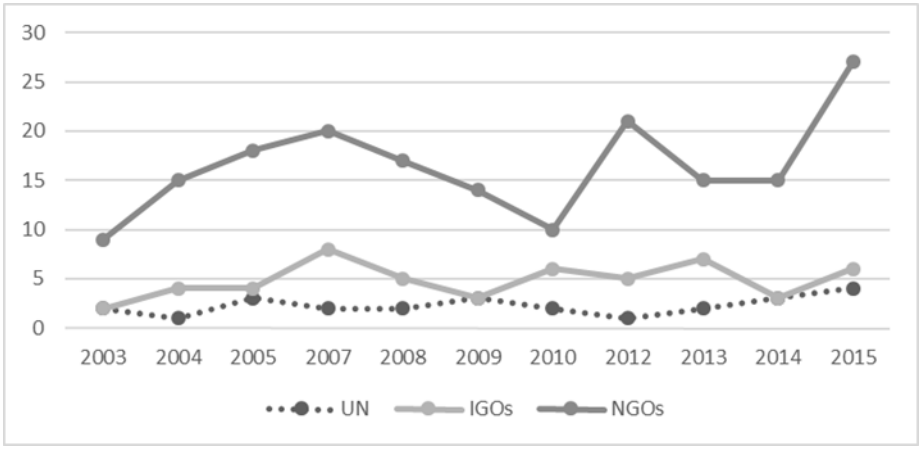

Figure 3: Non-state actors at the BWC Meetings of States Parties

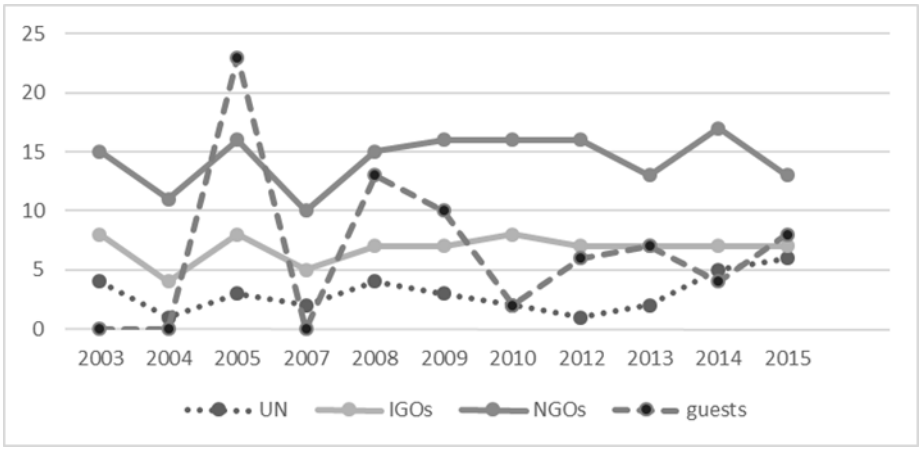

Figure 4: Non-state actors at the BWC Meetings of Experts

The evolution and destabilization of the BWC regime

The attempts to regulate the development of specific weapons and their use in war can be traced back to ancient times, but they reached their popularity in the 20th century. The Cold War era was particularly productive in this regard, as various bilateral as well as multilateral agreements made to restrict the development, proliferation and usage of certain weapons, whether conventional or unconventional. The Biological Weapons Convention is a typical product of this Cold War arms control politics and was negotiated between 1969-1971 following the US decision to end its offensive biological weapons programme. The draft of the BWC was prepared by the United Kingdom in 1969, but the final version of the treaty arose out of the bilateral collaboration between the United States and the Soviet Union. Interestingly, when ratifying the treaty in 1975, the United States ratified at the same time also the 1925 Geneva Protocol, which prohibits the use of chemical and biological weapons in war.

The novelty of the BWC lied in its ban on not only use, but also production and possession of biological weapons. However, when finalized and opened for signature in 1972, the treaty eliminated all of the formal verification mechanisms proposed initially by the United Kingdom and shifted the responsibility for investigating non-compliance with the treaty provisions solely to the UN Security Council. Given the veto power of the United States and the Soviet Union in the Council, it became virtually impossible to control the compliance by either of the superpowers or their allies (Littlewood 2005).

In direct defiance of the BWC, the Soviet Union secretly pursued a huge biological weapons programme, which was revealed only after the end of the Cold War. The revelation of this programme contributed to the broader post-Cold War efforts to strengthen the international arms control instruments, which prominently gave rise to a new round of bilateral treaties reducing and limiting strategic nuclear weapons between the United States and the Soviet Union (later Russia) as well as the Chemical Weapons Convention and the foundation of the Organization for the Prohibition of Chemical Weapons (OPCW). In the area of biological disarmament, State Parties expressed their desire to strengthen the BWC regime at the Third Review Conference, held in Geneva in 1991.

To this end, the 1991 BWC Review Conference established an Ad Hoc Group of Governmental Experts (called also VEREX, abbreviating verification experts). Since the perceived weakness of the BWC is most importantly the lack of verification mechanisms through which it would be possible to monitor compliance with the treaty, the key task of the experts as a part of the VEREX process was to "identify and examine potential verification measures from a scientific and technical standpoint" (UN 1991). The Ad Hoc Group met four times and focused especially on on-site and off-site verification measures such as information monitoring, data exchange, remote sensing, inspections, and exchange visits. Having examined the potential utility of these measures, the Group concluded that "some of the potential verification measures would contribute to strengthening the effectiveness and improve the implementation of the Convention, also recognizing that appropriate and effective verification could reinforce the Convention" (UN 1993).

In response to the VEREX process, Special Conference of the State Parties was held in 1994, in which it was agreed that an Ad Hoc Group of State Parties would continue in the efforts to strengthen the regime. The Ad Hoc Group of State Parties was specifically mandated to "consider appropriate measures, including possible verification measures, and draft proposals to strengthen the convention, to be included, as appropriate, in a legally binding instrument, to be submitted for the consideration of the States Parties" (UN 1994). The work of the Ad Hoc Group was also supported at the Fourth Review Conference in 1996, which encouraged the work of the Group on a draft protocol that was supposed to become binding for all State Parties.

The process of negotiating the new protocol is well described by Littlewood (2005), who looks among else at how the politics among great powers and their interests played out in the multilateral negotiations. While the administration of the US President George H. Bush initially opposed the work on strengthening the BWC, arguing that the BWC is non-verifiable,[25] the government of Bill Clinton was much more supportive of the efforts to

[25] Several reasons were put forward in this regard: "dual-use facilities made it difficult to distinguish prohibited from legitimate activities; a negotiated agreement could never be intrusive enough to detect clandestine programs, creating false confidence in compliance; and on-site inspections would expose U.S. government and commercial facilities to foreign espionage" (Tucker 2005).

strengthen the regime. What is more, as Littlewood describes, the negotiations were greatly affected by the broader turn to multilateral diplomacy in 1990s, which enabled many traditional 'middle powers' to play an important role in the process. This era is seen among diplomats and experts as a 'real golden age of the BWC', as it was possible to bring together many experts from all over the world and develop new ideas on how to address the problems of biological disarmament.

However, with the change of the US administration, the attitude of the US government towards the protocol dramatically changed. The United States feared that the protocol would be ineffective in identifying the violations of BWC compliance and would also harm their pharmaceutical and biotechnology research. Allegations that some countries seek to push through their specific agendas with the protocol were also considered. As a result, the US delegation withdrew from the negotiations and the negotiation on the protocol failed in 2001(Bansak 2011).

The failure of the verification protocol left the BWC regime shattered and State Parties entrenched. In the words of one long-term participant of the BWC process,

> while the protocol was not perfect, it was far from it, it was much better than what existed and certainly what exists now. The implosion of that process really left this convention rudderless. And the ambitions, the objectives, the sense of what could be accomplished went from the ambitious to the minimalist. (…) So grand ideas were abandoned and we went back to trying to figure out how can we salvage this to make it something meaningful.[26]

In a search for resuscitating the regime, new opportunities arose for new actors and initiatives to get to the BWC agenda. This move enabled the scientific experts and NGOs to intensify their involvement in the BWC politics and consequently gave rise to bureaucratic politics within the regime.

The rise of expert politics

The destabilization of the BWC regime led to the subsequent search for how to save the regime and found a compromise on how to proceed with biological disarmament in the

[26] Personal interview, 4th December 2014, Geneva, representative of a State Party (3).

international arena. As one interviewee put it, "there was a willingness to set aside the ambitious, and the ambition just became survival."[27] The chairman of the conference, Hungarian diplomat Tibor Tóth, supported by the most active states proposed putting the negotiations on hold for a year and then succeeded in reorienting the focus on the BWC regime towards apparently apolitical, low-profile agenda related to national implementation and consequently bioterrorism. As a part of this new agenda, greater role was given to experts.

In fact, the functioning of the BWC has been marked by an increasing involvement of experts in the regime already since 1990s. In the process of developing and negotiating the verification protocol, the Review Conferences were supplemented by the work of governmental experts, who worked with the BWC regime as a part of the VEREX process and later with the Ad Hoc Group of State Parties. Despite the failure of the negotiations about the verification protocol in 2001, the decade-long work on it enabled forming a community of governmental as well as non-governmental experts who have become an integral part of the biological weapons regime and who became recognized as apolitical actors with scientific expertise.

In a search for salvaging the regime, the 2002 Review Conference decided to intensify the BWC work by establishing so-called Intersessional Process, under which diplomats and experts were to meet twice a year – in August for a Meeting of Experts and in December for a Meeting of State Parties. The purpose of the intersessional process has not been on bringing the issue of the verification protocol back on the agenda, but rather to keep the regime alive and move forward with some agenda. In the words of one diplomat,

> Since 2001 we have sought to make the most of what was possible in terms of multilateral efforts to strengthen the Convention – once it became clear that a Protocol was not going to be achievable, we took the lead in proposing what became the intersessional process that has run in the three inter-Review Conferences since 2003. (…) Whilst it is clear that a verification protocol is not on the agenda, we have

[27] Personal interview, 4th December 2014, Geneva, representative of a State Party (3).

> sought to make the most of the intersessional meetings in order to promote common understandings and effective action.[29]

The later Review Conferences, in 2006 and 2011, confirmed this trend and the biannual meetings hosting an increasing number of experts have become a norm. In a similar spirit, the 2006 conference decided on the establishment of Implementation Support Unit (ISU) – an administrative body, which interacts with State Parties, relevant organizations and experts, assists states in implementing the Convention, and provides administrative assistance, among else. The ISU comprises mostly of former NGOs experts and has been particularly active in promoting the greater involvement of scientific experts and NGOs. One representative of an NGO recalls these developments in the following way:

> Well, in the beginning, when I was starting in 1995, this was sort of getting of the ad hoc group that failed. The protocol, that failed. At that time, all the meetings were not public. Here, you know, NGOs can go to all of the meetings, at least up to now. (…) But in the beginning it wasn't like that at all. We only had the plenary session at the beginning, and the plenary session at the end, and that was it. And otherwise, we sat in the halls, and waited for the delegates to come out and see if they would discuss any issues with us about what was going on. And that was sort of the extent of the work. But at one point, the BioWeapons Prevention Project was initiated, and so this was sort of a network of all the NGOs that were interested in the BWC issues, and sort of to strengthen all of the NGOs. (…) In 2005 he [the Ambassador of the UK] was chair and opened up the meeting to outside experts, and encouraged all of the delegations to invite experts from outside to be on the delegation. (…) After this, it has been a tradition to have guests of the meeting from the outside. But I would say that the BWC contrasts to most of the other non-proliferation treaties, it is very very open to the input of NGOs, and this is just about that time, or even before it started to be a tradition to have the NGO presentations in a special session. And so this probably started in the 2000's. Actually, shortly before that too, the NGO presentations, it kept working. But I've really seen that transition in time of the acceptance of the NGOs from the mid-90's up until this time.[30]

[29] Email interview 11th February 2015, representative of a State Party.

[30] Personal interview, 2nd December 2014, Geneva, representative of an NGO (1).

When asked how this opening up to experts, the interviewee responded with reference to the lack of scientific expertise on the side of diplomats:

> It is that diplomats just don't know that much about natural science and biology and biotechnology issues, and developments that are going on. I think it was the rapid development of bio-technologies, even from the nineties until the present time, this really exponential development of the life sciences, that has caused problems in dealing with this within the convention. And of course the delegations have their own experts, governmental experts, and they are very active within the process. But still, it is a certain openness also to other NGOs.[31]

Establishment of the intersessional process gave rise to a broad scope of new or previously minor topics to get to the BWC agenda and led to greater engagement of diverse actors from different communities, as these 'technical' issues are thought of as rather complex and requiring apparently more types of expertise to be dealt with effectively. This involvement of experts is typically seen as a valued contribution to the otherwise ill-functioning BWC regime and a reminder of the 'golden era' of the BWC regime in 1990s. As one interviewee suggested,

> 2002-2007 were sort of the dark ages and then again, I think a bit of a renaissance with the introduction of the meetings of experts. Where again, the diplomats weren't the only ones speaking. And it took a while for that process to take off, but I mean the meetings of experts now, when we are talking about disease surveillance, biosafety and biosecurity, have very good discussions on codes of conduct. Even though it doesn't lead to any real outcomes, the discussions themselves are valuable, and (…) there is a reason the meetings in August were so much better that the ones in December. It's because those were the scientific meetings of the technical experts, and these other ones where everybody puts in their 2001 hat and we end up back where we started.[32]

Table 3[33] shows an overview of the topics discussed during the first, second and third intersessional process (2003 to 2005, 2007 to 2010, and 2012 to 2015).

[31] Personal interview, 2nd December 2014, Geneva, representative of an NGO (1).

[32] Personal interview, 4th December 2014, Geneva, representative of a State Party (3).

[33] Based on the final documents of the Fifth, Sixth, and Seventh Review Conferences (UN 2002, 2006, 2012a).

Year	*Intersessional topics*
2003	i. The adoption of necessary national measures to implement the prohibitions set forth in the Convention, including the enactment of penal legislation
	ii. national mechanisms to establish and maintain the security and oversight of pathogenic microorganisms and toxins
2004	iii. Enhancing international capabilities for responding to, investigating and mitigating the effects of cases of alleged use of biological or toxin weapons or suspicious outbreaks of disease
	iv. Strengthening and broadening national and international institutional efforts and existing mechanisms for the surveillance, detection, diagnosis and combating of infectious diseases affecting humans, animals, and plants
2005	v. The content, promulgation, and adoption of codes of conduct for scientists
2007	i. Ways and means to enhance national implementation, including enforcement of national legislation, strengthening of national institutions and coordination among national law enforcement institutions
	ii. Regional and sub-regional cooperation on implementation of the Convention
2008	iii. National, regional and international measures to improve biosafety and biosecurity, including laboratory safety and security of pathogens and toxins
	iv. Oversight, education, awareness raising, and adoption and/or development of codes of conduct with the aim of preventing misuse in the context of advances in bio-science and bio-technology research with the potential of use for purposes prohibited by the Convention
2009	v. With a view to enhancing international cooperation, assistance and exchange in biological sciences and technology for peaceful purposes, promoting capacity building in the fields of disease surveillance, detection, diagnosis, and containment of infectious diseases: (1) for States Parties in need of assistance, identifying requirements and requests for capacity enhancement; and (2) from States Parties in a position to do so, and international organizations, opportunities for providing assistance related to these fields
2010	vi. Provision of assistance and coordination with relevant organizations upon request by any State Party in the case of alleged use of biological or toxin weapons, including improving national capabilities for disease surveillance, detection and diagnosis and public health systems
2012 2013	i. How to enable fuller participation in the CBMs
2014 2015	ii. How to strengthen implementation of Article VII, including consideration of detailed procedures and mechanisms for the provision of assistance and cooperation by States Parties

Table 3: Intersessional topics of the BWC meetings

Opening up the BWC regime to scientific experts led to the rise of many new practices through which scientists engage in the regime and thus shape the BWC politics. Before going into detail of how these practices structure the relations between the actors involved in the BWC regime, it is important to note that there are several types of experts and expertise recognized as such in the BWC regime and each may bridge the politico-diplomatic field with the sphere of science in a different way.

First, there are scientific experts coming from academia – typically from life sciences, science studies, political science or any combination of these. In the BWC, such experts are registered under the name of their respective university or research institute. However, the involvement of these experts is typically linked with some kind of political consultancy that these scientists engage in – whether in the form of occasional policy advisory, closer cooperation with any political institution (such as scientific advisory bodies at the national level), or work for an issue-specific NGO. Some of these scientists may thus be registered occasionally under their academic affiliation and other times with these NGOs or, for instance, a scientific organization that is related to the BWC agenda.

In fact, the network of NGOs – but also IGOs – behind the scenes of the disarmament politics is very broad, not only in the area of biological disarmament. For instance, there are 58 civil society actors registered under the BioWeapons Prevention Project (BWPP), coming from all over the world (BWPP 2016). In the words of one NGO representative, this network is seen as functioning as a community:

> We're definitely a part of the NGO group, we're also a part of BWPP, so we always know the other NGOs well. (…) So people tend to know each other well. In terms of work, for us it is interesting to meet the states here, but obviously we know the community well, especially in the NGO communities. It's definitely a group.[35]

Scientific experts are for these organizations invaluable assets, as they help them shape their agenda, better reach out to politicians and diplomats, and conduct the work on the ground, such as educational and training activities.

[35] Personal interview, 2nd December 2014, Geneva, representative of an NGO (2).

Besides, there are civil society non-proliferation experts who are linked with 'non-scientific' NGOs, such as Verification Research, Training and Information Centre (VERTIC), which i.a. monitors the compliance with non-proliferation as well as assists states in developing their national legislation. In the past years, representatives of public health community – such as the WHO – have also taken more active part in the meetings and conferences, which is related to the strengthening of the connections between the public health agenda and biological disarmament in the BWC. Similarly, actors representing pharmaceutical or biotechnology companies also have also attended the meetings, presenting themselves as 'field experts' with the knowledge on how to prevent and fight infectious diseases on the ground. Last but not least, most diplomatic delegations bring with them their national experts who are responsible for the implementation of BWC provisions in the domestic context or are in some way involved in the international projects focused on the biosecurity outreach and educational activities, among else.

(In)securitization of science and technology in the BWC

The involvement of scientific experts in the BWC regime and reorienting the focus of the BWC meetings and conferences led to the rise of technical, bureaucratic agenda in the regime. Specifically, the key issue for scientific experts in the security of scientific research and therefore, these actors have been involved in promoting this agenda in the BWC. As such, the rise of expert politics contributed to the subsequent (in)securitization of science and technology within the BWC regime, which can be situated located at the intersection of broader structural as well as discursive changes that destabilized the established model of science-security relations within the BWC. While the former denotes expanding the scope of actors involved in the regime and strengthening the role of expert politics, the latter refers to a shift from traditional arms control discourse to a broader understanding of bioweapons and an emphasis on 'securing dangerous pathogens'. This section shows how these developments have enabled the construction of new connections between science and security politics in the biological weapons regime and created a futile ground for further convergence and hybridization of scientific and security knowledge and practices.

The changing institutional structure of the BWC have been accompanied by a significant shift in the BWC agenda and disarmament discourse. The attempts to stabilize the BWC

after 2001 coincided with the changing international security environment after 9/11 and the US invasion to Iraq in particular, underlined by the fears of global terrorism and weapons of mass destruction. In this context, the United States and its allies brought up the issue of bioterrorism in 2003. Consequently, they argued for a new approach, through which to reinforce "national measures necessary to prevent unauthorized diversion of dangerous pathogens and toxins from approved use" (US 2003). Despite their failure to come up with a concrete strategy, State Parties agreed, i.a., on the value of "[t]he need for comprehensive and concrete national measures to secure pathogen collections and the control of their use for peaceful purposes" (UN 2003: 5).

Broadening of the BWC agenda and focusing more on the security of dangerous pathogens rather than inter-state compliance mechanism is apparent also in later meetings – in 2004, the BWC addressed so far unrelated issue of naturally occurring infectious diseases and in 2005, State Parties discussed the need to raise awareness among scientists about the problems of dual-use research in life sciences. The changing approach to science and technology within the biological weapons regime was confirmed at the Sixth Review Conference, in which State Parties agreed that "recent scientific and technological developments in the field of biotechnology […] could also increase the potential for the misuse of both science and technology" (UN 2006: 15).

State Parties at the Sixth Review Conference confirmed that the BWC "applies to all scientific and technological developments in the life sciences and in other fields of science relevant to the Convention" and "[condemned] any use of biological agents or toxins for other than peaceful purposes, by anyone at any time" (UN 2006: 8). Replacing the traditional focus on 'State Parties' with 'anyone' is an extremely strong message in the context of international non-proliferation, as it confirms broadening the scope of actors and activities that the BWC targets. Specifically, the issue of bioterrorism was discussed and the conference concluded that

> terrorism in all its forms and manifestations and whatever its motivation, is abhorrent and unacceptable to the international community, and that terrorists must be prevented from developing, producing, stockpiling, or otherwise acquiring or retaining, and using under any circumstances, biological agents and toxins, equipment, or means of delivery of agents or toxins, for non-peaceful purposes, and

> their recognition of the contribution of full and effective implementation of United Nations Security Council Resolution 1540 by all states to assist in achieving the objectives of this Convention (UN 2006: 8).

For that purpose, State Parties supported new measures to be applied as a response to the threat of bioterrorism. The Conference, among else, "[encouraged] States Parties to take necessary measures to promote awareness amongst relevant professionals", supported codes of conduct and other self-regulatory mechanisms, and "[urged] States Parties to promote the development of training and education programmes for those granted access to biological agents and toxins relevant to the Convention and for those with the knowledge or capacity to modify such agents and toxins" (UN 2006: 11).

At the Seventh Review Conference in 2011, State Parties agreed on rearranging the intersessional process and established three 'standing agenda items' that were to be addressed throughout the meetings between 2012 and 2015: strengthening the national implementation of the BWC (related to art. IV of the BWC), promoting international cooperation and assistance (related to art. X of the BWC), and the review of developments in science and technology (UN 2012a). This development was legitimized also in broader UN context – for instance, in his message to the BWC meeting in 2010, UN Secretary-General Ban Ki-moon (2010) asserted that "[w]ith the pace of advances in biological science and technology growing ever quicker, there is a pressing need for a structured and regular means of monitoring developments and assessing their implications." Concrete topics discussed at the BWC meetings under the new standing agenda item of science and technology review are presented in Table 4,[37] which shows how very specific, technical are the topics addressed as a part of this BWC agenda.

Beside these utterances that exemplify the official policy discourse in the BWC regime, though, the understanding of science and technology as a potentially dangerous resource for hostile actors who may wish to develop bioweapons has become less pronounced in the wider political discourse in the BWC regime. Interestingly, however, the bioterrorism discourse is not much prevalent in the BWC. Instead, the changing understanding of the biological threat seems to be rather taken for granted in this wider discourse and the

[37] Based on the final document of the seventh review conference (UN 2012a).

meetings, presentations, policy papers prepared by scientific experts and so forth are devoted to more technical aspects of how to secure science and technology. As such, the security framing of science and technology may be interpreted as having been translated to more technical debates led by scientific experts. The practices of scientific expertise in the BWC and their meanings and implications are discussed in the following section.

Topics addressed under the Standing Agenda Item on review of developments in the field of science and technology (intersessional programme 2012–2015)
i. New science and technology developments that have potential for uses contrary to the provisions of the Convention
ii. New science and technology developments that have potential benefits for the Convention, including those of special relevance to disease surveillance, diagnosis and mitigation
iii. Measures for strengthening national biological risk management
iv. Voluntary codes of conduct and other measures to encourage responsible conduct by scientists, academia and industry
v. Education and awareness-raising about risks and benefits of life sciences and biotechnology
vi. Science- and technology-related developments relevant to the activities of multilateral organizations such as the WHO, OIE, FAO, IPPC and OPCW
vii. Any other science and technology developments of relevance to the Convention

Table 4: Science and technology review topics 2012-2015

Hybridization in practice: the BWC as a conceptual and policy laboratory

Even though the issues of science and technology governance are discussed extensively in the BWC regime, the BWC as it currently stands is seen primarily as a diplomatic forum, not as an institution that could – or should – regulate the governance of science and technology.[39] Nonetheless, the lack of direct regulatory powers does not imply that the BWC cannot play a role in shaping the rationalities and practices of how science and technology related to biological research should be governed. In fact, when looking at the functioning of the BWC regime, one of its key recent developments has been the involvement of many diverse actors and institutions coming from different social spheres – from NGOs, science associations, to public health community, private actors and of course of international organizations such as the EU or Interpol. These actors often use the opportunity of participating in the BWC meetings to promote their agenda, disseminate specific policies

[39] Skype interview, 10th December 2014, representative of an NGO.

and ‘best practices’ and find new partners or strengthen the existing partnerships in the area of biosecurity education and training programmes, biological preparedness etc. From this perspective, the BWC regime may be seen as a Latourian ‘laboratory’[40] that helps disseminate specific narratives and practices related to the management of biological risks and threats and thus promote certain rationalities and techniques of government that link the governance of science and security in a new way.

Compared to the issues of national implementation and international cooperation and assistance, the science and technology review is seen as an apolitical topic, which is not difficult to agree on among State Parties.[41] Due to the perceived apolitical character of the agenda, the review of science and technology is practically in the hands of scientific experts. In cooperation with the ISU, scientific experts prepare reports to the meetings and conferences which summarize the advances in science and technology related to the BWC and discuss the implications of these advances for the practices of biological disarmament. Besides, they submit a plethora of working papers and presentations introduced and discussed at the BWC meetings, which serve as a basis for developing further stance towards these issues at the BWC.

As a part of these publications and presentations, scientific experts typically seek to identify new problems or provide alternative understanding of already discussed issues, and suggest policy measures that shall be adopted in response to these problems. Concepts and practices promoted by these experts often start to live their own life in the BWC regime as well as beyond. This is for instance the case of the very concept of ‘biosecurity’. One of the active scientific experts in the BWC, Brian Rappert, explains the emergence of the concept and its further diffusion to an international audience, highlighting also the resistance of some actors to use this concept (Rappert 2009). Despite the initial hesitation, though, the concept has become widely popular and it used by a broad scope of actors not only in the BWC, but also in other contexts.

[40] For Latour, laboratory is site of practices where scientific knowledge is constructed (Latour and Woolgar 1986).

[41] Personal interview, 2nd December 2014, Geneva, representative of an NGO (3).

Another example of promoting a specific concept and relatedly a set of governmental techniques for the regulation of science and technology is an initiative understood as building a 'web of prevention'. This concept was developed by scientific experts, associated especially with the University of Bradford, who proposed a novel approach to the governance of scientific research, "in which governments, organisations and individuals – including scientists and scientific organisations – play a role in helping to prevent the hostile application of the fruits of a biotechnology revolution which is fundamentally well-intentioned" (Whitby et al. 2015). Through the involvement of multiple stakeholders, a complex system of surveillance regime in bio-science shall be introduced and upheld. This system shall be based especially on education of scientists and awareness-raising about the dangers of dual-use research and responsibility innovation (Rappert and McLeish 2007). Many scientific experts are then directly involved in developing and implementing concrete educational programmes and projects through which this knowledge is spread to countries which are identified as lacking proper system of oversight in life sciences.

An interesting set of practices related to the involvement of scientific experts in the BWC regime is providing alternative narratives and frames of biological threats and risks. Concretely, some scientific experts have been engaged in challenging the apparently dominant policy discourse on bioterrorism in the BWC, focusing especially on the often mentioned accessibility of biological material and how easy it is to develop biological weapons. They criticize the apparently misleading dominant narrative on the deskilling of biology and the growing availability of biological material and technologies and argue that an omitted aspect in the offensive biological research is 'tacit knowledge' – a concept borrowed from philosophy and used e.g. in sociology and STS. By pointing out that the development of biological weapons requires a lot of tacit knowledge, resources, time and very specific type of scientific expertise, scientific experts consequently suggest that instead of fearing the misuse of biological science by amateurs, the regulation and oversight shall target rather the very community of scientists and researchers who are already trained in conducting biological research.

This also brings about shifting the attention to the education of scientists and the introduction of the practices of safe and responsible research and development – in other words, practices such as those developed under the 'web of prevention' umbrella and related to the notion of

scientific responsibility (Revill and Jefferson 2013). The diplomats as well as scientific and NGO experts start to notice this shift towards the understanding of scientific knowledge as a security threat as well, as one interviewee confirms:

> The dangerous thing is that our skills are quite efficient. And that technology, theoretically, makes it easier for us to utilize these skills in doing something dangerous. So I think it is very necessary that we regulate, but we can regulate as much as like. I mean it's also legal to shoot people. Still being done. So I fully understand the regulations. But I think one of the most important things is actually to find out the moral of the people in the academia, doing the research. Because moral is more regulating that law. (…) The regulation is necessary, but the ethical debate will become increasingly more necessary.[42]

Interestingly, the debate on tacit knowledge recently expanded from the sphere of science experts to the official diplomatic discourse, as the US delegation submitted an official report to the BWC about this concept and its implications for the proliferation of biological weapons (UN 2015b).

Further example of how concepts and best practices are promoted within the BWC regime are so-called poster sessions, which have been initiated by scientific experts. Similar to some scientific conferences, the key information on the ongoing projects related to the BWC agenda are presented through informal poster sessions at the meeting of experts. First held in 2008, these poster sessions are quite popular among the participants of the meetings, both diplomats as well as other actors, as they enable socialization, arranging further partnerships as well as sharing best practices – on how to promote as well as how to get involved into such projects. There are many types of actors who prepare and present these posters – from universities and scientific associations, NGOs, international organizations and networks to states or even specialized national agencies, which seek to promote the specific agenda at the BWC. The posters typically describe the activities of the given institution in the area of biological risk management, biological preparedness, biosecurity outreach and education, emphasising either how this area is regulated in the given national or institutional context or how certain educational or regulatory practices are promoted internationally. Therefore, the

[42] Personal interview, 1st December 2014, Geneva, guest of the Meeting of State Parties.

posters often contain maps or other graphics that show the networks and partnerships which a given institution engages in. Besides, the posters tend to repeat the dominant concepts and frames discussed in the BWC, such as biosecurity, biosafety, biological risks etc.

Needless to say, the BWC meetings nowadays host many side events like this, in which scientific experts present their research or concrete projects related to the BWC agenda. These side events are held before, after or in between the official sessions of the meetings and many of them are organized or co-organized by scientific associations or NGOs. Apart from the organization of side events at the BWC meetings, another area of scientists' involvement in the BWC regime is the presentation of official statements in the plenary session. These 'ritualistic statements', as many experts themselves perceive them,[43] serve not only for the presentation of specific scientific associations or NGOs and their agendas, but can be also seen as a recognition of the authority of the BWC regime and at least partial acceptance of the dominant narratives about biological threats and risks.

This practice also demonstrates the importance of socialization in the BWC regime. In order to effectively mediate the knowledge between the world of diplomacy on the one hand and the field of science and academia on the other hand, scientific experts become socialized in the policy-world at the BWC and simultaneously bring their own specific concepts and practices to the realm of non-proliferation diplomacy. For instance, scientists themselves acknowledge that they had to adjust to the language of security and the diplomatic practices. In this regard, for instance, one scientist reflects on her own experience and notes the importance of adapting to the BWC environment:

> some NGOs in particular have shown their use, they are really very very good in what they do and so I think this is a part of the acceptance. But really, it is more from the side - not from the diplomatic side - of opening up and becoming more liberal in this sense. It is really just seek out. Some of them can't come from some NGOs. And it is funny because the NGOs that have developed with time too... Because none of them are very radical, you know, but there have been NGOs with statements that have been very radical, very arrogant in the past. Somehow they have just fallen

[43] Personal interview, 2nd December 2014, Geneva, representative of an NGO (3), Skype interview, 10th December 2014, representative of an NGO.

> along the way, I don't know. (…) I was also more radical, but then I learned (…) the ways of how diplomats have to work within certain constraints (…). It's a practical thing, you know, instead of being very idealistic and non-practical, you try to be more practical to get more things done.[44]

The meaning of these practices may be interpreted in several ways, apart from filling the void of diplomatic (in)activity and providing an alternative agenda for the otherwise deadlocked political negotiations about biological disarmament. On the one hand, by engaging in these practices, scientific experts strengthen their role as respected and active agents and agenda-setters in the BWC regime and reinforce the relevance of their boundary expertise in this context. On the other hand, through these activities and projects, scientific experts give concrete meaning to the new agenda of the BWC regime and develop concrete 'best practices' related to this agenda that can be applied by State Parties. In effect, these experts contribute to shifting the metaphorical boundary of science-security relations, more or less explicitly reaffirm the securitization of bioterrorism and the insecuritization of scientific research, point out the importance of broadening the scope of global security governance towards the regulations of science and technology in life sciences, and develop and partially help implement concrete techniques of governing this new area.

The agency of scientific experts actively involved in the BWC shall be also seen in the context of the relatively apolitical character of the BWC, compared for instance with the nuclear non-proliferation regime. For diplomatic representatives, whether operating from Geneva or their respective national ministries of foreign affairs, the BWC agenda is typically seen as low-profile and only as one of more agendas related to the non-proliferation of WMD as a whole or even broader. As such, this system privileges experts not only with recognized scientific capital, but also simply those who are willing to actively contribute.

Beyond the lab: biosecurity education and awareness-raising

The stabilization of the science-security relations within the BWC is still an ongoing process – what we may observe is relatively stable, broadly accepted discourse about the need to secure scientific and technological progress linked with a plethora of new practices of

[44] Personal interview, 2nd December 2014, Geneva, representative of an NGO (1).

governing science and upheld by relatively fluid and unstable network of actors and institutions. This section looks at how the BWC is becoming 'a nodal point' linking and legitimizing a plethora of activities related to the governance of dual-use research in life sciences, which bring together and empower many new types of actors who implement the new biosecurity policies in practice. As a representative of one NGO notes, these activities are organized by diverse ad hoc groups of various actors:

> In terms of the actual work that we do outside this meeting, it's actually with NGOs (…). Interpol, we haven't worked with them in a while but we did do some things in the past. Also regional organizations such as the OSCE, we've also worked with them. That was more related to the UN Security Resolution 1540, but it's really diverse in terms of who you work with - international organizations, regional organizations, like the EU, and also NGOs in terms of workshops. And sometimes we partner up when they're already organizing something (…). It's not just NGOs, it's definitely more international organizations.[45]

Biosecurity education and training are a prime example in this regard. As discussed in the prior sections, the focus on science and technology in the BWC regime enabled the rise of new activities within the realm of informal politics, which substitute the lack of any binding regulations and agreements among State Parties. Most of these initiatives are aimed at promoting education on biosecurity and dual-use dilemma in life sciences and providing training in responsible conduct of science. For instance, a great emphasis has been paid to developing educational techniques, from online educational programmes to the development of educational workshops and the publication of biosecurity textbooks. The experts at the University of Bradford, for instance, wrote two textbooks about biological security targeted at undergraduate students of life sciences (Novossiolova 2016, Whitby et al. 2015).

These projects are run by many actors, from governmental agencies of specific states (among the most active are for instance the United States and Canada) or the EU to NGOs, scientific associations, and even individual universities. Examples of such endeavours include the establishment of CBRN Centres of Excellence, funded by the EU, or biosecurity educational workshops and conferences organized by the Interacademy Partnership – an international

[45] Personal interview, 2nd December 2014, Geneva, representative of an NGO (2).

network of science academies. For some of the involved organizations, these projects are an important part of their agenda and provide an opportunity to gain additional funding, e.g. from the EU grants.

The EU in general is very actively involved in these practices in several aspects. First, it offers grants for scientific activities promoting responsible research and innovation in life sciences, helping thus some projects run by scientific experts keep going. Second, it directly sponsors concrete projects and initiatives that build national capacities for dealing with biological risks in developing countries, such as the CBRN Centres of Excellence. Finally, the EU directly finances the BWC and supports its operation. As a part of the third initiative, the EU launched a project called BWC Action and established a small unit of experts who cooperate with the United Nations Office for Disarmament Affairs (UNODA) and the ISU in Geneva and coordinate the EU activities related to this project. The current BWC Action, mandated by the Council of the EU, concretely supports the organization of regional workshops for national and regional experts and officials related to the national implementation of the BWC and newly pronounced practices of biosafety and biosecurity, provides more specific (e.g. legislative or administrative) assistance with the national implementation, and develops and runs further 'enabling tools' such as an electronic database for the submission of CBMs or detailed guidance for the national implementation of the BWC (EU 2012).

The BWC meetings and conferences are vital for arranging and coordinating these activities. In fact, the site can be seen as a nodal point for these new connections, both at the formal and informal level. On the one hand, the outreach activities and assistance are promoted at side events and to some extent at the official diplomatic sessions, as discussed also in the prior section. The BWC then serves as a platform for arranging this type of cooperation as well as for promoting these practices to the broader audience. Side events are one of these channels through which the best practices in biosecurity are promoted and the collaboration between 'developed' and 'developing' states is discussed on concrete examples. For instance, in 2014, scientific experts organized a side event at the Meeting of State Parties about the progress in building the web of prevention, which was sponsored by the Ukrainian embassy. At this side event, three 'Western' scientific experts talked about the concept of web of prevention and their experience with implementing the suggested practices of

responsible science. Their presentations were supported by a Ukrainian bio-scientist, who was provided insights from the implementation of the web of prevention in Ukraine.

On the other hand, the backstage of the BWC meetings is a place where new projects are arranged and the progress of ongoing projects is discussed. It is impossible to avoid overhearing these debates, some of which may qualify as quite tough negotiations about the amount of financial assistance provided typically by Western countries as a part of their support of biosecurity and biosafety capacity-building in developing countries. Several interviewees actually confirmed that what happens in the lobby on the background of the meetings is for them more important than what is discussed in the plenary session or in the side events and some even acknowledged that they only come to Geneva to participate in these 'behind the scenes' negotiations, without entering the plenary room at all.

The rationality embedded in these projects comes close to the emerging system of life science governance described in the prior chapter. Therefore, the key focus of these activities is on promoting biosecurity education and raising awareness about the dual-use issues. Further activities include more specific projects, such as building or security a specific biological research centre, assisting with drafting national legislation and building a national system of biological risk management, providing training to local custom officers about the regulation of dual-use trade etc. These activities are typically organized under the auspices of the EU or national ministries of Western states, run by a network of national and international experts, who come from the relevant national institutes, globally active NGOs and academia, and are targeted at the states of 'global South', including countries from Latin America, Middle East, Southeast Asia etc.

Surprisingly, though, there is very little coordination among different projects. As several interviewees noted, this system is still very fragile, as it is driven by individuals rather than institutions and faces potential challenges, especially in terms of further funding. Despite their heterogeneity and the lack of virtually any coordination and institutionalization in the international (or specifically BWC) context, these projects share a very specific common logic combining the elements of development aid, science diplomacy, and non-proliferation politics. The projects are typically justified as strengthening the national implementation of the BWC and contributing thus to the prevention of the spread of WMD. At the same time,

though, the initiatives are to great extent run solely by scientific associations or with a significant assistance of scientific experts and are thus seen as a part of scientific diplomacy. In their basic features, nonetheless, the projects share the logic of development cooperation, even though they are not always funded from resources for these purposes. In the EU, for instance, an important initiative focused on building so-called CBRN Centres of Excellence is supported jointly by the European Commission's Joint Research Centre and the Directorate General for Development and Cooperation – EuropeAid, i.e. institutions involved in the governance of research and development cooperation, respectively (EU 2015).

However, these new policies and their promotion by scientific experts are not accepted by everyone. Especially developing states, i.e. recipients of the 'expert assistance', have mixed opinions on the involvement of scientific experts and the related reorientation of the BWC agenda towards apparently irrelevant issues not related to the original purpose of the BWC. While some actors see this type of practices as leading to a welcome course of additional funding that can be used for building local infrastructure, others perceive it as 'geopolitics by other means' and highlight that this agenda serves the purpose of the powerful states only and that the security concerns related to bioterrorism and the misuse of life science are not shared in their countries.[46] In fact, during official as well as unofficial interviews, some actors acknowledged that linking development aid and science diplomacy is a way to circumvent political obstacles that hamper official negotiations, so this interpretation may be seen to have broader roots.[47]

These observations are important for understanding the politics of biosecurity in several respects. First, they show how the link between the biological disarmament and biosecurity is forged in practice and how it is performed via novel arrangements involving actors and institutions that represent the scientific community, the community of NGOs, the public health community and the world of arms control diplomacy. One interviewee noted in this regard, for instance, that

[46] Personal interview, 4th December 2014, Geneva, diplomatic representative of a State Party (2).

[47] Personal interview, 2nd December 2014, Geneva, representative of an NGO (3).

> as soon as we talk things which are infectious diseases, we don't have national issues any longer, we have national capabilities, but they have to be put in a global context. And the best place to do that is to do that within the NGOs. So I really hope we can develop the relation, but it requires effort, not only on our part, but on the NGO part as well. But I think, what I see, generally speaking with the NGOs is that they are embracing these partnerships more and more.[48]

Second, the abovementioned practices also document that the BWC meetings have gradually evolved into a platform that brings together a broad scope of international actors, who use the BWC meetings to arrange new collaborations and coordinate the work in the existing networks related to the promotion of biosecurity. Beside the developments in the BWC that have enabled the greater involvement of scientific experts and the agenda they pursue, the status of the BWC as a nodal point in the global politics of biosecurity is partially made possible due to the fact that there is no other international institution with almost universal membership that would be devoted to dealing with the governance of science and coordinate action with regard to the governance of science and technology in the area of life sciences. Finally, the observed practices seem to reinforce the traditional North-South divides, exercised typically through the politics of development aid, the export of Western expertise to 'developing' states etc., which is in this case repeated via the novel practices of biosecurity education and training.

Science and security in the BWC: towards a new model of political governance?

To sum up, the politics of arms control has been one of the key areas of interest for strategic and security studies, which evolved after the World War II. This type of research associated the issues of arms control, disarmament, and non-proliferation with the politics among Great Powers and focused on the changing dynamic of arms control from the perspective their evolving national interests. This chapter sought to offer a different perspective on the politics of arms control and focused on the role of scientific experts in international non-proliferation regimes. Concretely, it looked at scientific experts in the biological weapons regime,

[48] Personal interview, 1st December 2014, Geneva, guest of the Meeting of State Parties.

established around the Biological Weapons Convention and their role in the changing agenda and practices of biological arms control.

The research shows that the development within the biological weapons regime enabled searching for new ways how to approach biological disarmament. With the rise of global war on terror and the broader international attention given to WMD, it became possible and in fact welcome to reorient the focus of the BWC politics towards bioterrorism and the security of dangerous pathogens rather the continue in the efforts to develop the verification mechanism that would enforce peaceful use of biology in state programs. This development allowed greater involvement of new types of actors in the regime and thus also new agenda in the BWC, prominently scientific experts associated with academia or scientific NGOs.

The involvement of scientific experts has affected the BWC regime in several ways. First, scientific experts have had a key agenda-setting and agenda-shaping role in the process. They were able to quickly rally around the new issue agenda related to bioterrorism that was promoted by some states after the unsuccessful transformation of the regime. Through their active and very visible involvement in the regime, they are able keep the issue of new biological threats high on the agenda and gradually add new topics related to the 'science and technology review' agenda item. In the words of one diplomat, "engagement of the scientific community has helped improve understandings of S&T[49] issues; helped promulgate ideas of dual-use governance and raise awareness of the BTWC and its prohibitions in the scientific community".[50] In fact, the concepts and discourses promoted by scientists have been gradually accepted by broader scope of actors. For instance, scientists have brought to the BWC new concept and practices, which became widely used, and they have also developed educational and training practices that are being adopted by a broad scope of actors in the BWC.

Second, even though the overall influence of scientists on the structure of the BWC work is seen as rather marginal by many actors involved in the BWC regime, their engagement has affected the very organization of the BWC meetings – side events organized by scientists, NGOs and similar actors have become quite popular among the diplomats and they allow

[49] Science and technology.

[50] Email interview 11th February 2015, representative of a State Party.

scientists to present their work, activities and perspectives on the issues dealt with at the BWC and thus make new connections between world of diplomats and the scientific practice.

Finally, scientists have had an important legitimization role and are seen as indispensable in the regime due to their credibility. Scientists broaden the scope of issues dealt with within the BWC and open up the debate for 'non-traditional' policy measures, which are often of apparently technical, apolitical character, such as those related to biosafety and scientific ethics. In other words, scientists are seen as a part of the solution, not as the problem, compared to other arms control regimes. This role has been possible partially due to the inability of diplomats to overcome the tensions between different groups of state with regard to the more traditional issues of arms control. What is more and more popular, instead, is scientific diplomacy through which 'soft measures', such as biosecurity education and training or funding of biosafety improvements in development countries, are promoted. Scientists thus become active in implementing policies that are discussed at the BWC and that mostly originate from Western states. Their activity is seen as a way to downplay tension between blocs of states and promote the biosecurity agenda in a depoliticized way, through bureaucratic politics. As one interviewee summed up,

> Safety goes into the labs, that is actually not as complicated, because these are rules. (…) People prefer to do safety because it's not very complicated. It's not intellectually complicated. Security is a big problem, because as soon as you speak security, you speak politics. And when you speak politics, all the challenges begin.[51]

Despite the transformation of these practices, though, many scientific experts as well as diplomats interpret the BWC regime as being in crisis without any signs of progress. In the words of interviewees, "the BWC is a particularly non-happening place"[52], which suffers from "an avoidance of decision taking and reluctance to agree to effective action" and becomes "more and more confrontational and sterile"[53]. This widespread 'frustration discourse' is understandable given the lack of institutionalization of the novel practices

[51] Personal interview, 1st December 2014, Geneva, guest of the Meeting of State Parties.

[52] Skype interview, 10th December 2014, representative of an NGO.

[53] Email interview 11th February 2015, representative of a State Party.

related to the politics of biosecurity and the inaction related to the processes of BWC verification and compliance, yet still somehow striking. The broader acceptance of the rationality of biosecurity and the novel security framing of science and technology, supplemented by the rise of new techniques of governing biological threats and risks can be thought of as a significant transformation of the BWC as a regime of practices on its own. In fact, some scholars see this fluid network of stakeholders and novel biosecurity practices as an alternative approach to disarmament rather than as an imperfect or in-progress system of governance. For instance, following Slaughter (2009), Millett (2010) calls this model 'an evolved networked approach' to arms control and disarmament. In fact, the very concept of disarmament has been questioned by some experts, who argue that neither the term disarmament nor non-proliferation accurately describes the nature of the contemporary biological (but also chemical) weapons regime. Instead, they prefer to speak of post-proliferation context, which "calls into question top-down coercive policy making and suggests the need for a more collaborative risk management and problem-solving approach involving relevant stakeholders, such as industry and the scientific community" (McLeish and Trapp 2011: 534).

When focusing on the implications of this dynamic to the relations between science and security, the developments in the BWC regime discussed above clearly point out the destabilization of the regime and the subsequent hybridization of governance, characterized by the securitization of science and technology and the development and promotion of insecurity practices, which is driven by new actors governing the boundary between science and security – scientific experts. In this context, science has actually gained two new roles: on the one hand, it has become a subject of interest for policy-makers and subject to new regulatory oversight, yet on the other hand, science as a social sphere as well as a specific discursive realm has become also a new 'backchannel', supplementing and even substituting diplomatic negotiations with expert activities and bureaucratic politics. In spite of the missing institutionalization of the current network of actors and practices that give content to the BWC non-proliferation politics nowadays, it is possible to conclude that what became relatively stable in this context is, first, the very security framing of the problems of governing research and innovations in life sciences and, second, the expert status of boundary actors who mediate knowledge and practices between the world of politics and

science. This insecuritization process may be consequently seen as leading to strengthening the role of ‘bureaucratic politics’ as a mode of governing bioweapons and organizing the relations within the BWC regime.

5 Biosecurity governance in a 'local' context: the Czech politics of CBRN

This chapter looks at the governance of biological threats and risks in the context of the Czech Republic. Specifically, it focuses on the sphere of non-proliferation bureaucracy, which bridges the areas of science and security politics in the Czech Republic. As a post-communist country that has recently experienced democratic transition and the integration into the Western economic and political structures, the Czech Republic is an interesting case for studying how broader (in)securitization processes related to the rise of biosecurity and the politicization of dual-use research translate to a new, 'local' context and how they affect the governance of science and security there. In fact, the Czech Republic considers itself – and to certain degree it is also recognized as such at the international scene – as one of the most active small states involved in the politics of non-proliferation and disarmament and a regional 'biotechnology leader' (see e.g. McLauglin et al. 2014: xi). Therefore, the potential for engaging in these processes can be seen as quite high. In research on changing approaches to biological weapons and biosecurity, though, most attention is given to either the United States and advanced Western countries such as the United Kingdom or to the promotion of biosecurity policies and practices in the 'developing' countries. However, the Czech experience with the international politics and diplomacy in the biological weapons regime is different from the most researched ones and so is also the national system of biosecurity and biosafety governance, including both broader structural arrangements and specific practices and techniques of governing biological threats and risks. From this perspective, the case study focusing on the biosecurity politics in the Czech Republic may be seen as filling this research gap.

The chapter concretely outlines the process of ideational and institutional change in the field of non-proliferation politics and explores the practices of biosecurity. It focuses on how the biosecurity agenda and notion of dual-use dilemma are brought to the Czech context, what are the discourses most often cited in this regard and what meanings they ascribe to the main actors in this area. The analysis focuses especially on the organization called State Office for Nuclear Safety (SONS) that have come to connect the spheres of security politics,

diplomacy, public health, trade regulation and science politics and regulate the handling of dangerous CBRN materials. The agency and relevance of the SONS in the area of non-proliferation has been confirmed by several types of interviewees, from actors associated with the issue of non-proliferation from the political, technical as well as academic perspective. The research draws on a set of semi-structured interviews with these actors and use additionally primary sources such as webpages, accessible internal materials of the relevant organizations, selected parliamentary debates, strategic texts related to the Czech foreign and security policy, educational texts and presentations for students of life sciences, and secondary literature.

Situating the Czech politics of non-proliferation

The research related to this case study was originally motivated by an attempt to explore whether and how a small state, recently involved in more intense interactions in the transnational sphere (especially through the incorporation into transatlantic political and security structures, such as the EU and NATO), reflects a particular 'global' security trend – specifically, the transforming governance of biological risks. Informed by the existing scholarly critique which points out the reactiveness and strategic and ideological emptiness of the Czech foreign politics (e.g. Drulák 2010, Hynek 2013), it was expected that the Czech response to this trend would be in line with this critique. The initial assumption of the research was thus that the notion of biosecurity and changing nature of biological risks would be to some extent formally and rhetorically adopted in the Czech context, but without any meaningful change in security practices and performances (referred as 'Švejkian' attitude by Kuus 2008).

Having approached the relevant agencies, though, it soon became clear that the initial assumptions do not hold. In fact, not only was the issue of biosecurity present and articulated in the discourse of various experts and foreign-policy bureaucrats, but the interviewees also repeatedly emphasised that they perceive the Czech Republic as one of the most active participants in the biological weapons regime and consider the Czech system of oversight over CBRN materials as highly advanced and unique in international comparison. This finding contributed to shifting the focus of this research to the logic of this activity, its meaning as well as implications. Why is the Czech Republic active in this rather arcane

field? Why do (some of) the Czech security bureaucrats tend to export their expertise abroad, participate in novel biosecurity policies, and why do they want to actively contribute to the European and global biosecurity governance?

The governance of biosecurity and dual-use is in the Czech Republic closely related to the realm of foreign-policy and to the policy area of non-proliferation. In order to understand the practices of governing biosecurity, it is important to first situate the above-mentioned puzzles in the broader context of the transforming foreign-political orientation of the Czech Republic. According to a prominent anthropologist Ladislav Holý, the awareness of being Czech is usually rather tacit and seldom an object of explicit discourse, perhaps apart from moments of crisis or situations of high symbolic value (Holý 1996: 9). Such moment was certainly the Velvet Revolution of 1989, which not only started a process of restructuring the state security and bureaucratic apparatus, but also shaped the Czech identity and the understanding of the role that the Czech Republic plays on the international scene. This transformation was tellingly expressed in one of the often cited slogans of the revolution and subsequent transition – the desire to 'return to Europe', which represented one of the rare clear enunciations of the content of the Czech national identity and a clear goal of the Czech foreign policy.

The notion of returning to Europe and the related vision of Western-based Czech identity strongly entered into the public debate and had a tremendous impact on number of both domestic and foreign policies (Holý 1996, Weiss 2011). This discourse was built on the assumption of the 'kidnapped West' – a belief that the Central Europe has always been a natural part of the Western civilization, but it was forcefully separated from the 'Western world' after the Second World War and the incorporation of the country in the Soviet sphere of influence (Kundera 1984). After the fall of Communism, the task was thus to reunite the Czech Republic (or previously Czechoslovakia) with the West. This was to be done via the reassurance of the Czech commitment to the Western values of democracy and human rights, transformation of institutions and joining the EU and NATO. Besides, the Czechs got involved in number of activities through which they aimed to gain the recognition as a 'good citizen' and a member of the developed world – from an active support of democracy and human rights in various international fora to the participation in peacekeeping operations in

Balkans or the support of non-proliferation initiatives (Fawn 2003: 206-208, Horký-Hlucháň 2015, Weiss 2011).

The narrative of the 'return to Europe' dominates the transformation of the Czech foreign policy in 1990s. Even though the ethos of Westernisation has somewhat lost traction in the second half of 2000s among certain parts of the public and political elites (Beneš and Harnisch 2015: 158-159), the notion of belonging to the Euro-Atlantic ('Western') world is strongly upheld in the key strategic documents on Czech foreign and security policy and by government officials. As prior research showed, these identity discourses also cross the boundary between two dominant foreign-political ideological groups active in the foreign and security policy apparatus – the Atlanticists (prioritizing strong alliance with the United States) and the Europeanists (favouring the EU and multilateralism) (cf. e.g. Hynek 2013).

One of the areas which the contemporary political elites seeks to focus on in their attempts to strengthen the Western character the Czech foreign policy is the politics of WMD non-proliferation. Even though the Czech diplomacy does not initiate any major new steps in this regard, it presents itself on the international scene as a devoted advocate of the non-proliferation of WMD firmly allied to sponsors of such initiatives. That is often reflected in the official statements at the UN General Assembly, where the Czech representatives, beyond expressing the usual commitment to the non-proliferation initiatives, repeatedly stress that the Czech Republic was the first European country that has ratified the Comprehensive Test Ban Treaty (UN 2013, 2014, 2015a), or highlighted the so-called Prague Agenda (a vision for nuclear disarmament) proclaimed by the US President Obama during his visit to the Czech Republic in 2009 and reviewed in Prague every year since. In fact, even holding this event in Prague is seen as a reward for the Czech activity in the field of nuclear non-proliferation. [54] Nonetheless, the attention given to nuclear non-proliferation trickles down also to less visible WMD non-proliferation issues, including biological non-proliferation.

[54] Personal interview, 19th February 2014 (1), Prague, two SONS representatives.

The creation of the CBRN bureaucracy in the Czech Republic

In fact, the international regime dealing with the biological disarmament established by the BWC treaty was not very active until the beginning of the new century and so was also the national politics in this area (Středa and Bajgar 2001). The agenda of biological protection have always been primarily in the hands of public health institutions. The Ministry of Health is responsible for managing biological emergencies, even though it collaborates with other relevant resorts in case of public health incident. In the past, the work with dangerous agents and toxins was mostly associated with military research and veterinary and microbiological research. However, the agenda of biological protection used to be more decentralized and the move towards greater centralization is only relatively recent.

In 2000, the Czech government decided to appoint the State Office for Nuclear Safety as the national body responsible for the implementation of the BWC and the administration and supervision in the area of biological weapons prohibition. The SONS is an independent governmental institution that is not subjected to any ministry, but reports directly to the Czech government and has its own budget. In fact, though, the SONS was not a new organization, it was founded in 1993 after the dissolution of Czechoslovakia and it took over competences in the supervision of the use of nuclear energy. Only two years after its establishment, the SONS co-opted the agenda of radiation supervision and protection, which had been previously dealt with in a decentralized way by multiple national bodies (SONS 2016c). Given the closure of many uranium mines, infamously related to the forced labour of political prisoners under the communist regime, and the planned – yet highly politicized and disputed – construction of the second nuclear power plant in the Czech Republic, the SONS soon became a publicly known and politically recognized actor, as it actively took part in the national debate on the use of nuclear energy, in which it represented the voice of experts. In 2000, the Czech government decided to assign the agenda of chemical weapons prohibition to the SONS, since it already had the appropriate institutional infrastructure and expert know-how to deal with these issues, and the same followed in 2002 with the agenda of biological weapons non-proliferation (SONS 2016c). Consequently, the SONS itself founded the National Institute for Nuclear, Chemical and Biological Protection (NINCBP), which was in fact a successor of several institutes that had previously conducted military

research and secret radiological research in uranium mines. Nowadays, the NINCBP provides technical and research support for the SONS in the area of radiological, chemical and biological agents (NINCBP 2014).

After the terrorist attacks in 2001, the issue of WMD received more attention in the Czech political arena. When NATO started to focus on other types of WMD, the Czech Republic as a new member was eager to prioritize the issue and took part in various international non-proliferation and counter-proliferation initiatives (Ministry of Foreign Affairs 2002: 83). However, for Czech politicians, the issue has remained uninteresting in terms of mobilizing domestic support or gaining political capital. The agenda thus remained with foreign-policy bureaucrats,[55] who acknowledge that the issue is very technical and complex[56] and welcome the engagement of SONS experts, while maintaining general oversight on the foreign-policy issues.[57] In this context, the SONS drafted a new legislation called Biological Act, which was adopted in 2002 and which establishes the SONS as an authority that regulates and supervises the handling of biological agents and toxins (SONS 2016a). Since then, the SONS has become the key national authority overseeing the secure handling of CBRN materials and the main actor representing the Czech Republic on the international scene in the area of non-proliferation and in the biosecurity networks.

Constructing the CBRN expertise: hybridization in action

The SONS gradually built a special status of a respected and trusted partner to politicians and ministerial bureaucrats, especially with regard to technical solutions in the non-proliferation area, but also in terms of strategic advice and planning.[58] This status can be explained by a specific combination of trust that has the SONS gained among governmental

[55] This could be well illustrated by the parliamentary discussions about biological weapons legislation, which received only very limited attention in either chamber of the parliament (PCR 2002a, 2002b).

[56] Given the compulsory 'rotation system' at the Ministry of Foreign Affairs, the positions of the bureaucrats change very often and it is thus difficult for them get fully familiar with this complex agenda. Source: personal interview, 10th February 2014, Prague Ministry of Foreign Affairs officer.

[57] For instance, most of the relevant legislation is prepared in specialized committees with SONS assistance, without being significantly changed later in the legislative process (PCR 2002c).

[58] Personal interviews, 10th February 2014, 30th March 2015, 4th May 2015, Prague, Ministry of Foreign Affairs officers.

bureaucrats during several heated debates on the issue of nuclear safety, long-standing belief that the Czech diplomacy shall pursue the aim of non-proliferation in international politics and the actual bureaucratic practices, affected by the lack of capacity to deal with the issue at the political level.

As already explained, the SONS officers gradually gained widely recognized reputation and prestige as experts on nuclear energy. As such, they started to be perceived as respected experts with valued scientific capital in relation to the political sphere as well as public. Given the common institutional framework as well as common material and to some extent also human resources, this expert status allows the non-proliferation professionals to act as a respected actor also in other areas related to the non-proliferation.

This applies especially to the relations between the non-proliferation bureaucrats and the political sphere. Among politicians and ministerial bureaucrats, the SONS enjoys a special status of a respected and trusted partner to whom they effectively pass on the initiative to put forward the strategic plans as well as technical solutions with regard to the area of biological non-proliferation, while maintaining a broader oversight over this agenda in the context of the foreign policy.[59] This status can be explained by a specific combination of a long-standing belief that the Czech diplomacy shall pursue the aim of non-proliferation in international politics and the actual bureaucratic practices, affected by the lack of capacity to deal with the issue at the political level. In broader context, foreign politics is in the Czech Republic of very little interest to general public and is characteristic by a lack of vision, reactiveness and political resignation (Hynek 2013). Despite the absence of a clear foreign-political strategy, the Czechoslovak and later Czech diplomacy has been quite active in the area of non-proliferation of WMD, even though this initiative was oriented towards nuclear weapons.[60]

The non-proliferation professionals, though, have gained reputation not only in the politico-diplomatic realm of foreign policy, but also among scientists, since they are themselves recruited mostly from research and academia. In fact, the Czech microbiological research has had a long tradition, going back to the progressive interwar period. Active interwar

[59] Personal interview, 10th February 2014, Prague, Ministry of Foreign Affairs officer.

[60] Personal interview, 10th February 2014, Prague, Ministry of Foreign Affairs officer.

scientists laid down the foundations of institutions as well as the standards and norms of the scientific work (Spížek 2002). Given the relatively apolitical nature of life sciences, the key structure of the scientific field remained more or less intact for a long time even during the communist era. The safety practices of scientific work became deeply internalized, as the interviewed experts and life scientists acknowledge, and together with the tight political control and relatively limited, yet closely regulated interstate movement of materials and persons created an environment of high biological safety – and in effect, also perceived security. Non-proliferation experts from both SONS and NINCBP even argue that on both institutional and practical basis, the biosecurity measures were functioning better than they do today.[61] After the end of the communist regime in 1989, the structure of the field was significantly changed, marked especially by the rapid decline in military research. Simultaneously, the political and economic openness of the country and the overall liberalization of business and research brought new challenges to biosafety practices.[62] Consequently, this enabled the rise of new actors with a specific form of knowledge, who have been able to navigate in the changed structural environment.

While the SONS bureaucrats are acknowledged for their scientific and field-specific expertise, their political relevance in the governance of CBRN issues is made possible by keeping the agenda as low-profile as possible in the political realm. The very beginning of SONS's engagement with biosecurity and related non-proliferation issues was driven by its professional scientific reputation acquired through its previous involvement with nuclear and chemical issues. Given its engagement in the international regimes as well as its position at the national level, the SONS bureaucrats assert that their expert opinions are trusted and they are able to push through most of its proposals as long as they do not deviate from the general foreign-political direction.[63] As one official described,

> this issue is, thank God, very apolitical and it is possible to find a consensus (…). When we ask for support, we get it from most of the politicians easier than some

[61] Personal interviews, 5th December 2013, Prague, two SONS representatives, and 23rd January 2014, Brno, two representatives of the NINCBP.

[62] Personal interview, 16th January 2014, Brno, professor of microbiology.

[63] Personal interviews, 10th February 2014, Prague, Ministry of Foreign Affairs officer, 19th February 2014 (1), Prague, two SONS representatives, and 4th May 2015, Prague, Ministry of Foreign Affairs officer.

> other [agencies], who then envy us. But it is based on a position built for a long time and long-term efforts of showing that the Czech Republic has some know-how.[64]

The key cited discourse is thus the one of long-standing technical and political expertise, proved in other non-proliferation areas (and beyond) and ready to be applied in biosecurity agenda as well.[65]

The language through which the non-proliferation activities and CBRN risk management is described also demonstrates that the CBRN professionals avoid the politicization of the issue area. For instance, biosecurity as a concept does not have an established meaning in the Czech technocratic language and some actors refuse to use it at all for its potential political connotations.[66] The biological law is also written without any mobilizing references and 'calls for action', which can be seen for instance in the US context, and the framing of all regulations and laws in this area is strictly legalistic and technocratic. As such, even though the non-proliferation professionals accept the discourse on the changing nature of biological threats and risks, which is increasingly promoted in the international arena, they resist politicizing the issue in the domestic context. To attract the attention among political decision-makers and in the scientific community, they present the issue of biological safety and security as relevant by invoking the language of international obligations rather than by using the language of security.[67] This approach resonates with the identity narrative accepted in the bureaucratic and political fields of the Czech Republic as a 'developed Western state' and active, if not leading, non-proliferation actor. At the same time, though, by consciously framing the issue as a technical problem, these actors can effectively emphasise their expert status and take over the agenda at the domestic level. Given their 'ability to keep their activities without major controversies', they are able to gain support for introducing new

[64] Personal interview, 19th February 2014 (1), Prague, two SONS representatives. The interview was originally held in Czech and the excerpt has been translated to English by the author.

[65] Personal interview, 1st April 2015, Brno, former intern at the SONS, and 8th April 2015, Brno, academic non-proliferation expert.

[66] Personal interviews, 5th December 2013, Prague, two SONS representatives, 7th January 2014, two representatives of the Crisis Preparedness Health Society, 10th February 2014, Prague, Ministry of Foreign Affairs officer, and 19th February 2014 (1, 2), Prague, SONS representatives.

[67] Personal interview, 19th February 2014 (1), Prague, two SONS representatives.

rules and security practices in the domestic context also in the political sphere, where their activities are not subject of serious political deliberation.[69]

In effect, the SONS is able to coordinate all domestic activities related to the biological non-proliferation, represent the Czech Republic in international expert regimes and at conferences, assists actors from the policy realm, and draft non-proliferation legislation.[70] SONS as the main coordinator of BWC implementation at the national level does not face many competitors in translating the issue to the domestic context. As outlined above, ministries which deal with biosecurity-related issues largely lack competences and willingness to form their own positions, as the issue area is quite apolitical.[71] Army, the traditionally dominant actor in this issue area, has been since the fall of communism in 1989 largely losing its position due to the perceived change of the broader social and security environment, overall status in the society and budgetary cuts. Despite its efforts to engage in certain international biodefence and biosecurity projects, its role in engaging in biosecurity governance is limited only to the military field itself.[72] As one of the NINCBP's officers noted, when asked about the Czech involvement in international biosecurity projects, "we are for example cooperating with the Norwegian Army. The people from the [Czech] Army are a bit jealous, because they feel they should do this instead of us."[73]

The employment and general acceptance of this discourse in the wider governmental field has its important implications for the ways how are the biosecurity issues governed. Based on its perceived competence and the very ambiguity of the biosecurity agenda, SONS is able to coordinate all domestic activities related to the biological non-proliferation, represent the Czech Republic in international expert regimes and at conferences, assists actors from the

[69] Personal interviews, 5th December 2013, Prague, two SONS representatives, 10th February 2014, Prague, Ministry of Foreign Affairs officer, 19th February 2014 (1), Prague.

[70] Personal interviews, 5th December 2013, Prague, two SONS representatives, and 19th February 2014 (1, 2), Prague, SONS representatives.

[71] Personal interviews, 5th December 2013, Prague, two SONS representatives, and 10th February 2014, Prague, Ministry of Foreign Affairs officer.

[72] Personal interview, 19th February 2014 (1), Prague, two SONS representatives.

[73] Personal interview, 23rd January 2014, Brno, two representatives of the NINCBP. The interview was originally held in Czech and the excerpt has been translated to English by the author.

policy realm, and draft non-proliferation legislation.[74] This form of engagement with biosecurity reiterates the perceived expert status of SONS among the foreign-policy bureaucrats. In fact, as the main coordinator of BWC implementation at the national level, it does not face many competitors in bringing the issue to the domestic context and setting the nature of the biosecurity initiatives. As outlined above, ministries which deal with biosecurity-related issues largely lack competences and willingness to form their own positions, as the issue area is largely perceived as technical and fully transferable to bureaucratic experts.[75] The SONS officers reiterates the technical and apolitical framing of this policy area (and themselves), both rhetorically as well as through other performances towards various audiences. For instance, at the seminar for actors working in the private companies and laboratories, academia or research and dealing with (highly) hazardous agents and toxins, they described themselves as mere bureaucrats and justified their role as well as the agenda they pursue mostly by the language of legal regulations originating from international obligations of the Czech Republic, which was also accepted as such by the audience.

'Westernization' and localization of biosecurity practices

The changes in dealing with biological threats and risks are visible at many Czech institutions that are in any way involved in this area. Many changes can be seen as the result of international emulation as a part of the broader practices of Westernization. However, not every emulation is situated in the identity discourse and interpreted as an example of Westernization. Instead, some developments are presented as specifically 'Czech' modification of internationally circulated practices serving the purposes of Westernization. Aligning the Czech Republic to the West and the family of developed states through performance of advanced expertise in the particular policy area still lies at the core of the

[74] Personal interviews, 5th December 2013, Prague, two SONS representatives, 7th January 2014, Prague, two representatives of the Crisis Preparedness Health Society, and 19th February 2014 (1, 2), Prague, SONS representatives.

[75] Personal interviews, 5th December 2013, Prague, two SONS representatives, 10th February 2014, Prague, Ministry of Foreign Affairs officer, 30th March 2015, Prague, Ministry of Foreign Affairs officer.

particular activity, yet the international discourses and practices of science-security cooperation should be adjusted to the local context.[76]

One set of new practices related to biosecurity governance thus comes from distinct sites, as some local actors promote specific practices related to the management of biological risks that are inspired from abroad. These practices include areas such as laboratory safety rules, common trainings and exercises between different sectors of integrated rescue system etc. Such initiatives are typically unsystematic, driven 'from below' and to great extent limited only to a particular institutional setting. An example of adopting biosecurity practices 'from below' is the establishment of so-called Biohazard Teams as a component of national rescue system, which brings together health, veterinary and hygiene professionals in response to complex emergency situations. This initiative started in some regions at the beginning and was in fact institutionalized and recognized by the Ministry of Health only after several years of existence as a result of international pressure to advance the system of governance in this area.[77]

Another specific case of biosecurity practices inspired from abroad can be found in the military field. Reacting to its decreasing status in the society and to the broader trend of redefining the role of military in the post-Cold War world, the Czech army have sought to adapt to the new structural environment and incorporated among else the agenda of preparedness to biological threats and risks. The army even founded a NATO-supported centre specializing in CBRN defence and a high-tech Biodefence Centre in Těchonín. The Biological Defense Centre in Těchonín was founded in 2002 amid the greatest fears of global (bio)terrorism. It is a military hospital under the highest biosafety levels (3 and 4) equipped with laboratories for the diagnostic of selected biological agents, which classifies it as one of approximately 40 high-containment facilities in the world (Federation of American Scientists 2013). The center was supposed to become a vital part of the NATO biodefence system and exemplify thus the Czech contribution to the alliance politics. Since its very

[76] Personal interviews, 19th February 2014 (1, 2), Prague, SONS representatives.

[77] Personal interview, 7th January 2014, Prague, two representatives of the Crisis Preparedness Health Society.

costly foundation,[78] though, the biodefence center has remained unfinished and has been of no use – no one has ever been treated there. However, despite many calls to close down the facility, the Czech army has always been able to defend the existence of the hospital, justifying its relevance against various security threats and shifting the meaning of the purpose that the biodefence center is to serve. As such, these initiatives are perceived by other domestic actors as problematic and unprofessional, and in effect costly and detrimental for the Czech image in international politics.[79] The army's engagement in biosecurity governance has thus only very limited impact not only internationally, but also at the domestic level.

On the contrary, the actors who are able to dominate the promotion of biosecurity practices at the national level are non-proliferation experts from the SONS. Drawing on their 'boundary' expertise, these actors are able to link the knowledge on scientific expertise and resources with the political demands of the politico-diplomatic sphere and situate their activities in the practices of Westernization, supported by the foreign-policy audience. This also relates to the boundary practices that link science and security politics. Being aware of the specificities of the local field, they stress that they do not aim to transpose specific policies from the transnational sphere or other states into the Czech context, but seek to adjust them to the local science, from which they originally come, so that they do not harm research with harsh measures. [80] To illustrate this perspective emphasising the importance of local knowledge with a (metaphorical) example given by one of the interviewed officers about the encounter between the 'local' and 'global': "The Americans came with their perfect PowerPoint slides, but no one understood them and they were not able to run their slides on our machines."[81]

[78] The estimated total costs of the Biological Defence Centre in Těchonín are 2,900 million Czech crowns, i.e. ca. 120 million US dollars (Supreme Audit Office 2015).

[79] Personal interviews, 7th January 2014, Prague, two representatives of the Crisis Preparedness Health Society, 23rd January 2014, Brno, two representatives of the NINCBP, and 19th February 2014 (1), Prague, two SONS representatives.

[80] Personal interviews, 19th February 2014 (1, 2), Prague, SONS representatives.

[81] Personal interview, 4th March 2015, Prague, SONS representative. The interview was originally held in Czech and the excerpt has been translated to English by the author.

At the same time, these actors are able to assess which of their suggestions can gain political support and which would be too controversial, changing the structure of governance too much that it would change the structural arrangements of CBRN governance too much. In this regard, they note that thanks to their initial informal negotiations with all the concerned parties (politicians, researchers, private companies, bureaucrats), they have been so far always able to design and push through new legislative and regulations without much opposition.[82] The SONS therefore aims to fully implement all the international obligations with accordance of the internationally developed scripts and rationalities, yet in the actual performance on the domestic stage it employs the long-established local discourses (cf. Kuus 2008).

Governing the CBRN circulations

In the area of biosecurity and biosafety governance, the SONS is specifically engaged in introducing two types of biosecurity practices. The first ones relate to the delimitation of select agents and toxins, their tracking, recording and oversight over handling. Concretely, the SONS

> supervises handling of highly hazardous and hazardous biological agents and toxins (...); issues, modifies and cancels licences for handling of highly hazardous biological agents and toxins; maintains a database which contain information about licence holders, (...) persons handling hazardous biological agents or toxins, (...) species of highly hazardous and hazardous biological agents and toxins within the territory of Czech Republic, (...) facilities handling these agents and toxins; executes national inspections. (SONS 2016a)

These principles are not unusual in the international comparison, but what differs among states is the concrete regulatory framework and the level of its institutionalization. The SONS in this regard actively develops a system of complex and highly centralized CBRN surveillance, which is justified by the benefits of the 'synergy effect' of linking all the components of the CBRN agenda – the regulation and oversight over the handling of chemical, biological, radiological and nuclear materials. In fact, this system is quite unique

[82] Personal interview, 19th February 2014 (1), Prague, two SONS representatives.

in international comparison. A similar agency was established also in Australia in 1999 (Australian Safeguards and Non-Proliferation Office), but in other countries this agenda is dealt with in a decentralized manner. Typically, each part of the CBRN agenda is governed to some extent separately and also by different actors, including police, army, health professionals etc. Therefore, the Czech system is presented in the international arena as a 'good practice', which is meant to inspire other countries and promote international standing of the Czech Republic.[83]

The core of the CBRN governance promoted by the SONS is a very technical and centralized approach towards the governance of biosecurity. The key basis of this approach is described in the legislative framework established for this area by the *Act No. 281/2002 Coll., on Some Measures Related to Prohibition of Bacteriological (Biological) and Toxin Weapons and on Amendments to Trades Licensing Act*. This Act is supplemented by *Decree No. 474/2002 Coll*., which includes a list of highly hazardous biological agents and toxins and hazardous biological agents and toxins. Further elements of the legislative framework draw on regulations regarding the national implementation of the EU export control related to dual-use items, public health legislation and regulations regarding occupational and public safety and environmental protection (Kubátová 2014: 63-64).

The SONS serves as a nodal point where any institution or company that seeks to work with highly hazardous biological agents and toxins needs to ask for permission. In the application submitted to the SONS, the given institution has to specify the type and amount of these agents and toxins, explain the purpose of working with them, establish a contact person responsible for the handling with these agents and toxins and provide a proof of her professional capacity to handle these materials. Besides, the institution shall provide a proof of a clean record of the statutory representative as well as the person responsible for the handling with the (highly) hazardous biological agents or toxins and a technical documentation regarding the buildings and laboratories in which the work will be conducted. For working with hazardous biological agents and toxins or when importing or exporting

[83] Personal interview, 19th February 2014 (1), Prague, two SONS representatives.

biological agents or toxins to or from the Czech Republic, the institutions are obliged to notify the SONS this intend and provide further details (SONS 2016b).

However, the SONS argues that the current system is already in some respects obsolete and has thus prepared a new legislative framework.[84] The argument for changing the legislative framework is two-fold: first, based on the reflection of the existing practices, some mechanisms apparently do not work enough, such as in the area of trading with biological materials, and second, there is an international pressure to states to better secure CBRN materials. While the international community originally put the emphasis on interstate compliance, the current approach is towards securing CBRN materials against theft. The SONS seeks to accommodate these trends and focus more on the security of pathogens and the oversights over organizations and companies that may violate the biosecurity norms.[85] As a part of this approach, the non/proliferation professionals plan to strengthen the principles of biosecurity governance and instead of merely controlling the flow of pathogens, they seek to adopt so-called 'graded approach'. Graded approach is a safety principle already applied e.g. in securing nuclear facilities and activities and which is based on applying different levels of stringency of control over products or processes in response to the estimated risks if the control would be lost.[86]

The structure of power relations in this area can be well demonstrated on the example of reporting data on so-called confidence-building measures (CBMs) to the BWC (Figure 5). The CBMs are collected "in order to prevent or reduce the occurrence of ambiguities, doubts and suspicions and in order to improve international co-operation in the field of peaceful biological activities," as decided at the Second Review Conference to the BWC in 1986 (UN 1986: 7). The reports on CBMs are gathered by the ISU BWC at the UNODA and they include data on national research centres and laboratories, biodefence research and programmes, vaccine production facilities, information on disease outbreaks, selected

[84] The draft bill is planned to be read by the Czech Government in October 2016.

[85] Personal interview, 19th February 2014 (1), Prague, two SONS representatives.

[86] According to the International Agency for Atomic Energy, graded approach is defined as follows: "For a system of control, such as a regulatory system or a safety system, a process or method in which the stringency of the control measures and conditions to be applied is commensurate, to the extent practicable, with the likelihood and possible consequences of, and the level of risk associated with, a loss of control" (IAEA 1979).

scientific publications related to the science and technology advancements that are relevant for the BWC, data on national legislative and regulatory framework regarding the handling of biological agents and toxins etc.

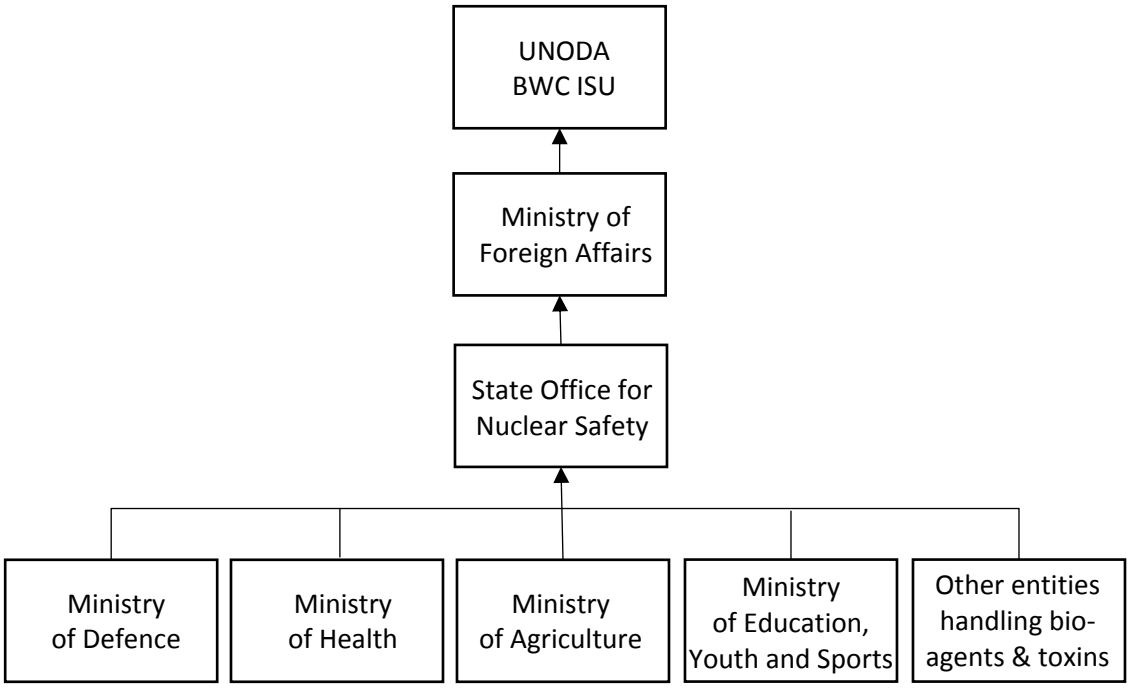

Figure 5: Data collection network of the BWC CBMs in the Czech Republic

The Czech Republic regularly submits these reports, even though it is not a binding obligation, and the reports are publically available at the website of the BWC ISU. In the Czech Republic, the SONS serves as the national contact point for all BWC-related matters and as such, it also collects and processes the data and prepares the annual report for the ISU on CBMs. Figure 5 (based on Kubátová 2014: 65) depicts the process of collecting data relevant for the CBMs submitted by the Czech Republic to the biological weapons regime.

As the figure shows, the data flow is centralized at the SONS, which communicates with different types of actors and institutions at the national level and gathers data on the broad of scope of activities that are relevant for the BWC regime. These are associated with specific ministries and include, among else, Military Medical Agency, Faculty of Military Medical Sciences at the University of Defence (Ministry of Defence), State Veterinary Administration (Ministry of Agriculture) and several more (Kubátová 2014: 65). The SONS

submits the report to the BWC via the United Nations Department at the Ministry of Foreign Affairs, but since it is very technical issue, the ministry does not typically intervene in this process and submits it to the UNODA, where it again gets into the hands of experts working for the ISU. As one interviewee noted, the Ministry of Foreign Affairs can be seen as a 'gate keeper' for all international activities in the area of biological disarmament and biosecurity, the SONS supervises the implementation of the BWC in the domestic context, and the scientific community is completely uninvolved of this process.[87]

In the shadow of biosecurity politics: science and technology governance

The second group of practices that the SONS promotes could be described as educational activities. The importance of these activities has been repeatedly stressed by experts at the transnational level as of the most important aspects of biosecurity governance, as discussed also in previous chapters. These practices have in the past few years risen in prominence in the Czech scientific field, but are still of limited relevance for reconfiguring the relations between science governance and security politics.[88] These practices are primarily aimed at raising awareness among life scientists, research and medical professionals, customs officers, and other bureaucrats involved in handling with biological agents about the potential security implications of their work. SONS in this respect promotes full implementation of biosafety principles and as a further step suggests developing new biosecurity practices in education, which shall minimize the risk of misuse.[89]

Life sciences and biotechnology industry are rapidly evolving in the Czech Republic. While life sciences as an academic field have a long tradition in the Czech Republic (and Czechoslovakia), current trends are the rise of private biotechnology industry and the overall internationalization of the field (Kadlecová 2012, Kubátová 2014: 56). This internationalization is significant not only in the very practices of research (e.g. in terms of research cooperation or target journals for the publications of Czech scientists), but also increasing involvement of Czech researchers in international projects, especially those

[87] Personal interview, 19th February 2014 (2), Prague, SONS representative.

[88] Personal interview, 16th January 2014, Brno, professor of microbiology, and 19th February 2014 (2), Prague, SONS representative.

[89] Personal interviews, 5th December 2013, and 19th February 2014 (1, 2), Prague, SONS representatives.

funded from the sources of the EU.[90] Most research in this area specializes in plant and animal biotechnology, bio-pharmacy and biomedical research as well as in traditional areas of brewery and diary (Kadlecová 2012: 8).

Biodefence projects of the Czech Republic have been conducted primarily by research institutes under the umbrella of the Ministry of Defence, by the NICBP Department of Biological Protection and some research institutes and private companies. Many projects targeted especially at private companies specializing in the production of CBRN protection materials have been funded by the Ministry of the Interior (Kubátová 2014: 57-60). These companies, some of which are associated in the Czech NBC Team, cooperate closely not only with the professionals from the sphere of internal security, but also with academic researchers with military security expertise.[91]

Inspired by the international efforts in the area of biosecurity educational and awareness-raising about the problems related to the dual-use research, the non-proliferation professionals from the SONS attempted to map this area in the Czech Republic. The SONS acknowledges that this initiative was directly inspired by a report on biosecurity education in Europe *Fostering the Biosecurity Norm: Biosecurity Education for the Next Generation of Life Scientists* (Mancini and Revill 2008), prepared by Landau Network Centro Volta in Italy and the University of Bradford in the United Kingdom and presented at the Meeting of State Parties to the BWC in December 2008 (Kubátová 2014: 64). In 2009, they conducted a survey aimed at the awareness about biosecurity, biosafety and dual-use work among twenty life science faculties in the Czech Republic. The results of the survey showed that

> approximately half of undergraduate students had some practical knowledge of biosafety (because of their study modules), but only a quarter of them were familiar with biosecurity issues. Dual-use issues were familiar to about half of all doctoral

[90] Skype interview, 22nd November 2013, microbiologist, personal interview, 16th January 2014, Brno, professor of microbiology.

[91] Personal interviews, 8th April and 3rd June 2015, Brno, academic non-proliferation expert. However, neither the structure of relations among these actors nor the practices at the boundary of military research and primate CBRN companies have been subject to this research, due to the lack of data and more difficult accessibility to this social field.

> students, while a third were aware of the BWC and its provisions. (Kubátová 2014: 64)

Based on these findings, the SONS concluded that "university educational modules lacked biosecurity and dual-use elements in regular life-science curricula" (Kubátová 2014: 64). The SONS would like to implement some elements of biosecurity education into the existing curricula, especially because they are preparing a new legislative framework in which the biosecurity principles would be more accented anyway and these steps would thus go in the same direction. However, in their words, they respect the boundaries of science policy and acknowledge that their role shall not be to directly intervene in the system of education, since they lack competences, capacities as well as funding to do so. At the same time, though, they believe that if they are to set the biosafety and biosecurity standards and define the conditions for the work with dangerous agents and toxins, they shall also explain these moves to the scientific community.[92]

In the Czech Republic, compared to other countries, this process of introducing biosecurity practices and raising awareness about dual-use research is driven exclusively by non-proliferation professionals who draw on their scientific expertise, but act as state bureaucrats. The community of life scientists is not involved in this process and if so, they seem to act only as an audience, not as securitizing agents who would seek to bring any structural change. This does not mean, however, that scientists do not stimulate any changes in the regulatory practices in science as such. For instance, the intensive internationalization of scientific cooperation often motivates individual scientists to bring concrete 'best practices' in more specific areas from abroad to their respective laboratories and workplaces.[93]

In the scientific community, the SONS is seen as a respected partner, who acts pro-actively and seeks to raise awareness about new types of biological threats and risks, especially in the past few years. Albeit drawing on its scientific expertise, for the community of researchers the SONS is a bureaucratic actor who communicates with them in the language of rules and obligations and derives its legitimacy from its legal status. In principle, the role of the SONS is not problematized or disputed and the scientific community seems to accept

[92] Personal interview, 19th February 2014 (1), Prague, two SONS representatives.

[93] Personal interview, 16th January 2014, Brno, professor of microbiology.

the overall logic of the regulatory framework. However, some researchers argue that the existing regulation is sufficient and it is not necessary to expand it and introduce new rules and practices. Scientists do not know or speculate about the international activities of the SONS and their attempts to develop the Czech system of oversight as a model for other countries.[94]

Interestingly, when communicating with the scientific community and presenting their agenda on biosafety and biosecurity (either at a seminar that I attended, at a conference or e.g. in email communication), the SONS does not seek to frame this agenda in the language of biological threats. Instead of referring to the contemporary bio-threat narratives and the risks of bioterrorism (such as those outlined in the introduction), they justify the changing governance of biological research mostly by the international legal obligations of the Czech Republic and the developments within the biological weapons regime in particular (Kubátová 2009).

Exporting the 'best practices'

However, the aforementioned practices promoted by the non-proliferation professionals are developed not only for the domestic field, but are meant also 'for export'. This export takes two forms: first, through diplomatic cooperation within the biological weapons regime, and second, through the organization of practical seminars, exercises and trainings for CBRN experts from other states. An example of the former is the Czech contribution to a working paper prepared in collaboration with Canada and Switzerland, which is supposed to provide a blueprint for the national implementation of the BWC (UN 2012b). The working paper was presented at the Meeting of State Parties to the BWC in December 2012 and contains a detailed description of the Czech, Canadian, and Swiss national legislatives and institutional frameworks for implementing the BWC and information about a practical implementation of this system. The working paper presents the SONS and the Ministry of Industry and Trade in the Czech Republic as the key bodies responsible for this agenda, with the Ministry of Industry and Trade focusing especially on the supervision of trading with dual-use items. In

[94] These findings are supported by several formal as well as informal interviews with researchers in the field of life sciences. Nonetheless, no comprehensive survey was conducted for this purpose.

practice, though, the Ministry of Industry and Trade has only rather formal functions especially in the area of licencing, while the logic of this governance is shaped mostly by the SONS.

The latter activities relate to international collaboration at the level of non-proliferation professionals and CBRN practitioners. Referring to the contemporary challenges of the BWC regime regarding international harmonization and implementation, SONS actively participates in education, training and capacity-building activities related to CBRN management in 'developing' states, especially in the Middle East and the post-Soviet region, and offers technical support and assistance to developing countries in implementing the BWC CBMs.[95] In fact, several interviewees raised this issue themselves during the course of the interviews and stressed that the low-quality biosafety and biosecurity standards in developing countries are a great security concern for the international community. Positioning themselves in contrast to the states with underdeveloped biosafety and biosecurity practices, they highlighted that the Czech Republic as a developed country actively diffuses the best practices and thus helps prevent the spread of biological risks originating from these countries.[96]

This practice and its interpretation demonstrates that the Czech non-proliferation professionals identify themselves with the transnational field, seek recognition in it by highlighting their domestic achievements and actively perform their role as members of an active and responsible state. As the non-proliferation professionals note,

> we participate in all conferences, are a member of all organizations (…) No one has invited Slovaks to the Hague conference, no one is speaking with Austria, or even with Poland, which is a much bigger country. Thanks to our non-proliferation activities, we can be at the same level as much bigger countries, for example Germany (…). It is like in ice hockey – we are a small country, but we can play at the top level.[97]

[95] Personal interviews, 5th December 2013, Prague, two SONS representatives, and 8th April 2015, Brno, academic non-proliferation expert.

[96] Personal interviews, 5th December 2013, Prague, two SONS representatives, 23rd January 2014, Brno, two representatives of the NINCBP, and 10th February, 2014, Prague, Ministry of Foreign Affairs officer.

[97] Personal interview, 19th February 2014 (1), Prague, two SONS representatives. The interview was originally held in Czech and the excerpt has been translated to English by the author.

> In general, we are among very developed European countries [in the CBRN protection]. Top five or top six I would say.[98]

The effective promotion of nationally tested 'best practices' is clearly interpreted as contributing to improving the Czech position in the international sphere and to certain extent, it could be seen as driving the agenda forward.[99] By reinforcing the beliefs and narratives of the identity of the Czech Republic as a 'developed Western state', which acts side by side with its 'Western partners', the non-proliferation bureaucrats are able to gain support and legitimacy for their international activities at the domestic level.[100] Whether or not this image of the Czech Republic as a forerunner in the area of biosecurity is accepted in the international area is yet a question that does not have an easy answer. On the one hand, the Czech CBRN professionals certainly do not demonstrate their activities towards the international audience in any significantly visible manner and nor they present them actively in the BWC among the most vocal proponents of the new approaches to biological disarmament. On the other hand, to what extent the Czech system of oversight and regulation of the CBRN materials really serves as an example for bureaucrats and experts from other countries is a questions that cannot be answered sufficiently at this moment for the lack of data in this regard.

Neither scientific, nor security agents: the rise of CBRN expertise

This case study looked at how security technocrats have built a system of CBRN risk management and became thus active in the process of insecuritization of biological threats and risks in the Czech Republic. First, the chapter discussed how the broader changes in the political field have enabled the rise of this specific types of bureaucratic actors, who legitimize their role by engaging in broader trends in security governance at the international

[98] Personal interview, 23rd January 2014, Brno, two representatives of the NINCBP. The interview was originally held in Czech and the excerpt has been translated to English by the author.

[99] Personal interviews, 5th December, 2013, two SONS representatives, 10th February 2014, Prague, Ministry of Foreign Affairs officer, 19th February (1), Prague, email interview, 12th January 2014, diplomatic representative.

[100] Personal interviews, 5th December, 2013, two SONS representatives, 10th February 2014, Prague, Ministry of Foreign Affairs officer, 19th February (1), Prague, two SONS representatives, 4th March 2015, Prague, SONS representative.

level and thus contributing to the Westernization of the Czech foreign policy. Specifically, the chapter showed that the active non-proliferation politics responds to the global demands for creating new types of security experts, who understand the logic of new threats and risks and are willing to actively pursue this type of politics. The research showed that the strong pro-Western orientation of the Czech security bureaucrats enables them to not only legitimise their activities and building their own position in the broader field of power, but also reinforces and re-constructs the Czech political identity in specific, seemingly apolitical practices at the boundary of domestic and foreign policy-making. Concrete expressions of this performance are for instance the attempts to export the Czech expertise and best practices to the states with an underdeveloped systems of bio-risk management as a part of the active participation of the Czech Republic in the international regimes.

This Westernization of the Czech identity, the internal political and institutional changes, and the ambition to contribute to the politics pursued by the United States and its allies may be understood as factors which make possible the rise of actors who perform the transforming Czech identity on concrete practices. Experienced and educated non-proliferation professionals, who are able to exercise the role of trusted experts in the political and public arena, accommodate the local scientific field, become socialized in the international non-proliferation networks, and orient their activities towards the demands of the 'West', are a perfect fit for giving a concrete meaning to the Westernization of the Czech foreign and security politics.

Even through the dynamic of 'insecuritization' of CBRN is very different from that experienced in the BWC regime, the developments in the Czech field of non-proliferation bureaucracy actually resonate with the broader trends brought about by the politics of biosecurity – the focus on governing the circulation of dangerous pathogens, no matter where they come from or which threat they may be related to. As such, the expertise of the currently praised experts is centred around the ability to define undesired type of subjects and forms of circulations and then govern the circulation of these materials.

Through employing these techniques of governance, the SONS de facto constructs a set of securitized objects and actors existing in a special security regime. By establishing the subject of governance at the level of biological agent or toxin, the SONS engages in a very

complex structure of relations with all sorts of actors, from scientists working at universities and research centres to private laboratories and biotechnology companies. Instead of securitizing a whole scope of activities in these spheres, though, the SONS exercises its power over science by regulating only a subset of scientific practices which involve the handling with specifically defined security objects – (highly) hazardous biological agents and toxins. The newly planned regulatory approach is situated in the discourse of biosecurity and shall draw on different techniques of government. Especially interesting is the planned focus on risk assessment, which shall come close to the emerging system of biosecurity regulation in Western countries and which shall define biological dangers and the strength of regulatory measures based on the type of activities and processes conducted at a specific workplace rather than solely based on the type of biological material that is used in the experiments. Similar to the developments in the United States and elsewhere, the new Czech approach to biological security shall build on the idea that biological threats and risks are not necessarily defined by specific biological materials, but are a product of a more complex assemblage of materials, technologies, equipment, and know-how. Due to the lack of data, however, it was not possible to analyse the principles of the system of risk assessment and the logic of the regulatory practices, which are under preparation, in more detail. In both types of governance, nonetheless, the SONS shapes the practices of scientific as well as commercial research by a technocratic, apparently apolitical measures.

To sum up, the SONS backed by the broader field of non-proliferation professionals embodies a very specific type of social sphere which not only crosses, but also effectively blurs the boundaries between the traditional policy areas such as diplomacy, trade regulation, science politics. Instead of boundary discourses and practices that would redefine what is science and how it differs from security, however, the SONS experts create and regulate new categories – categories that go beyond the science-security dichotomy. Therefore, to understand what the SONS does, we need to abandon the categories of normal and exceptional politics and understand exceptionality as constructed at the level of concrete practices that the SONS regulates. As such, these regulatory practices as presented not as the governance of broader issue areas or even social spheres, such as science, or as ‘high’ or ‘low’ politics – instead, the SONS interprets its role as ‘merely’ involved in the governance of the circulation of CBRN materials. Through these practices, though, the SONS is able to

monopolize the CBRN expertise and knowledge in the national context, which is a basis for intervening in the conduct of conduct in different social spheres. This move may be seen as so powerful precisely because it is not linked with the securitized or politicized categories such as science and security, but is based rather on identifying dangerous objects, defining the rules and practices for their handling, and policing their circulation throughout their whole 'life cycle'.

In effect, constructing new issue areas by bureaucratic actors with recognized scientific capital and subjecting them to insecuritization governance has further social and political implications. The implications of this boundary work range from shaping the structure of power relations and changing the type of recognized power and expertise in a specific area to the very effects on the governed subjects whose behaviour become target of the novel regulations and risk management practices. In general, this case also serves as a reminder that even though security may be depoliticized and translated into seemingly technical sphere of bureaucracy, 'the political' is still present and cannot be played down.

6 Towards an ethicalization of security?

What are the implications of the novel forms of governing biosecurity and dual-use research to the politics of security and insecurity? Based on the findings from the previous chapters, this part seeks to discuss in more detail one specific feature that seems to be present in the emerging discourses, practices, and governance structures related to the governance of biosecurity and the dilemma of dual-use under study and that is the securitization of scientific knowledge and the related development of ethics-based practices of security governance in science. This feature plays out prominently in the emerging US system of regulating life sciences, yet since the Unites States actively promotes the promotion of this system in many other countries, is starts to play a more important role also in international negotiations on biological weapons and practices of biological non-proliferation.

This work finds that the attempts to secure potentially dangerous research and innovation are based on redefining the principles and practices of scientific responsibility and transforming an ethics-based system of governance into a technology of security. The aim of this chapter is to discuss the implications of constructing this new subject of security governance, developing and implementing new techniques of security governance, and creating a new type of security expertise at the boundary of science and security that involves in the new politics of scientific (in)security.

Securitization of scientific knowledge

The first part of this work looked specifically at the overlap between science and security in relation to the contemporary governance of scientific knowledge in life sciences. Coming from the perspective of International Political Sociology, the thesis suggested that the recent securitization of scientific knowledge is based on an instrumental hybridization of scientific practices of knowledge production and circulation and their subordination to the practices of security. Albeit initiated in the field of national security, these changes are implemented by scientific authorities (professional societies, educators, institutional leaders, journal editors, publishers etc.), whose social and scientific capital is upgraded to 'security expertise' and who are consequently empowered to act as guardians of secure science. As a response

to the perceived need to secure scientific research, experts acting at the boundary of science and security politics become active players in developing new rules of scientific work, designing the transformation of scientific practices, and reinterpreting the existing norms and values in science.

Consequently, scientists are supposed to adopt the practices of risk management and, through risk-benefit assessment, weight the benefits of research against the newly defined security values. Apart from its questionable 'efficiency', this innovative form of security governance may shape the habitus of scientists and the way scientists are trained to think and act. Based on a sophisticated modification of field-specific norms and practices, this regulatory framework has far-reaching implications for the 'rules of the game' in modern life sciences. This raises further questions: what does this trend mean for the responsibility for security governance? How does it affect the role of science in the society? And how does it affect the practices of security expertise and security governance in other areas?

Ethicalization of security

The analysis shows that the emerging governance of dual-use research life sciences is marked by a blurring boundary between security and scientific ethics. Arguably, though, the process of integrating the logic of security into ethics-based governance in the field of science is more complex than securitization, as it involves new sites, new actors, and new routes and, more importantly, brings about new implications for the politics of (in)security. Consequently, I suggest we understand this trend as an *ethicalization* of security. Ethicalization of security may be understood as a process of securitization that is contextualized in the discourse and practices of ethical governance and combines the elements of sovereign intervention and self-regulation of the governed subject as the exceptional measures. Ethicalization of security can be seen as a pragmatic move by securitizing actors, who want the audience not only to approve specific security measures, but also to internalize the very logic of security and become active agents of security governance. Ethicalization thus entails moving an issue out of the realm of democratic deliberation that is justified not by the need to tackle an extraordinary threat, but by the need to uphold ethical norms. In practical terms, ethicalization is based on the responsibilization

of the governed subject, which is supposed to internalize the specific rationality and adopt self-regulatory practices.

Contextualization of security in the discourse and practices of ethics. Embedding the narrative on dual-use research and biosecurity in the existing discourse on ethics and practices of responsible science is particularly remarkable. This contextualization is explicitly pragmatic, as it is used to effectively address the scientific audience for which ethical concerns and research integrity have played an important role, at least after the Asilomar conference in 1970s. For instance, when presenting the US experience with biosecurity education to the international audience composed of diplomats and science experts, the representative of the US National Academy of Sciences explained that

> Framing the issues as Responsible Science makes concepts such as biosecurity and dual use relevant and more readily accepted when presented as part of the larger social responsibility of science; is compatible with more security-focused activities for specialized, more directly affected audiences; facilitates reaching wide range of scientists, who are part of many stakeholders (…) and can complement the existing legal and regulatory structure and provide a basis for discussing additional measures or changes in practices (Husbands 2014b).

In brief, referring to the logic of scientific responsibility "allows scientific engagement on biosecurity to take advantage of the international attention to issues of research integrity" (Husbands 2014a). The practices such as introducing biosecurity education to existing curricula and training programmes or assigning the competences of biosecurity review to institutional ethics committees and editorial boards of scientific journals can be then read in the same way, only adjusted to different settings.

However, this contextualization of security into ethical discourse and practices arguably goes beyond approaching a specific audience in such a way that it more readily accepts new threat images and security measures (cf. Balzacq 2005, Balzacq 2011b, Salter 2008a, Stritzel 2007). The logic of security, which is according to securitization theory characterized by exceptionality, emergency, and a call for extraordinary measures that exceed normal political procedures (Buzan et al. 1998: 24), is in this case replaced by the logic of ethics, based on defining good and bad values and right and wrong behaviour. The intended impact of this move is similar, yet instead of invoking the language of existential threats, the focus

shifts on stressing positive values and practices to the audience. This ethicalization of security, though, brings about further implications for the governed subject, the accountability for conducting security, as well as for the politicization of security and potential resistance to it.

Combination of sovereign intervention and self-regulation in the governance of security. Besides this mobilizing effect, ethicalization changes the role of the audience. By framing security regulations not as *requirements*, but as *responsibilities*, the governed subjects are asked not only to approve new measures, but also to internalize this very logic of security and regulate their behaviour according to the newly defined rules. The great emphasis placed on education as a part of biosecurity governance is a good example in this regard. Through attractive summer schools, practical trainings or e-learning modules, students shall learn about responsible science and engage in these new practices with the ultimate goal of reaching 'not just following rules, but true commitment.'[101] By developing a mind-set of awareness, future scientists shall learn to 'think security' and thus become more susceptible to further security regulations.

By defining the rules for desired and undesired behaviour, ethicalization constructs security and insecurity at the level of the governed subject. The concept of dual-use, which establishes a simplistic, yet powerful black-and-white image of scientific practice, is a prime example. Building on the notion of 'good' and 'bad' research, the culture of responsibility is a way to reinforce and institutionalize this dichotomy, while expanding the vision of 'good researcher' as a responsible, rule-obeying, truth-seeking person, who conducts research "solely for peaceful and beneficial purposes" (National Security Council 2009: 1). To support the good practices, scientific elites are empowered and assigned new responsibilities and competences. For instance, scientific educators may address a broader scope of social issues and thus shape the 'common sense' of future scientists in new ways. Similarly, scientific authorities, who are traditionally entitled to guarantee the quality of published research, shall act as guardians of secure research. At the same time, the failure to fulfil the ideal of a responsible scientist becomes a security concern, as scientific ethics, informal

[101] Paraphrasing one presenter on the expert panel about biosecurity education, Meeting of Experts to the Biological Weapons Convention, Geneva, 7th August 2014.

norms and rules are transformed into security norms. As demonstrated on the example of the contested publications as well as the moratorium on gain-on-functions research, this enables sovereign power to affect the functioning of the scientific field and intervene in the process of knowledge production and circulation. Even though "the validity of correlating violations of scientific responsibility with personnel security risks" is occasionally debated (AAAS 2013: 16), the prevailing discourse seems to take this link for granted.

Yet what does it mean to use ethics as a 'weapon to counter bioterrorism' (cf. Somerville and Atlas 2005)? What are the implications of *governing security through ethics*? It could be argued that responsibilizing governed subjects and imposing a system of self-regulatory security practices have great consequences especially for democratic accountability and the prospects of resisting security. First, it creates new links between science and security. The rise of boundary organizations, such as the NSABB, and mixing scientific and security expertise are of particular relevance in this regard. As security experts, scientists are supposed to take 'a view from nowhere', objectify their (or other people's) research, project its further evolution and calculate and weight its future benefits and potential societal costs. Such an approach decontextualizes, yet simultaneously recontextualizes scientific expertise and subordinates the process of knowledge production to the logic of security and risk management practices in particular. The culture of responsibility transformed into security governmentality makes scientists act as security agents, which can be seen as an example of 'citizen-surveillance' or 'citizen-detective' practices (Vaughan-Williams 2008), yet upgraded to encompass also 'citizen-self-surveillance'. This seemingly value-neutral, expert-driven approach has an important effect: it reinforces the depoliticization of security and the diffusion of responsibility for security governance. What is more, however, in undemocratic settings, where the system of checks and balances in general – and in academia in particular – is not well established, the securitization of life sciences may also prone to the misuse of power in academia. The empowerment of scientific elites to provide security expertise in governing the security of scientific research may go hand in hand with increasing the power asymmetries in the academic field and ultimately to diminishing the possibilities of students and scientists who are not in the position of power to resist the politics of scientific elites.

Second, translating security measures into daily knowledgeable practices and employing the frame of ethics shapes the prospects for resistance of individual scientists. Future scientists learn to conduct research and disseminate its results through internalizing field-specific norms and values, which also involves accepting the system of power relation in academia and ways of gaining capital (cf. Bourdieu 1988, 1990a). Resisting the emerging regime of practices can not only raise security concerns, but also diminish "the very possibility of participating in the moral economy of scientific exchange", as further research shows (Caduff 2012: 335). For instance, publishing is of great symbolic value and is also the key strategy to gain scientific (and relatedly other forms of) capital, so scientists may either accept the newly defined publishing practices or shift their attention to less innovative and less controversial research to comply with the established 'publish or perish' norm (Devaux 2015).

Finally, securitizing scientific responsibility changes the meaning and practice of democratic accountability of science. STS scholars emphasise the importance of an open dialogue between scientific community and the general public about what scientists shall study and how (e.g. Jasanoff 2005). However, when concerns about moral and ethical responsibilities of science become a matter of security, whom shall science be responsible to and how shall this relationship look in practice? To what extent would further debates be open to critique of not only concrete regulatory practices, but also more general principles of governing science? As the current debate on gain-of-functions research suggests (see e.g. Duprex et al. 2015), scientific elites are able to voice their criticism, but this resistance seem to be focused on seeking appropriate measures to deal with the concerning issues rather than rejecting the broader security frames of biosecurity and bioterrorism in the first place.

Secrecy, security and the individualization of risks

How to deal with the tension between openness and secrecy in science is a general dilemma that has been present in many contexts during the course of human history (Hull 1985). Yet is there something new in the way scientific knowledge becomes securitized within the logic of biosecurity and dual-use dilemma? How unique is the shift towards the ethicalization of science governance? And what are the political implications of this trend, if they can be generalized at all?

This thesis sought to explore several specific regimes of knowledge, which have produced discourses of bio(in)security and the dangers of biological research 'in the age of terrorism'. Despite the different constellations of science, politics, and expertise and the diversity of practices of governing bio(in)security in these settings, the regimes of governing the circulations of biological material, technologies, and know-how have in common certain aspects which deserve more attention. One of the prominent developments that can be observed in these systems of governance is a growing tendency towards an individualization of risks. Albeit already briefly discussed before, I would like to get back to this aspect, as I find it crucial for understanding the conditions of possibility for the ethicalization of science governance.

When the US government decided to build nuclear weapons during the World War II, it mobilized thousands of scientists to work in secret laboratories in Los Alamos as well as elsewhere on a project, whose concrete ambitions and aims were known only to a few. The scientists who took part in the Manhattan Project were thus in most cases unaware of what aims their work serve, being familiar only with the narrow context of their work and knowing that they participate in a top secret military research. The responsibility for the project was thus in the hands of the state – the state possessed power and knowledge about the secret research, while scientists were in a directly opposite role, tasked only to provide their specific technical expertise. In other words, the state took control over the context of research production as well as consumption, creating thus the conditions for the existence of military research and having control over how this research would be used in practice.

The sociology of secrecy in the context of biotechnology research is radically different. While the state still holds power over the production of scientific research, its capacity to control the research consumption, i.e. how research is used, is diminishing. Since unpredictable threats coming from unknown actors are seen as the defining features of the contemporary security environment, the attention of policy-makers turns to a broad scope of diverse risks and consequently to regulating the circulation of an increasing scope of materials, technologies, bodies, and ideas. This uncertainly translates also to the governance of research and contributes to the imaginaries of how the valued scientific innovations and skills may become a part of the undesired circulations, contributing thus to the perceived insecurity. As the experience from the field of life sciences demonstrate, the political

response to these developments is an ambition to tame the way that science is practiced in order to shape the circulatory movements from their very onset.

The result is, however, not only the expansion of regulation to new governed subjects, but also the diffusion of responsibility for the governance of science. In contrast to the model of secret research, based on the principles of command and control governance and limited scope for individual scientific responsibility for their action, scientists get to the forefront of the emerging regimes of biosecurity governance. They are supposed to comprehend the social and political context of their research, predict and assess how this research can become a threat, and consequently become active decision-makers in the governance of scientific secrecy.

The problem of this approach, though, is that it overlooks the broader structural factors which directly or indirectly create the demand for potentially dangerous research, which make it possible to build research infrastructure that enables the production of dangerous research results, and which encourage scientists to develop specific skills that are necessary for the production of dangerous science. In other words, the production of potentially 'deadly science' is not only made possible due to the possession of specific skills and training – what STS scholars call tacit knowledge, but also due to the social and political environment, in which the research is situated and which defines what aims, objects and procedures of scientific inquiry are desired, what are undesired, what are taboo, and why.

The huge investments of the US government into biodefense research, which occurred in the wake of the 9/11 attacks and as a part of the securitization of bioterrorism, is a prime example in this regard (Sell and Watson 2013). The construction of the novel research infrastructure, including people trained to work with the deadliest pathogens as well as the presence of these pathogens in the biodefence laboratories, creates secondary risks and consequently contributes to stirring up the fears that this dangerous research may 'get to the wrong hands'.

Given the (in)securitization of life science as a whole, the strategy of responsibilization relates not only to the governance of scientific secrecy, but also to the emerging governance of security in science. The neoliberal context in which science operates creates conditions that enable as well as reinforce these practices of responsibilization. The responsibility for securing research is individualized, which contributes to an increasing pressure on individual

actors involved in the process of scientific knowledge production and dissemination to keep an eye on the potential dangerousness of their work. Risks of scientific work are thus not only treated as individual responsibilities for the safety of research, but are also seen in connection to the management of security.

In effect, how political environment and threats to security are interpreted makes ultimately a difference for how power relations between scientists and the state are designed, who is supposed to possess what kind of knowledge and who and how is to be responsible for what kind of action. Albeit each empirical setting is characteristic by a unique constellation of these factors, the regimes of biosecurity governance in science generally seem to rely more and more on 'soft' regulatory approaches, which appeal to scientific ethics and individual responsibility for research and rely on technical, field-specific expertise. Such regimes of governance consequently contribute not only to the rise of specific form of science-security expertise, but also to reinforcing the very symbolic status of expertise in political governance, both in the domestic and international context. Nonetheless, as the present research has shown in several contexts, rather than as a sign of the absence of politics, the rise of expertise may be seen as the continuation of politics by other means.

The implications of ethicalization

This work suggested understanding this instrumental hybridization of scientific and security practices as a process of ethicalization of security. However, what deserves further attention is ethicalization not only as a concept, but also as a practice. How does the turn to state-imposed self-regulatory modes of governance affect the role of science in the society as well as the functioning of the academic field? How does it affect the practices of security expertise and the prospects of politicizing and potentially resisting security? And how does the dynamic of ethicalization vary across different disciplinary fields and (political) contexts?

Putting the findings into the context of contemporary critical security research, the portrayed science-security nexus can be seen as an example of an emerging 'insecuritization' (Bigo and Tsoukala 2008, Huysmans 2006). The fears of powerful, yet unpredictable and hardly governable 'Frankenstein science' give rise to efforts to secure the science through shaping the practices of knowledge production and dissemination. However, in the attempts to develop a 'culture of responsibility', scientists may in fact breed a culture of fear, mistrust

and ultimately insecurity. Looking at the scientific practices primarily through the lenses of security can raise tensions both within the scientific field as well as between scientists and the society.

Does ethicalization indicate broader changes in the understanding of science in the society? Does it exemplify perhaps a new type of 'social contract' for science in the society? The implications of ethicalization for the ontology of science shall also be further explored. For science as a cognitive domain, ethicalization may lead to changing the criteria for the validity of knowledge, i.e. the norms and practices defining how scientists observe the world, produce truth claims about its functioning and reflect on this process. By shaping the meaning of scientific progress and tying it more closely to the neoliberal risk-benefit framework, ethicalization is also related to shifting the attention to 'desired' objects and methods of research while downplaying others. As such, it may contribute to constructing new scientific taboos narrowly defined by material rather than social factors. However, the question is not only how ethicalization shapes the 'production of knowledge and truth' in science, but also what status this knowledge is to have under the new social contract for science.

To move beyond the simplistic understanding of scientific knowledge as a double-edged sword, it is important to better understand the functioning of the scientific field and the complexity of scientific practices. Critical security studies can in this regard provide invaluable insights. In particular, scholars could reflect on the dynamic interplay among science, politics, and security in which the current concerns over dual-use research are situated and thus help destabilize some of the taken-for-granted assumptions and security practices and put them in a broader context.

Conclusion

Managing the risks of techno-scientific progress is unique neither to life sciences nor to contemporary politics. However, the concerns over a potential misuse of scientific research were given a new meaning and salience in the post-9/11 environment with the rising fears of hostile non-state actors and the overall militarization of discourse and practices that are linked with the threat of terrorism. Compared to the Cold War era, though, the current focus is less on nuclear physics or technologies related to conventional weapons and more on emerging technologies, which are more accessible and thus more attractive for potential terrorists.

This work looked at how research and development in life sciences are constructed as a matter of security, how this development structures the relations between science and security and how the implications of this move to the politics of security and insecurity may be understood. The aim of this concluding chapter is to summarize the findings of the study, reflect on them from a broader perspective, and point out possible avenues and puzzles for further research.

Globalizing bio(in)security and its governance

This work dealt with the emerging governance of biological threats and risks associated with scientific research, yet the very understanding of these threats and risks in practice is worth discussing separately. As explained in the theoretical section of this work, one of the motives for departing from a threat-centric analysis of analysis, typical for securitization research, is that the specification of biological threats as such are not of much interest in either political or expert discourse. Instead, the assumption that seems to connect most utterances and practices related to biosecurity is that it is important to pay attention to a broad *spectre* of biological threats and risks, which ranges from issues as diverse as biological warfare, bioterrorism, bio-crime, accidental release of dangerous biological agents and toxins, and even pandemics of infectious diseases. The underlying belief that it is the very biological material that is dangerous no matter who and how may release it to public, however, is rather problematic. Instead of providing better understanding of the 'threatening' issues at stake,

their contextualization and prioritization, the prevailing all-embracing approach to the governance of *biosecurity* shifts the attention to action, i.e. how to effectively 'secure' potentially dangerous material, technologies and scientific knowledge.

The proliferation of threats and fears related to expanding the meaning of the negative circulations of biological agents has been described already by other researchers (Hartmann et al. 2005, Lakoff 2008, Lakoff and Collier 2008). What this approach makes possible, though, is the rise of apparently apolitical, technical interventions in the circulation of actors, things, and ideas related to biological research. The politics of CBRN management, discussed especially in the case study on the Czech practices of biosecurity governance, is a prime example in this regard. The CBRN bureaucrats accept the broader rationality of the globalizing bio(in)security and get involved in the development of governmental practices through which they regulate the circulation of CBRN material. In the attempts to prepare for any type of biological threat, what becomes securitized, or rather insecuritized, are more complex sets of relations among actors, objects, ideas, and issue areas rather than specific security problems characterized by knowing the source of the threat. This further reinforces the role of expert practices and downplays any comprehensive and open debate on how relevant these issues are, who shall decide on them, on behalf of whom, and how.

In effect, these rationalities and the newly developed techniques of governing biosecurity confuse the traditional politics of biological disarmament and the debates that have been associated with it. With the changing understanding of the threat and the referent objects that are to be secured against this threat, as well as broadening the scope of actors involved in governing these issues, it becomes more and more difficult to agree on what biological weapons are and what it means to ban them. In contrast, contextualizing the debate on the risks of biotechnologies in the politics of disarmament is problematic too, since it may promote rather narrow understanding of the complex problems and restrict the scope of potential solutions.

The case of the securitization of biotechnologies in the international biological weapons regime demonstrates this problem well. In order to gain attention and legitimacy among a broad scope of actors, the dilemmas related to the development of biotechnologies are linked to the logic of security, but this also comes at a price. Political interests and animosities

among states naturally affect these deliberations. Besides, the fact that there is very little coordination among the diverse *ad hoc* initiatives promoting scientific responsibility may support the interpretation that hidden agendas and national interests play greater role in these policies than the proclaimed goals.

When acknowledging the importance of dealing with the problems of regulating technologies, it might be helpful to consider moving the debate to a different, perhaps a completely new context. However, the aim of any different (whether national or international) forum shall not be to depoliticize the debate and leave it only to experts with limited democratic accountability. Instead, it shall rather allow for a variety of actors with diverse types of expertise to come together and share their concerns, best practices and ideas on how to approach these issues collectively. Two aspects are of particular importance: first, giving more voice to actors – be they the representatives of different states, security experts, scientists, public health professionals etc.– who challenge the dominant understanding of the problem and the suggested approaches to it, and second, freeing the deliberations from accenting security aspects and focusing on security-driven solutions.

Securitization, boundary work, and boundary expertise

Beside situating the issues of biosecurity and dual-use dilemma in the broader trends associated with the governance of security and insecurity, this research sought to look at how these developments affects the nexus between science and security politics 'on the ground', in concrete contexts where the new governmental practices are developed and implemented. The research concretely focused on how this dynamic plays out at so-called boundary sites, occupied by specific actors recognized as experts, who mediate the knowledge between the realm of science and politics. It was argued that the transformations these sites have undergone indicate broader development in the science-security nexus. Therefore, the rationalities and techniques of government through which life sciences are approached at these sites are an interesting object of this type of research.

In order to explore this dynamic, this work outlined a framework for analysing so-called boundary work related to securitization. By doing so, it departed from the established model for analysing securitization through securitizing speech acts, as presented by the Copenhagen School, and inspired by the sociological reading of securitization by scholars

associated with International Political Sociology and by the notion of boundary work, adopted from STS, built a different analytical model for studying the process of (in)securitization. This framework focuses less on the construction and reformulation of threats and more on the structuring effects of re-ordering social practices, which are connected to the changes in the problematization of security. The thesis concretely developed three theoretically-derived mechanisms of *bordering*, *hybridization*, and *stabilization* to study the transformative processes of security framing and applied this framework for studying these transformations in the international biological weapons regime and the Czech field on CBRN non-proliferation professionals.

Interestingly, both in the biological weapons regime and in the Czech Republic, the newly pronounced emphasis on securing the circulation of pathogens, no matter whether related to the development of biological weapons or the dissemination of dangerous scientific research, has gone hand in hand with broader destabilization of the established discourses and existing power structures. In the BWC regime, this evolution was enabled by a literal destabilization of the regime and the failure of diplomatic actors to uphold the practices of biological non-proliferation. In contrast, in the Czech case, this enabling conditions that made possible the bordering of security politics with science refer rather to broader changes of the underlying beliefs and governmental practices in the field of foreign-policy actors, who have pursued the strategy of 'Westernization' and integration into the political and security fields related to the EU and NATO in particular.

The dynamic of hybridization is in both cases characteristic by the rise of actors recognized for their scientific capital and expertise, who have been able to accommodate the dominant discourses, rationalities, and practices of the politico-diplomatic sphere, whether of primarily security (the BWC case) or identity character (typical for the Czech case). These actors have consequently started shaping the meaning of the governed issues and subjects, emphasising the perceived importance of novel security approaches to the new biological threats and risks, and in both cases, these actors have also been involved in designing as well as implementing new techniques of government and practices of biosecurity. While the boundary experts in the BWC regime focus more on the very governance of science and research, the CBRN experts in the Czech Republic have a wider scope of competences. Given the type of the empirical site in which these actors operate, the scientific experts in

the biological weapons regime are more engaged in shaping the linguistic framing of the issues at stake, developing new concepts that resonate with the diplomatic audience, or e.g. challenging certain narratives of biological weapons and biosecurity. On the contrary, the Czech CBRN professionals reinforces their status of apolitical, bureaucratic actors and do the boundary work rather through practice and transforming a system of oversight over potentially dangerous materials and items. Different constellation of power techniques and forms of knowledge are thus in play in these processes, albeit both seem to be closely related to the Foucauldian logic of governmentality.

Finally, the stabilization of the hybridizing system of governing the science-security boundary looks differently in the analysed contexts. In the biological weapons regime, a plethora of new biosecurity practices link together actors from very different fields, while these practices carry on a very novel meaning attached to biological weapons and the politics of biological disarmament. In particular, through these practices, the notion of globalized (in)security is spread, which turns previously apolitical, technical and seemingly non-security objects and activities into a matter of insecurity and highlights the globalized nature of biological threats and risks. However, albeit providing many opportunities for new actors to govern the newly shaped boundary of science and security, these practices are not well embedded in the socio-political context pf the BWC regime and are not institutionalized, as actors from the BWC regime also acknowledge. The potential of these practices to restructure the power relations in the given site may this be perceived as somehow limited. In contrast, the Czech CBRN professionals seem to succeed in shaping the boundaries of security in a less significant and pronounced way. This process of stabilization is thus without the ambition to transform more explicitly the structure of power relations in which these experts get involved, but still characterized by an ongoing strengthening of the bio(in)security practices and the role of these actors in governing them.

Generally speaking, the framework for researching the boundary effects related to securitization seems to provide a suitable starting point for a future theoretical discussion on the transformative processes of security framing. Further conceptual clarification and operationalization of the framework are for its use in different context, though, would be highly valuable. Contrary to this research, which has been formulated in a rather open-ended way, more specific aspects characteristic for the transformative securitizing dynamic could

be discussed and elaborated on for the purpose of more comprehensive empirical analysis. Whether coming from Bourdieusian or Latourian perspective, sociological literature may serve as a useful source of inspiration for developing this perspective and making it operational.

Analysing the social contract for science from critical security perspectives

This work sought to demonstrate that science can be seen not only as a specific sphere of social practices, but also as a potential new object of security governance. Given the special status of science in the society, the changing approaches to science governance and the role of science in the state in general are important areas for further inquiry. How can critical security studies contribute to the study of these issues and what can it offer to the sociology and philosophy of science?

One way of approaching these complex issues is to look at the science-security relations through the notion of social contract. Similar to the idea of social contract in the organization of the society, philosophers of science use the metaphor of social contract for understanding the norms and rules defining the relationship between the practitioners of science and the rest of the society (Gibbons 1999, Lubchenco 1998, Smith 1990). This hypothetical agreement between science and the society on what is science and how it should be governed has many dimensions, from establishing mutual expectations in the areas such as education, industrial research and development and so on.

At the heart of scientific work, though, lies the idea that science is about exploring the world and generating new knowledge. In order to feed the curiosity of scientists and be able to fulfil the task of knowledge production, however, science seems to require a specific prerequisite for a fruitful exploration of the world and that is freedom – scientific freedom. Or course, there are many conceptions of freedom as well as ways of translating what 'scientific freedom' means in practice, which also makes any generalising statements about the character of social contract for science difficult. These varying conceptions and practices of scientific freedom have been well documented by the scholars of STS, who look at the changing governance of science and different models of regulating scientific research, pointing out also the implications of such approaches (Cheh 1982, Edsall 1976, Metzger 1978).

As the attempts to regulate potentially dangerous scientific research demonstrate, balancing scientific freedom and (national) security may be seen as an important dimension through which the social contract for science is constructed. In other words, the battle over defining what science is, how it shall be regulated, whom it shall serve and how is fought increasingly in the field of security politics. Arguably, such battles may be fruitfully explored with the help of the analytical tools developed in security studies. What critical security studies can do in this regard, for instance, is to focus on how the ideas of scientific freedom and openness are given concrete meaning in the context of security politics, i.e. when contrasted to security and the principles such as secrecy or surveillance.

One possible way how to approach this is to focus on the securitising practices in science. Albeit seemingly insignificant, the change in the mundane practices of academic work may in fact indicate broader shifts in the understanding of science-security relations. Even without invoking the language of extraordinary threats, urgency and exceptionality, certain people, activities, or technologies may come to be understood as dangerous and thus requiring an additional oversight. By studying the context of such practices and their structuring effect on the given community of practices, researchers can underline the rise of new types of thinking and regulation that in effect shapes the social contract for science. The involvement of academia in the war on terror is a prime example of such development. In some countries, the rise of radicalism and extremism among university students are seen as a serious security threat, which requires new measures. The measures discussed most in this regard involve the practices of reporting potentially suspicious behaviour of students by their professors to security authorities (Travis 2015). This case would be one out of many potentially interesting examples of how academia is constructed academia as an object of the insecurity politics.

Another perspective would be to approach this is to look at the processes of security framing related to the role of science and scientists in exceptional politics. Studying how social and political issues are reframed through the language of security can help us situate and explain for instance broader shifts in the regulation of science and technology or the mobilisation of scientists for political work. For instance, how do some areas of research come be understood as more sensitive and thus deserving tighter regulation? How do whole disciplines and research programmes get classified and regulated by military officials under the logic of

security? As critical security scholars point out, the language of threats invoking the need to protect certain values from these threats are powerful tools that can justify exceptional policy measures or broader policy changes in general. Similarly, we may ask how scientists get mobilised and motivated to the service of the state and under what conditions.

As the history of science shows, discourses of exceptionalism are not exceptional among scientists. For example, Fritz Haber, German chemist and Nobel Prize laureate, who is perhaps best known for pioneering the work on weaponising chlorine and other poisonous gases during the World War I, famously asserted that "during peace time a scientist belongs to the World, but during war time he belongs to his country." While such patriotic attitude towards warfare may seem far away from contemporary concerns of scientists, one could argue that scientists nowadays may experience similar problems, albeit in different contexts. For instance, issues like climate change and geoengineering, counterterrorism and the related fight against extremism and radicalisation among young people, or the regulation of dangerous research and innovation may – and in many cases do – find resonance in the scientific audience and mobilize scientists to an 'extraordinary' activism in which they may deny the broadly accepted principles of scientific and academic work. Yet what is so special about the times of crisis that fuels political activism among scientists and their desire to devote their work to the state as a way to tackle extraordinary threats? How are these crises constructed and given the meaning that mobilises the scientific audience? And how does the notion of scientific social responsibility play out in these processes? While critical security studies perhaps cannot explain the patriotic sentiment of individual scientists, the use of critical security concepts and methods may find its use in exploring broader trends and phenomena related to the changing science-security relations and arrangements.

From technical to ethical solutions and beyond

In his address to the World Economic Forum in Davos in 1992, Václav Havel, former playwright and President of Czechoslovakia and the Czech Republic, criticized the dominant belief of the modern era that the world is a "a wholly knowable system governed by a finite number of universal laws that man can grasp and rationally direct for his own benefit." He argues that this belief has led people to assume that they can discover the 'ultimate truth' and consequently be "capable of objectively describing, explaining and controlling

everything that exists". Havel warns of the dangers of such approach, pointing out that the apparently objective recipes, control systems, instruments and institutions cannot solve the problems that people create themselves by developing new technologies and "[treating] the fatal consequences of technology as though they were a technical defect that could be remedied by technology alone" (Havel 1992). In contrast, Havel argues for highlighting the individuality of different problems and consequently, understanding the pluralism of the world. This postmodern approach to politics shall be, according to Havel, based on personal experience and spirituality and the values of solidarity and respect among people rather than on an apparently objective fact-based analysis of the society, its problems and solutions to them (Havel 1992).

Havel's essay is a powerful reminder of the choices that we make when dealing with different issues. Whether we treat some problem as a technical, ethical, social, or even security issue is a political choice, which has profound implications on who and how will be able to talk about the issue, shape its meaning, and make decisions on how it shall be dealt with. In the contemporary debates about the dangers of emerging technologies and the ways of regulating them, our societies make such choices as well. How certain values, decision-making practices, techniques of government, and power relations play out in the way these choices are made depends always on a concrete context, as this work also demonstrates.

The developments in life sciences, especially related to biotechnologies, are increasingly interpreted as creating new political and security risks and therefore, new approaches to managing these risks are sought. Contrary to Havel's concern, the responses to these issues seem to be based on a mix of technical, political, and ethical approaches, with a great emphasis put actually on the matters of scientific ethics. Does this development indicate a move towards pluralistic politics, which takes into the account different voices, different values and different experiences of people? In other words, can the promotion of 'responsible bio-science' and ethics-based frameworks for scientific work, built by scientific experts and security professionals, be perceived as an example of evolving postmodern politics? Having reflected on the findings of my research and contrasted with my theoretical and normative positions, which I have sought to explain in this work, I have come to the conclusion that these developments shall rather be interpreted differently.

On the one hand, the ethicalization of security, as it evolves in the governance of life sciences, shows in fact many signs of traditional logic of security – the underlying fear of an exceptional threat, its communication to different audiences, and attempts to develop novel policy measures that would provide an appropriate response to this threat. In this context, the ethics frame provided seems to work as a tool to mobilize the audience rather than as a new paradigm within which the risks of emerging technologies would be dealt with. Therefore, as long as exceptional politics is part of the game and state authorities set the boundaries of the debate, it is difficult to talk about true pluralism and the victory of postmodern politics, as Havel envisions it.

On the other hand, the ethicalization of security go hand in hand with the responsibilization of the governed subjects and consequently, the individualization of risks. However, with this move, we shift our attention from bigger questions asking about the broader enabling conditions that gave rise to the abovementioned risks of emerging technologies in the first place. The recent developments in the biological weapons regime paradoxically epitomizes the very same problem. The shift from the problematic issues of biological disarmament to the debate on biosecurity, biosafety and dual-use research is by many involved actors interpreted as a way to hide the disagreements on broader political issues and to move away towards rather marginal, 'technical' issues, whose relevance for the politics of arms control is even questioned by some. Albeit the meaning of 'political issues' in this context is rather specific and very narrow, the implications are similar. How is it possible that so many scientists pursue such a dangerous research in the first place? What are the origins of this research? What sources is this research funded from? Who is supposed to make use of this research and how do these actors take part in the sharing the burden of the risk governance? In fact, the decision to construct the dual-use dilemma as an ethical issue and diffuse the responsibility for preventing the misuse of scientific research shifts the attention from broader questions and consequently from analysing the systemic roots of issues that we call security threats. More critical engagement with this topic can thus not only move the debate on biosecurity and dual-use research, but also provide new inspiration for the social scientific research on security.

Interviews

Skype interview, 22nd November 2013, Czech microbiologist.

Personal interview, 5th December 2013, Prague, two representatives of the State Office for Nuclear Safety.

Personal interview, 7th January 2014, Prague, two representatives of the Crisis Preparedness Health Society.

E-mail interview, 12th January 2014, diplomatic representative of a State Party.

Personal interview, 16th January 2014, Brno, professor of microbiology.

Personal interview, 23rd January 2014, Brno, two representatives of the NINCBP.

Personal interview, 10th February 2014, Prague, Ministry of Foreign Affairs officer.

Personal interview, 19th February 2014, Prague, two representatives of the State Office for Nuclear Safety (1).

Personal interview, 19 February 2014, Prague, representative of the State Office for Nuclear Safety (2).

Personal interview, 18th November 2014, Prague, biohacker.

Personal interview, 30th March 2015, Prague, Ministry of Foreign Affairs officer.

Personal interview, 31st March, Prague, former intern at the State Office for Nuclear Safety.

Personal interview, 1st April 2015, Brno, former intern at the State Office for Nuclear Safety.

Personal interview, 4th March 2015, Prague, representative of the State Office for Nuclear Safety.

Personal interview, 8th April 2015, Brno, academic non-proliferation expert.

Personal interview, 4th May 2015, Prague, Ministry of Foreign Affairs officer.

Personal interview, 3rd June 2015, Brno, academic non-proliferation expert.

Personal interview, 1st December 2014, Geneva, guest of the Meeting of State Parties.

Personal interview, 2nd December 2014, Geneva, diplomatic representative of a State Party.

Personal interview, 2nd December 2014, Geneva, representative of an NGO (1).

Personal interview, 2nd December 2014, Geneva, representative of an NGO (2).

Personal interview, 2nd December 2014, Geneva, representative of an NGO (3).

Personal interview, 3rd December 2014, Geneva, diplomatic representative of a State Party.

Personal interview, 3rd December 2014, Geneva, three diplomatic representatives of a State Party.

Personal interview, 4th December 2014, Geneva, diplomatic representative of an IGO (1).

Personal interview, 4th December 2014, Geneva, diplomatic representative of a State Party (1).

Personal interview, 4th December 2014, Geneva, diplomatic representative of an IGO (2).

Personal interview, 4th December 2014, Geneva, diplomatic representative of a State Party (2).

Personal interview, 4th December 2014, Geneva, diplomatic representative of a State Party (3).

Personal interview, 5th December 2014, Geneva, diplomatic representative of an IGO.

Skype interview, 10th December 2014, representative of an NGO.

Skype interview, 17th December 2014, representative of an NGO.

Skype interview, 30th January 2015, representative of the BWC ISU.

Personal interview, 14th April 2015, Prague, former diplomatic representative of an IGO.

Participant observation

Seminar for actors dealing with highly hazardous agents and toxins and hazardous agents and toxins, 29th May 2014, State Office for Nuclear Safety, Prague.

Meeting of Experts to the Biological Weapons Convention, 4th – 8th August 2014, Geneva.

Meeting of State Parties to the Biological Weapons Convention, 1st – 5th December 2014, Geneva.

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