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The Governance of Dual-Use Neuroscience

Introduction

Given the history of major misuse, for hostile purposes, of advances in science and technology, perhaps the most likely outcome over coming decades is that precisely the same thing will happen to the ongoing advances in neuroscience. Then, as Meselson[1] warned, 'therein could lie unprecedented opportunities for violence coercion, repression or subjugation'. It is important, however, to grasp that this need not necessarily happen.

In his study, *In Defence of History*, Richard Evans pointed out that:[2]

> History, then, can produce generalisations ... It can identify or point with a high degree of plausibility, patterns, trends and structures in the human past ... But history cannot create laws with predictive power.

He continued by stating that 'all those who thought, or claimed, that they had discovered laws in history were ... wrong'. And to illustrate his point, he argued that the Bolsheviks, who thought they had discovered that revolutions inevitably led to military dictatorships, proceeded to gang up on Trotsky in an attempt, in Evan's words, to 'do their level best' to break that law.

So, there is no inevitability about the future major misuse of neuroscience for hostile purposes. Whilst that may be the most likely outcome, it is not the only possibility, particularly if strenuous efforts are made by those who can see the dangers to prevent it happening. The question then is what can best be done and who can do what is needed?

M. Dando, *Neuroscience and the Future of Chemical-Biological Weapons*

A reality check

It is important, nevertheless, to be realistic about the predicament that we are in today. First, there are reasons to believe that the state system that has prevailed since the Peace of Westphalia in 1648 is under threat.[3] Some argue that the present state-based system evolved because the increased size and complexity of human societies required a new form of bureaucratic, hierarchical integration that nation states provide. That increase in the size and complexity of our societies, it is argued, came about because of the impact of advances in science and technology, which first began in Europe where the Peace of Westphalia was agreed.

Following this argument, the increase in interconnectedness, size and complexity of human societies has now, because of the continued impact of advances in science and technology, begun to force a change back to something more like the medieval – less state-centric – system. As one expert was quoted as saying:[4]

> Neo-medievalism, on the other hand, means overlapping authorities, divided sovereignty, multiple identities and governing institutions, and fuzzy borders.

From a hopeful perspective, this process could lead to a further integration of international society as multiple networks at different government and non-government levels grapple with our complex shared problems of sustainable growth and justice.

However, given the situation in late 2014, an opposing pessimistic perspective is hard to dismiss. Hopes for an Arab Spring evolving into a Middle East of stable, successful democracies looks a very distant prospect.[5] Much more likely, it seems, is that we face a generations-long period of conflict there, with its impact spreading to many other parts of the world because of terrorist actions. Moreover, the situation in Ukraine suggests that those who worried that the post-Cold War settlement in Europe was too one-sided, and might not remain acceptable to Russia for long, may well have been correct. Worrying moves towards rearmament on both sides could presage a long period of difficult relations between Russia and the United States and its allies. And, of course, that is to leave aside the difficulties that the West will have in accommodating a much more powerful China in the fast-growing Asian region.

So, the evolution of governance of science and technology – and the results of our new investigations of the brain – will almost certainly take

place in a period of societal turbulence, one that will involve conflict and violence on a variety of scales. The temptation to put advances in neuroscience to use in these conflicts will always be present, and pressing reasons for immediate action can be expected from advocates, whatever the potential longer-term dangers that may arise. It is against that background that the present state and future prospects for the governance of neuroscience and its impacts have to be examined.

It is important to understand that the dangers of misuse of the life sciences are well understood, at least by the military. The UK Ministry of Defence Strategic Trends Programme's publication, *Global Strategic Trends – Out to 2040*[6] did its best to make this clear, stating:[7]

> The era out to 2040 *will* be a time of transition; this is *likely* to be characterised by instability, both in the relations between states, and in the relations between groups within states … the struggle to establish an effective system of global governance, capable of responding to these challenges, *will* be a central theme of the era.

It continued by arguing that during this period the distribution of power will change:[8]

> Out to 2040, the locus of global power *will* move away from the United States (US) and Europe to Asia, as the global system shifts from a uni-polar towards a multi-polar distribution of power.

Clearly, within such a transitional period, conflict and warfare are strong possibilities. As the document notes,[9] 'out to 2040, there are few convincing reasons to suggest that the world will become more peaceful'. And it should be noted that 'likely' is intended to convey a probability of 60 per cent to 90 per cent and 'will' a probability of greater than 90 per cent.

In regard to our central concern here, the document states bleakly:[10]

> The CBRN threat from state and non-state actors is *likely* to increase, facilitated by lowering of some entry barriers, dual purpose industrial facilities and the proliferation of technical knowledge and expertise. Terrorist attacks using chemical, biological and radiological weapons are *likely*.

Moreover, seemingly innocent advances in neuroscience cannot be assumed to be immune from misuse in such circumstances.[11]

Non-security implications of neuroscience

Robert Blank, who had written an early account of the potential implications of advances in neuroscience in the 1990s,[12] summarised the present situation in a new book in 2013 titled *Intervention in the Brain: Politics, Policy and Ethics*.[13] Following introductory chapters on the human brain, current capabilities to intervene in the operations of the brain and neuroethics and neuropolicy, Blank has a series of chapters that deal in some detail with non-security implications, such as addiction, individual responsibility, and the legal, media and commercial applications of new technologies that can be used to affect brain processes. He also deals with issues more directly related to international security, such as aggression, racism and conflict within national settings.

Blank might best be characterised as a cautious optimist. He is aware that many people could benefit from the work of neuroscientists today, but is also aware of the mistakes that have been made in the past, for example in the use of frontal lobotomy on many patients when there was considerable evidence of the dangerous nature and severe consequences of the use of this technique. As he noted,[14] this was done in spite of 'early evidence of postoperative infections and autopsies showing large areas of the brain were utterly destroyed' and 'the emotionless, inhuman quality of many lobotomised patients'. In general, therefore, he argues for an urgent application of much more systematic and forward-looking analyses of the social implications of advances in neuroscience than we have seen to date.

In particular, Blank shows much concern about the use of psychotropic drugs. As he expresses this worry:[15]

> Drugs are used to alter behavior because they are effective and convenient, not because of a compelling scientific consensus as to how they help patients.

So, in his view, drugs are sometimes used for non-medical reasons to achieve other policy objectives. He suggests that drugs are used as quick fixes for anxiety, depression and other problems, and illustrates his point by reference to the use of Ritalin for children and, more generally, to the protection of the individual rights of people who come under pressure to use drugs to make their behaviour more socially acceptable

So the point of interest here is that there is nothing new about advances in neuroscience raising difficult policy issues. Nor is there anything new

in the lack of development of adequate policies to regulate the use of the new knowledge and novel technologies, despite much debate. As Blank wryly points out,[16] 'unlike brain policy, where there has been a dearth of action, there is a vast literature and considerable international scholarly activity in neuroethics'.

Whilst it is not the main focus of his book, Blank also, by drawing on the work of other scholars like Jonathan Moreno[17] who have investigated the military applications of modern neuroscience, applies his cautious approach to such applications in his seventh chapter, 'The Media, Commercial and Military Applications, and Public Policy'. For example, in a section on interrrogation he suggests that the recent public outrage over harsh treatment of suspected terrorists in the US 'has sparked interest in chemical approaches to interrogation'. He goes on to discuss the potential use of oxytocin in this context and then suggests that:[18]

> It is likely that there will be attempts to develop such substances, similar to the 1950s notion that LSD or other hallucinogens could be 'truth serums'.

Although, as he also points out, 'there is a consensus that physicians should not use drugs or other biological means' to take part in interrogations that are contrary to human rights and laws of war legal requirements.[19]

In his consideration of the use of neuropharmacology for national security Blank also looks at the use of, what he terms, calmatives and the use of chemical agents in the 2002 Moscow theatre siege. He notes the criticisms made of this use of fentanyl derivates by those concerned about the possible violation of the Chemical Weapons Convention but he suggests that this has not prevented continuing work on such less than lethal options and he references work on means of preventing respiratory depression when drugs such as fentanyl are used.

Blank is even more pessimistic about preventing the hostile misuse of biotechnology. Although he does not mention the Biological and Toxin Weapons Convention, he notes that:[20]

> Biotechnology's dual-use conundrum may hint at the difficulty of 'binning' advanced cognitive science research and development into offensive or defensive categories and may challenge traditional international security models.

So, with regard to the particular problem of developing means of controlling the applications of modern neuroscience for hostile purposes it would appear that Blank's general cautious optimism is transformed into a wary pessimism.

Yet, in his view, as modern neuroscience evolves and more applications of novel technologies appear, political debate is bound to increase and grow more intense[21] in regard to the issues he discusses in his chapter on the media and commercial applications and 'particularly with respect to military and national security applications'. The question here then is, what options may be available to strengthen the CBW non-proliferation regime against potentially dangerous developments in neuroscience?

Strengthening the regime?

Jonathan Moreno gave some consideration to the issues that are central here in his wide-ranging discussion of brain science and the military in the twenty-first century (see reference[17]). For example, he examined the implications of successful intranasal administration of oxytocin[22] and, in particular, he made an extensive review of debates in the United States this century in his chapter on non-lethal weapons.[23] I think it is evident from his account that the CWC and other international agreements, for example on human rights,[24] have had an impact in constraining proponents of incapacitating chemical and biological weapons in such debates.

Moreno, in fact, despite taking a realistic attitude to the possibility of misuse of the neurosciences, ends his book on a positive note:[25]

> We should be able to learn and apply the lessons of the new brain science for peaceful purposes. As the national security implications of neuroscience become more apparent, the pressing need to examine how our brains dispose us to peace as well as war should gain currency.

Indeed, he argues that the practical fields of conflict resolution and interventions in civil conflicts might benefit from our greater knowledge of the brain.

Moreno provided a positive preface to another recent study of the military implications of neuroscience,[26] in which he argued that the last ten years have seen a major increase in discussions of the ethical, legal and social implications of the neurosciences. There are certainly positive contributions in this study pointing to ways in which malign

applications of the advances in neuroscience might be constrained, for example, Curtis Bell's account[27] of an attempt to set up a pledge for neuroscientists in a chapter titled, 'Why neuroscientists should take the pledge: A collective approach to the misuse of neuroscience'. Yet there is also plenty of cause for concern amongst the diverse eighteen chapters. For example, chapter 7 was contributed by Rachel Wierzman and the editor James Giordano[28] and is titled: '"NEURINT" and Neuroweapons: Neurotechnologies in National Intelligence and Defense'. This chapter states[29] that the major reports (discussed earlier here in Chapter 6) on the military applications of neuroscience were followed in the United States by 'a series of Strategic Multilayer Assessment (SMA) conferences' which 'considered the potential impact of neuroscientific understanding of aggression, decision-making and social behavior on policy and strategy pertaining to NSID [National Security, Intelligence and Defense] deterrence and influence campaigns'. So the issues, for example related to oxytocin, that were discussed at the end of Chapter 9 are still under review in the United States.

Wierzman and Giordano produced an updated and extended version of an earlier paper in their chapter of the study covering numerous issues, but the parts of most interest to us here are those dealing with neuroweapons in combat scenarios.[30] The headings of those parts of the chapter are shown in Table 12.1

In three detailed tables they set out the possibilities under each of the headings in Table 12.1 and, whilst the last heading leads into a discussion of the many drawbacks, it is clear that the authors' view is that the use of some of these weapons needs to be carefully considered. This is presumably in order to have an adequate defence if necessary, but no consideration is given in the chapter to either the CWC or the BTWC, nor does either convention have a mention in the book's index. Yet times are changing for life scientists, and scientists in associated areas of research, in the United States.

Table 12.1 Neuroweapons in combat scenarios

Neurotropic drugs
Neuromicrobiological agents
Neurotoxins
Practical considerations, limitations, and preparations

Source: Modified from Giordano, J. (2014) (Ed.) *Neurotechnology in National Security and Defense: Practical Considerations, Neuroethical Concerns*. Taylor and Francis Group, Boca Reton, CRC Press.

Legal developments in the United States

A Working Paper submitted by the United States for the July 2014 BTWC Meeting of Experts updated other States Parties on developments in the United States with regard to government oversight of life sciences dual-use research of concern. The paper recalled that the United States had issued a policy for the oversight of dual-use research of concern in 2012 that had placed requirements on federal departments and agencies (see Chapter 11) and announced that the government would shortly release a second policy that would expand DURC oversight to research institutions receiving US federal funding.

This policy, released on 24 September 2014, had numerous features of interest to anyone who supposed that modern societies would allow scientists to pursue any research they wished without oversight by government.[31] At first sight the policy, in requiring institutional oversight of dual-use research of concern, appears to cover only government departments and agencies, and institutions within and outside the United States that receive United States government funding. However, it also applies to US institutions that:[32]

> B ii. Conduct or sponsor research that involves one or more of the 15 agents or toxins listed in Section 6.2.1, *even if the research is not supported by USG [United States Government] funds*. [emphasis added]

Moreover, this section on the applicability of the policy ends by stating:

> Institutions that do not receive USG funds for life sciences research, but conduct life sciences research that has the potential to generate knowledge, information, products, or technologies that could be used in a manner that results in harm, are not subject to oversight as articulated in this Policy, *however, they are strongly encouraged to implement internal oversight procedures consistent with the culture of shared responsibility underpinning this Policy*. [emphasis added]

In short, all such institutions would be well advised to follow this policy.

The policy is also quite explicit in its requirement for education and training to be adequate for effective implementation of the policy. For example, the responsibilities of the principal investigators include:[33]

> E. Ensure that laboratory personnel (i.e., those under the supervision of laboratory leadership, including graduate students, postdoctoral fellows, research technicians, laboratory staff, and visiting scientists) conducting life sciences research with one or more of the agents listed in Section 6.2.1 of this Policy have received education and training on DURC.

And the institutional responsibilities include:[34]

> G. Provide education and training on DURC for individuals conducting life sciences research with one or more of the agents listed in Section 6.2.1 of this Policy, and maintain records of such education and training for the term of the research grant or contract plus three years after its completion.

Additionally, the responsibilities of the US Government,[35] set out in section 7.4, include to 'develop training tools and materials for use by the USG agencies and by institutions implementing this policy', and 'provide education and outreach to stakeholders about dual use policies and issues'.

Whilst these developments are further ahead than in other countries, there are certainly related developments taking place in other countries to consider what might best be done to ensure that the life sciences are protected from misuse. The seriousness and complexity of the problem became utterly clear on 17 October 2014 when the US Government halted further funding of gain-of-function research for a period in order that a deliberative review could be carried out. The announcement stated:[36]

> In the light of recent concerns regarding biosafety and biosecurity, effective immediately, the U.S. Government (USG) will pause new USG funding for gain-of-function research on influenza, MERS or SARS viruses, as defined

and:

> In parallel, we will encourage the currently-funded USG and non-USG-funded research community to join in adopting a voluntary pause on research that meets the stated definition.

During the one-year pause the NSABB would carry out the deliberative review and the National Research Council of the National Academies would convene a conference to review the NSABB draft recommendations. Then the NSABB would provide recommendations to the government.

International developments

Discussions of control measures for life sciences research are clearly also taking place in a number of other countries. These are likely to produce further national measures in some countries, but getting international agreement on the best way forward is likely to be a slower and more difficult task.[37]

In regard to the Chemical Weapons Convention, it is already clear that converting it from a primary focus on disarmament to a primary focus on non-proliferation – preventing the resurgence of chemical weapons around the world – is going to be a long-drawn-out process. For example, bringing facilities that produce by biosynthesis (OCPFs) fully under the verification system has been a clear *scientific* requirement for years, but it has not been possible to reach an agreement to do so. Yet perhaps the situation in regard to dealing with the potential loophole in Article II.9 (d) of the Convention may be becoming more tractable. Recently, a number of states have made it clear that they are not interested in incapacitating chemical agents for law enforcement and there are a number of different ways in which states can move towards an agreement on a restrictive interpretation of the meaning of this element of allowed peaceful purposes.[38]

Much will depend on the Eighth Review Conference in 2016 for the future of the Biological and Toxin Weapons Convention. Clearly, the new Intersessional Process agreed in 2011 has been far from a raging success in enabling joint actions to be agreed and implemented to strengthen the Convention.[39] As the Chair of the 2014 meetings noted in a letter to States Parties on 7 October 2014:[40]

> Our task now is to take this wealth of information and ideas [produced at the preceding Meeting of Experts] and consider how we might transform it into common understandings and effective action at the Meeting of States Parties.

He continued by noting that he had produced his own synthesis of what had been produced at the Meeting of Experts and suggested that further

work should be undertaken before the Meeting of States Parties, in part to get greater clarity on 'where we might focus efforts on promoting effective action'.

The Chairman's synthesis paper included seven sections related to the SAI on advances in science and technology. They included, 'D. Voluntary codes of conduct and other measures to encourage responsible conduct' and 'E. Education and awareness-raising about risks and benefits of life sciences and biotechnology' but, most interestingly, under the final section, 'G. Any other science and technology developments relevant to the Convention', the paper pointedly noted that 'States Parties reiterated the value of continuing to consider, in future meetings, possible ways of establishing a more systematic and comprehensive means of review'. In short, we might say that they could go back and reconsider the excellent proposals made by several states at the Seventh Review Conference. If they cannot do so, continuing stagnation and potential disregard and disuse might be the fate of the Convention.

Conclusion

It seems reasonable to conclude that the jury is still out on Meselson's question of whether the biotechnology revolution will be applied in major ways to hostile purposes. It is not difficult to think of ways in which awful manipulation of the brain could result if humanity decides to go down that road.[41]

Yet travel down that road is not inevitable. We do not have to choose that route and scientists have a major role to play in protecting their work from such misuse. It bears repeating that scientists of considerable standing played significant roles in the decision of the United States to abandon its offensive biological weapons programme[42,43] and thus opened the door to negotiations in the BTWC (with its commitment to continue to work for negotiation of the CWC). Moreover, the BTWC negotiation was preceded by two major scientific reports,[44] one by the UN Secretary-General's Committee of Experts and another by a group of consultants to the World Health Organization.

Whilst it will not be sufficient, a necessary precondition for scientists to take on their increasing responsibilities as the revolution in the life sciences continues to gather pace in coming decades, is, as the UK Royal Society argued, for attention to be paid to ensuring that they have a better understanding of the security implications of their work. This point was again the first recommendation of what has been widely regarded as the most thorough recent analysis of the problem of dual

use. Published by the German Ethics Council in late 2014 this recommendation stated that:[45]

> In view of the potential for misuse of dual use research in the life sciences, there is a need to increase the degree of awareness amongst the scientific community for these issues and to promote an underlying culture of responsibility.

So, a decade after the call for awareness and education of life scientists about biosecurity and the problem of dual use by the Fink Committee, they remain largely unachieved objectives.

The question that remains is, how long do we have to properly engage life scientists, like those studying the nervous system, to help work out how we best protect what they produce from large-scale hostile misuse? How long, in the present international situation, before we see the major use of chemical and biological weapons in the inevitable conflicts that will characterise the coming decades of the first half of the twenty-first century? What does seem certain in this centenary year of the start of the cataclysmic First World War is that there will be a prolonged period of instability[46] and that, so far, we have not been overly successful in dealing with these conflicts.[47]

Reflecting on the numerous books that have appeared recently, which try to explain how the First World War came about, Lawrence Freedman, Professor of War Studies at Kings College, London, concluded[48] that there were no sure lessons, but decision makers always have choices and that they should make their choices with the best possible information and scepticism about military plans. Obviously, had they better understood the nature of the warfare that would be possible with the weapons available the decisions to go to war would have been taken with much more caution in 1914. Thus today neuroscientists with a clear grasp of biosecurity and the problem of dual-use, and the professional organisations to which they belong, surely have many roles to play in helping to prevent the proliferation and potential use of novel chemical and biological weapons. These include not only being careful about the research they do and what they publish, but also following the efforts to strengthen the national and international policies and regimes designed to prevent the misuse of their work, helping inform the public and policy makers of both the dangers and the potential benefits of their work, and ensuring that their students are well-informed and engaged in this effort during their working lives because the problem

of biosecurity and dual use will not be resolved for decades to come. Above all, it needs to be understood that it will be too late to act if the use of novel neuroweapons becomes widespread and commonplace as a method of warfare and terrorism. The effective long-term governance of neuroscience will depend in good part on the continued effective engagement of well-educated scientists with the public, media, military and politicians well into the middle years of this century.

References

1. Meselson, M. (2000) Averting the hostile exploitation of biotechnology. *The Chemical and Biological Conventions Bulleti*n, **48**, 16–19.
2. Evans, R. J. (1997) *In Defence of History*. London: Granta Publications. pp. 60–61.
3. MacKenzie, D. (2014) Imagine there's no countries. *New Scientist*, 6 September, 30–37.
4. ibid, p.36.
5. Kissinger, H. (2014) The World in Flames. *The Sunday Times*, 31 August, News Review pp.1–3.
6. Development, Concepts and Doctrine Centre (2010) *Global Strategic Trends – Out to 2040*. Ministry of Defence, London.
7. ibid, p.10.
8. ibid.
9. ibid, p.14.
10. ibid, p.15.
11. See, for example, Bardin, J. (2012) From Bench to Bunker: How a 1960s discovery in neuroscience spawned a military project. *The Chronicle of Higher Education*, 9 July. Available at <http://chronicle.com/article/From-Bench-to-Bunker/132743>. 19 September 2012.
12. Blank, R. H. (1999) *Brain Policy: How the New Neuroscience Will Change Our Lives and Our Politics*. Washington, D.C: Georgetown University Press.
13. Blank, R. H. (2013) *Intervention in the Brain: Politics, Policy, and Ethics*. Cambridge, MA: MIT Press.
14. ibid, p.36.
15. ibid, p.46.
16. ibid, p.65.
17. Moreno, J. D. (2006) *Mind Wars: Brain Research and National Defense*. New York: Dana Press.
18. Reference 13, p. 224.
19. ibid, p. 226.
20. ibid, p. 223.
21. ibid, p. 227.
22. Reference 17, pp. 90–91.
23. ibid, pp. 163–184.
24. Crowley, M. J. A. and Dando, M. R. (2015) *The Use of Incapacitating Chemical Agent Weapons in Law Enforcement*, in press.
25. Reference 17, p. 204.

26. Giordano, J. (2014) (Ed.) *Neurotechnology in National Security and Defense: Practical Considerations, Neuroethical Concerns*. Taylor and Francis Group, Boca Reton: CRC Press.
27. ibid, pp. 227–238.
28. ibid, pp. 79–114.
29. ibid, p. 80.
30. ibid, pp. 96–109.
31. United States (2014) *The United States of America Government Policy for Institutional Oversight of Life Sciences Dual Use Research of Concern*. Available at <http://www.phe.gov/s3/dualuse>. 20 October 2014.
32. ibid, p. 8.
33. ibid, p. 12.
34. ibid, p. 16.
35. ibid, p. 18.
36. United States (2014) *U.S. Government Gain-of-Function Deliberative Process and Research Funding Pause in Selected Gain-of-Function Research Involving Influenza, MERS, and SARS Viruses*. Available at <http://www.whitehouse.gov/blog/2014/10/17/doing-diligence-assess-risks-and-benefits-life-sciences-gain-function-research>. 20 October 2014.
37. Netherlands National Academy (2014) *Report of a Debate on Gain-of-Function Research between Professor Giorgio Palu and Professor Simon Wain-Hobson*, Amsterdam, 25 June.
38. Crowley, M. J. A. and Dando, M. R. (2014) *Down the Slippery Slope? A Study of Contemporary Dual-use Chemical and Life Science Research Potentially Applicable to the Development of Incapacitating Chemical Agent Weapons*. Policy Paper 8, Biochemical Security 2030 Project, University of Bath, November.
39. Dando, M. R. (2014) *To What Extent Was the Review of Science and Technology Made More Effective and Efficient at the 2013 Meeting of BTWC States?* Policy Paper 5, Biochemical Security 2030 Project, University of Bath, May.
40. Ambassador Urs Schmid (2014) *Biological Weapons Convention Meeting of States Parties*. BWC Implementation Support Unit, United Nations, Geneva, 7 October.
41. Serronia, M. I. J. (2007) Awakenings (1990): The epidemic of children who fell asleep. *Journal of Medicine and Movies,* **3**, 102–112.
42. Tucker, J. B. and Mahan, E. R. (2009) *President Nixon's Decision to Renounce the U.S. Offensive Biological Weapons Program*. Center for the Study of Weapons of Mass Destruction, Case Study 1, National Defense University, Washington, DC, October.
43. Reference 42, p. 3. Footnote 9 lists some of the scientists involved such as 'Harvard molecular biologist Matthew Meselson'.
44. Reference 42, p. 7.
45. Deutscher Ethikrat (2014) *Opinion: Biosecurity – Freedom and Responsibility of Research*. German Ethics Council, Berlin. (p. 179).
46. Hass, R. N. (2014) The unravelling: how to respond to a disordered world. *Foreign Affairs*, November/ December, 70–79.
47. Boot, M. (2014) More small wars: counterinsurgency is here to stay. *Foreign Affairs*, November/December, 5–14.
48. Freedman, L. D. (2014) The war that didn't end all wars: what started in 1914 – and why it lasted so long. *Foreign Affairs*, November/December, 148–153.