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The challenge of framing for efforts to mitigate the risks of "dual use" research in the life sciences

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ABSTRACT

Drawing upon insights from research in the social sciences about the role of "issue framing" in policy debates, the paper presents an argument for employing "Responsible Science" as the fundamental frame for strategies to engage scientists and scientific organizations in issues related to the potential risks posed by "dual use" research in the life sciences. It argues that this focus on *responsibilities* rather than *requirements* will be more effective, particularly in initial engagement efforts. The work of several international scientific organizations to employ this framing in their education and outreach activities is presented to illustrate the advantages of such an approach. The paper also includes a case study of a controversy over dual use research with highly pathogenic avian influenza to illustrate the power of framing in policy debates.

1. Introduction

Remarkable advances in the life sciences hold the promise of solutions to the world's growing health, food, and energy challenges, as well as the benefits of a new bio-economy. But the developments are also sparking a range of ethical, social and legal concerns, including that the knowledge, tools, and techniques resulting from these discoveries could be used to produce new bioweapons or enable bioterrorism. In the security realm, the scope and pace of the advances potentially pose fundamental challenges to the national and international institutions and policies that have been developed to prevent the misuse of the life sciences to cause deliberate harm.

The present international security landscape combines a strong norm against the misuse of the life sciences to cause deliberate harm with a weak institutional regime to prevent such actions. The cornerstone of the international regime, the 1972 Biological and Toxin Weapons Convention (BWC), has no agreed mechanisms to verify compliance with its prohibitions or to act against violations of its terms. The BWC's 8th review conference in November 2016 failed to agree on new, positive measures or even the continuation of its annual meetings of experts, highlighting concerns about the future of international efforts at biological nonproliferation and disarmament (Mackby, 2017; BWC, 2017). Although salvaged with agreement on a new set of experts meetings in December 2017, the concerns remain.

As the formal political process around the BWC unfolds over the next several years, filling any gaps and promoting constructive action will likely continue to rest on achieving a "web of prevention" as an active strategy.[2] The argument for the web concept is that multiple organizations and arrangements at the national, regional, and international level are relevant to the task of fostering and sustaining biosecurity. Beyond governments, a wide and varied array of nongovernmental stakeholders are essential elements of a

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[2] The International Committee of the Red Cross popularized the term as part of its 2002 appeal, *Biotechnology, Weapons, and Humanity*. See also Rappert and MacLeish (2014).

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successful prevention strategy, including industry, the public health community, the law enforcement and security communities, and so on. The web's effectiveness, however, depends on engaging the active support of stakeholders for policies and actions where their contributions are most relevant. This paper focuses on the efforts to engage the scientific community, both individual scientists and scientific organizations, in preventing and mitigating the particular risks associated with the potential misuse of research.

Mobilizing the scientific community in support of biological nonproliferation and disarmament faces a number of challenges. One is the scope of research about which policy makers should be concerned. In 2003, a report from the U.S. National Academy of Sciences coined the phrase "dual use dilemma" to describe the risk that research intended for benign purposes could also be misused to develop biological weapons or for bioterrorism (NRC, 2004).[3] The members of the committee that produced the Fink report, named for the committee's chair, Gerald Fink of MIT, could not have anticipated that "dual use research" would become the standard term for a set of the security issues raised by modern biotechnology. But although in common use, it remains controversial. Critics argue in particular that the concept is too broad to be useful and could lead to policies that unnecessarily hamper important research. In 2007, when the U.S. National Science Advisory Board for Biosecurity (NSABB) proposed a framework for oversight of dual use research, the Board argued that

> Because arguably most life sciences research has some potential for dual use, the NSABB strove to delineate a threshold that would identify that subset of life sciences research with the highest potential for yielding knowledge, products, or technology that could be misapplied to threaten public health or other aspects of national security. This subset of research is referred to herein as "dual use research of concern" (NSABB, 2007: 16).

U.S. policy has primarily focused on this narrower category of dual use research of concern or DURC for the last decade.[4]

The Fink report also illustrated dual use risks with the example of seven classes of experiments that the authoring committee considered plausible potential microbial threats. The committee argued that the potential risks extended well beyond advances in microbiology,[5] but policy in the United States and overseas has continued to concentrate on this field of life sciences research.[6] This reflects the history of past biological weapons programmes that weaponized human, plants, and animal disease causing agents, and the international norm embodied by the BWC is thus traditionally described as preventing "the use of disease as a weapon."[7]; But it also affects how ongoing policy debates and efforts to engage scientists are framed.

"Framing" refers to a set of sometimes overlapping concepts and theoretical perspectives, developed in a number of social science fields, which provide insights into how individuals, groups, and societies perceive, organize, and communicate about reality. "Framing effects refer to behavioral or attitudinal outcomes that are not due to differences in *what* is being communicated, but rather to variations in *how* a given piece of information is being presented (or framed) in public discourse" (Scheufele and Iyengar, 2014: 1). "Competing interests frame issues in ways that strategically advantage their political positions, emphasizing certain aspects of an issue over other considerations, influencing estimations of the causes, consequences, and solutions to a policy problem" (Nisbet and Lewenstein, 2002: 5). Efforts to create a compelling frame that defines an issue in policy debates over emerging technologies are thus often a key feature of the strategies used by different groups. One can think of examples such as "Frankenfoods" in the battles over genetically modified organisms in agriculture or the current competing frames of "autonomous weapons systems" versus "killer robots." Studies of communication provide insights into how to design and convey information and messages to enhance the chances of understanding and acceptance by the recipients, including for emerging technologies (Nisbet & Lewenstein, 2002; Scheufele & Lewenstein, 2005). The understanding and application of insights about framing is central to the emerging "science of science communication" (Jameison, Kahan, & Scheufele, 2017). The next section offers an example of how what I call "competing catastrophes" came to frame the controversy over research with pathogens with pandemic potential. This is followed by an example of how some international scientific organizations have framed scientists' engagement in biosecurity issues as part of the "responsible conduct of research" or the larger "social responsibility of science."

[3] This is different from the traditional concept of "dual use" in security, which refers largely to technology and products that, although intended for commercial purposes, may have military applications. There are traditional dual use commercial items in biotechnology, such fermenters, that may be subject to controls, and the ready availability of these items via the internet is a subject of proliferation concern (see, for example, Zilinskas, 2015). Controls may also extend to "intangible technology," which comes closest to the Fink Committee's concept of "dual use." According to the U.S. State Department, this "includes, but is not limited to, instructions (written or recorded), working knowledge, design drawings, models, operational manuals, skills training, and parts catalogues" (https://www.state.gov/strategictrade/practices/c43180.htm).

[4] The current U.S. government definition of DURC is "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" (U.S. Government, 2012: 1–2).

[5] "The seven areas of concern listed here only address potential microbial threats. Of course, modern biological research is much broader, encompassing all of the health sciences, agriculture, and veterinary science. It also includes diverse industries such as those that manufacture pharmaceuticals, cosmetics (e.g., Botox), and soft drinks (e.g., citric acid production). Moreover, all of these areas are changing rapidly. The great diversity as well as the pace of change makes it imprudent to project the potential both for good and ill too broadly and too far into the future. Therefore, the Committee has initially limited its concerns to cover those possibilities that represent a plausible danger and has tried to avoid improbable scenarios. Over time, however, the Committee believes that it will be necessary not only to expand the experiments of concern to cover a significantly wider range of potential threats to humans, animals or crops but also to include oversight of work conducted for or performed within the private sector as well as non-NIH [National Institutes of Health] government facilities and sponsored activities that are not already voluntarily complying with the Guidelines [recommended in the report]" (NRC, 2004: 114).

[6] The seven types of experiments covered by the 2012 U.S. policy for DURC, are essentially the same as those in the Fink report.

[7] For a history of past weapons programmes, see Wheelis et al. (2006). More recently advances in fields such as neuroscience, in genome editing tools such as gene drives, and the growth of a global "bioeconomy" that relies on biotechnology-based production methods are expanding the range of security concerns (see, for example, Dando (2015), National Academies of Sciences, Engineering, & Medicine (2016a), and Royal Society (2015)). These new issues are not yet widely reflected in policy.