Towards an Aspirational (Ethical) Code under the Biological and Toxin Weapons Convention: Engaging the Life Science Community

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Summary

It is unclear at present how the proposal by China and Pakistan for an Aspirational (Ethical) Code under the BTWC will be taken forward through to the 9th Review Conference of the Convention in 2022. However, some difficult questions will have to be addressed for this process to be successful in producing a code that can then be implemented in more detailed codes of conduct and codes of practice in national and professional settings after the Review Conference. This paper addresses one such question: How might the Aspirational Code proposed by China and Pakistan in 2018 best be modified to make it easy to engage the life science community?

1. Introduction

The development of effective approaches and mechanisms for the governance of dual-use life sciences research – benignly intended research which could also be misused for hostile purposes, including the development of novel biological and toxin weapons – is an essential element of strengthening the international norm against biological weapons enshrined in the 1975 Biological and Toxin Weapons Convention (BTWC). Life sciences stakeholders, for example in academia, industry, or government have a fundamental role to play in the governance of dual-use life sciences research, not least because they are on the frontlines of driving innovation. The 2019 *Guidelines for Responsible Conduct in Veterinary Research* published by the World Animal Health Organisation (OIE) underscore that the "responsibility for the identification, assessment and management of dual-use implications rests to differing degrees across many stakeholders throughout the research life cycle": e.g. researchers, institutions, grant and contract funders, companies, educators, scientific publishers and other communicators, and regulatory authorities.[1] Fostering a culture of trust, personal responsibility, accountability and transparency that champions ethics in the workplace is an important prerequisite for the development and implementation of sustainable approaches and measures for the management of dual-use life sciences research.[2]

The utility of aspirational codes, such as codes of ethics and more detailed codes of conduct for promoting a shared recognition of and compliance with professional norms and ethics principles has been observed in

different fields of professional practice, for example in medicine and biomedical research.[3] States Parties to BTWC have also noted the value of fostering a culture of responsibility amongst relevant national life sciences professionals and the voluntary development, adoption and promulgation of codes (of conduct)[*] with relation to strengthening the national implementation of the Convention.[4] During the current BTWC inter sessional meetings, codes and biological security education are being considered by the BTWC Meeting of Experts on Review of Developments in the Field of Science and Technology Related to the Convention.[5] In 2018, China and Pakistan tabled a joint proposal for the development of a code for biological scientists under the BTWC.[#] This proposal builds upon an earlier Working Paper that China submitted in 2015 ahead of the Eighth Review Conference of the BTWC.[6] Given the far-reaching implications of the COVID-19 global pandemic, the importance of engaging life sciences stakeholders with the prevention of biological threats and the risk of deliberate disease is likely to receive considerable attention at the 9th Review Conference of the BTWC.[7]

Exactly how the question of the further development of the code will be handled by States Parties in the lead up to the Review Conference, at the Review Conference and during the next inter sessional meetings after the Review Conference is not clear at this stage. However, some of the difficulties in achieving an agreement and getting it implemented in more detailed national and professional codes of conduct based on the aspirational code in diverse national and professional settings can be envisaged. One such difficulty, given the other pressures they experience, will be in getting life scientists to accept that the code is both relevant to their work and can be practically implemented within their concept of responsible conduct of research. Hence, it is essential to consider practical options for maximising the engagement of life science stakeholders both with the development and the promulgation of the proposed code.

The aim of this paper is to make suggestions about how the proposed China-Pakistan code might best be modified in order to be as easily acceptable as possible to the life science community. The paper is organised in the following sections: Section 2 gives a brief history of the work on codes for life scientists within the meetings of States Parties to the BTWC and presents the proposed China-Pakistan code; Section 3 provides an overview of the origins and development of the *Hague Ethical Guidelines* for chemists under the CWC; and Section 4 present a summary and analysis drawn from the vast general literature on how codes should be developed and implemented. This then leads in Section 5 to a comparative analysis of the original 2005 *Statement on Biosecurity* by the Inter Academy Panel, the *Hague Ethical Guidelines* and the proposed China-Pakistan code in the light of the preceding sections; and thus, in conclusion in Section 6 to some ideas about how the proposed China-Pakistan code might best be modified and what practical steps for its implementation could be considered.

2. Codes under the BTWC

The code proposed by China and Pakistan was first put forward by China at a BTWC meeting in 2015 and was then revised at a major international meeting of experts in Tianjin China before being put forward again in 2018.[8] This revised version of the code is shown in Table 1.

TABLE 1. The Code for Biological Scientists under the Biological Weapons Convention Proposed by China and Pakistan in 2018

States Parties to the Biological Weapons Convention recommend that biological scientists and research institutions shall follow the hereinafter code of conduct when conducting bio-science research and other related activities.

1. Ethical standard: Respect human life. Respect the dignity of humanity, and always revere life and consciously protect human rights. Respect social ethics, morality and social norms and traditions. Consciously maintain a harmonious relationship between humankind and the ecological environment. Constantly pay attention to the protection of the ecological environment. Consciously abide by legal regulations and standards governing scientific research. Refrain from behaviors intentionally or unintentionally ignoring laws and regulations and circumventing supervision.

2. Research integrity: Hold an attitude of rigor and integrity when conducting research. When conducting scientific research which is still controversial, researchers and institutions should fully consider the potential ethical and moral risks, strive to ensure that all those who may be affected benefit directly or indirectly from the research, and try to minimize possible hazards of the research.

3. Respect for the object of research: Respect the object of bio-science research, including human and non-human organisms. In researches involving the human subject, the legal rights and privacy of the human subject shall be fully protected, and his or her right of informed consent be guaranteed.

4. Process management for science research: Enhance risk control during the formulation and implementation of a bio-science research project. Conduct sufficient assessment and feasibility study on the possible threats the research process or outcomes may cause to health and society. Establish effective prevention and emergency response plans to mitigate relevant risks, and put in place a whole-process oversight mechanism on the research projects.

5. Constraint on the spread of research outcome: Strike a balance between public security and the freedom of research and speech. Use accurate and clear language when disseminating research outcomes to avoid misunderstanding from the general public. Limit or prohibit the dissemination of academic achievements which might be abused by non-state actors or pose threats to public health. The academic community shall publicly denounce academic misconduct in bio-research.

6. Popularization of science and technology: Attach great importance to popularization of biotechnology. Biological scientists have an obligation to educate the general public on bio-science and technology. When doing so, they are encouraged to make use of modern media and hi-tech means, to introduce both the positive impact and the potential risks of the bio-science development in an objective and comprehensive manner, and to assuage panic among the general public due to lack of information. Oppose fabrication of biotechnology events inconsistent with facts and news hyping.

7. Institution's role: Strengthen oversight of scientific institutions. Institutions shall conduct real-time monitoring and periodical assessment of research activities to mitigate potential risks and threats. Establish independent risk review committees within the institutions composed of scholars from relevant fields. Improve evaluation mechanism on publication of bio-science results.

8. Education and training: Scientific community and professional associations should play an active role in education and training. Increase public awareness of the Convention, and establish a safe education and training system for all parties involved in biotechnology research. Biological scientists should be encouraged to engage in dialogue and cooperation with social scientists, philosophers and anthropologists, so as to have a better understanding of the possible ethical and social implications of relevant biological research and its outcome.

9. Awareness and engagement: Biological scientists should be fully aware of the potential threats of dual-use research to human society, ecological environment and economic security. It is advocated to promote the peaceful application of biological research achievements, to prevent the abuse and misuse of biological products, scientific knowledge, technology and equipment, and to consciously resist any unethical scientific conducts that are harmful to human society.

10. International exchanges: Actively participate in international cooperation in the field of bio-science and technology research. Actively explore models and avenues for sharing bio-science achievements. Biological scientists around the world are encouraged to work closely for progress and innovation in bio-science and technology through learning from and inspire each other, with a view to promote the well-being and health of humankind.

Source: China and Pakistan, 2018[9]

The China-Pakistan code is an important initiative that will hopefully encourage increased substantive and sustained engagement by an ever-growing and more diverse number of States through relevant BTWC meetings and mechanisms. It builds on previous presentations and discussions under the BTWC,[10] and has also been extensively discussed by both BTWC State Parties and the broader life science community since its first presentation.

The value of codes of conduct in engaging life scientists with biological security issues has been recognised by BTWC States Parties. As part of the Intersessional Programme of Work agreed by the Fifth Review Conference of the BTWC, in 2003-2005 States Parties to the BTWC considered, *inter alia,* the topic of "content, promulgation, and adoption of codes of conduct for scientists".[11] As part of the Intersessional Programme of Work agreed by the Sixth Review Conference of the BTWC, in 2007-2010 States Parties considered the topic of "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."[12] As part of the Intersessional Programme of Work agreed by the Seventh Review Conference of the BTWC, in 2012-2015 the topic of "voluntary codes of conduct and other measures to encourage responsible conduct by scientists, academia and industry" was considered by States Parties under the Standing Agenda Item on the "Review of

developments in the field of science and technology related to the Convention."[13] During the current Intersessional Process 2018-2020, States Parties have agreed to consider the topic of the "development of a voluntary model code of conduct for biological scientists and all relevant personnel."[14]

At the 2008 Meeting of Experts, the Netherlands presented a Working Paper that reported on the development of a *national code of conduct* for biosecurity that had been developed by the Royal Netherlands Academy of Arts and Sciences (KNAW).[15] There are two importat features of the Netherlands Working Paper

Table 2: Main Elements of the Netherlands National Code of Conduct for Biosecurity

Basic Principles
Target Group
Rules of conduct
Raising awareness
Research and publication policy
Accountability and oversight
Internal and external communication
Accessibility
Shipment and transport

Source: Netherlands, 2008[16]

The first point of importance is that the Working Paper carefully distinguished between different kinds of codes and their functions. This differentiation was set out as in Table 3. The Netherlands paper drew this differentiation from a paper by the Sociologist Professor Brain Rappert.[17] Rappert argued that it was critical to differentiate between these different kinds of codes because discussions would become impossibly muddled if people were talking about different kinds of code. As indicated in the Working Paper, the Netherlands national code of conduct was "to be seen as a contribution to awareness raising".[18]

TABLE 3: Types of Codes and their Functions

Type	Name	Main Aims
Aspirational codes	Code of Ethics	Alert; set realistic or idealistic standards
Educational/Advisory codes	Code of Conduct	Provide guidelines, raise awareness & debate; foster moral agents
Enforceable codes	Code of Practice	Prescribe or proscribe certain acts

Source: Brian Rappert, 2004[19]

The second feature of interest is that the Netherlands code was developed after a *Statement on Biosecurity* that had been published by the Inter Academy Panel in 2005. The Statement which by then had been endorsed by 68 National Academies was included as an annex to the Working paper as shown in Table 4. It is clear that this was an Aspirational (Ethical) Code similar to the Hippocratic Oath and not a detailed code of conduct or code of practice.

TABLE 4: Statement on Biosecurity of the Inter Academy Panel

1. Awareness. Scientists have the obligation to do no harm. They should always take into consideration the reasonably foreseeable consequences of their own activities. They should, therefore: 1) always bear in mind the potential consequences - possibly harmful - of their research and recognize that individual good conscience does not justify ignoring the possible misuse of their scientific endeavour; 2) refuse to undertake research that has only harmful consequences for humankind.

2. Safety and Security. Scientists working with agents such as pathogenic organisms or dangerous toxins have a responsibility to use good, safe and secure laboratory procedures, whether codified by law or by common practice.

3. Education and Information. Scientists should be aware of, disseminate and teach the national and international law and regulations, as well as policies and principles aimed at preventing the misuse of biological research.

4. Accountability. Scientists who become aware of activities that violate the Biological and Toxin Weapons Convention or international customary law should raise their concerns with appropriate people, authorities and agencies.

5. Oversight. Scientists with responsibility for oversight of research or for evaluation of projects or publications should promote adherence to these principles by those under their control, supervision or evaluation.

Source: IAP, 2005[20]

The *Netherlands National Code of Conduct for Biosecurity* itself, for example, was taken into account in a *Code of Conduct for Biological Resource Centres* presented by the Global Biological Resource Centres Network (GBRCN) in an NGO Statement at the Seventh Review Conference of the BTWC in 2011.[21] However, it is quite clear that there was not a large-scale implementation of such codes derived from the Netherlands code and the principles set out and agreed by many National Academies. *The major likely cause of this failure is almost certainly the enormous amount of effort that is necessary to engage the life science community in the process of effectively developing and implementing such codes*. As a Working Paper by Australia put it at the 2005 BTWC meeting:[22]

> "Amongst the Australian scientific community, there is a low level of awareness of the risk of misuse of the biological sciences to assist in the development of biological or chemical weapons. Many scientists working in 'dual-use' areas simply do not consider the possibility that their work could inadvertently assist in a biological or chemical weapons programme. For most of these researchers, biological weapons

issues may seem irrelevant and therefore strong advocacy is required to overcome natural resistance or ignorance…"

Therefore, the Working Paper continued:

"…Introducing Codes of Conduct that highlight these issues is an important step in raising awareness. However, it is not enough simply to put such Codes in place. *Without effective measures to educate scientists about the existence and importance of such Codes, attitudes and awareness will remain largely unchanged."* (Emphasis added)

In drawing these conclusions together Australia's view was based on an extensive public awareness and communication strategy that it had employed in order to impress on the general population and scientific community of the importance of its quarantine policy to keep the country free of foreign species.

Contemporaneous and subsequent initiatives supporting such codes were undertaken by a wide range of scientific associations and organizations, including the American Society of Microbiology, the US National Academy of Sciences, the UK Royal Society, the International Centre for Genetic Engineering and Biotechnology, the International Union of Biochemistry and Molecular Biology and the International Council for the Life Sciences.[23] These activities have been complemented and stimulated by the ICRC as well as the work of individual scientists and academics.[24]

Further work, prior to and during the 2012-2015 BTWC Intersessional Process, to develop and promulgate codes for life scientists as well as associated policies on for example biosecurity, was undertaken in different States including Indonesia and Malaysia.[29] Consideration should also be given to the full range of Statements and Working Papers submitted by States and relevant reports and materials civil society scientific associations during or on the margins of MSPs and MXs.[26]

3. The Hague Ethical Guidelines under the CWC

In comparison to the time and energy expended by a diverse range of organizations in the life sciences, the chemical science community's efforts to develop codes were (initially at least) more limited and mainly focused upon the activities of the International Union of Pure and Applied Chemistry (IUPAC).[27] In 2004, the IUPAC President and the Director-General of the OPCW agreed on a joint project on chemistry education, outreach and the professional conduct of chemists. This led to a joint IUPAC/OPCW international workshop in 2005, which concluded that codes were needed for all those engaged in science and technology using chemicals, so as to "protect public health and the environment and to ensure that [such] activities … are, and are perceived to be, in compliance, with international treaties, national laws and regulations such as those relating to illicit drugs, chemical and biological weapons, banned and severely restricted chemicals."[28] The workshop also concluded that such codes were "complementary to national implementing legislation for the CWC" and would "help to achieve in-depth compliance throughout academia, industry, and government of those engaged in science and technology using chemicals". They would also "extend awareness of the general-purpose criteria of both the CWC and the BTWC and thus help ensure its effective implementation". The workshop recommended that IUPAC should develop a model code of principles as well as draft elements for codes that might be promulgated to IUPAC national adhering authorities (NAOs) and associate national adhering authorities (ANAOs), urging them

to review any existing codes to ensure these elements are included.[29] IUPAC and its Committee on Chemical Research Applied to World Needs (CHEMRAWN) subsequently initiated a project to develop such a code.[30] The group tasked with this project subsequently concluded that rather than drafting a single formal code, it would be more effective and persuasive to develop guiding principles, that is an Aspirational (Ethical) Code, that should then be considered by those developing any future codes of conduct for specific associations or other bodies. This reflected the view that codes are more likely to be accepted and implemented if they are developed by those to whom they will apply, thereby fostering a sense of 'ownership' amongst practitioners.[31]

In December 2014, in his *Statement* to the 19th CWC Conference of States Parties (CSP), the German Ambassador introduced his country's proposal for a "Hippocratic Oath" for chemists. Whilst acknowledging the importance of action and responsibility by States, he stated:

> "In order to free the world entirely of the danger of chemical weapons, we also have to appeal to the responsibility of individuals...who have the capability to develop and produce chemical weapons. This is the reason why Germany has submitted the proposal of a code [of conduct] for chemical professionals.... Similar to the Hippocratic oath...this concise text could lay the moral basis for the work of chemical professionals."[32]

The Conference formally:

> "**welcomed** the initiative for a text of ethical guidelines for chemical professionals related to the Convention" it further "**invited** the [OPCW's Technical] Secretariat to inform the Council of its efforts for the advancement of the initiative and its objectives in close collaboration with relevant professional and chemical industry organisations", and finally "**encouraged** States Parties to discuss the matter further."[33] (bold highlighting as original)

The German government subsequently provided dedicated funding for two workshops held in 2015 to explore these issues and develop an ethical guidelines text.[34] This project was supported and organised under the auspices of the Scientific Advisory Board of the OPCW; and the work was undertaken by an independent international group of scientists from the chemical industry and academia in 24 countries and from all world regions. This participatory approach of reaching an agreement could usefully be applied in the further development of a code under the BTWC. The independent group worked "to define and harmonize key elements of ethical guidelines as they relate to chemical weapons based on existing codes." [35] As part of this process, the group and the Technical Secretariat of the OPCW compiled and analysed a non-exhaustive collection of codes of ethics and conduct (and related guidelines).[36]

The resulting *Hague Ethical Guidelines,* echoing previous IUPAC thinking, are a set of principles — an Aspirational (Ethical) Code — that can be used to support both the development of new codes, and also to review existing codes, in order to ensure they align with the provisions of the CWC. The drafters note that "A code need not mention chemical weapons or the CWC to support its basic goals, and provisions may need to be tailored for particular sectors or circumstances, while still reflecting the fundamental values."[37] However, it should also be noted that whilst this referred to the range of codes informed by the guidelines, the introductory paragraphs contained in both the *Hague Guidelines Brochure* and the relevant promotional pages of the OPCW website clearly situate the guidelines as measures to promote adherence to the CWC.

The *Hague Ethical Guidelines* have subsequently been disseminated widely to professional societies, academia and industry organisations throughout the world. They have been endorsed by IUPAC and the International Council of Chemical Associations (ICCA).[38] Furthermore, in April 2016, the American Chemical Society (ACS) gathered 30 scientists from 18 countries for a workshop in Kuala Lumpur, Malaysia to collaboratively draft an actionable *Global Chemists' Code of Ethics* (GCCE), which was guided in part by The *Hague Ethical Guidelines*. This process was coordinated with assistance and support from the U.S. Department of State's Chemical Security Program (CSP) and Pacific Northwest National Laboratory (PNNL). [39]

The *Hague Ethical Guideline* as shown on the OPCW website are listed in Table 5. It should be noted that the OPCW continues to promote and promulgate these guidelines, particularly through the work of the Advisory Board on Education and Outreach (ABEO).

TABLE 5: The Hague Ethical Guidelines

The Key Elements

Achievements in the field of chemistry should be used to benefit humankind and protect the environment.

1. Sustainability

Chemistry practitioners have a special responsibility for promoting and achieving the UN Sustainable Development Goals of meeting the needs of the present without compromising the ability of future generations to meet their own needs.

2. Education

Formal and informal educational providers, enterprise, industry and civil society should cooperate to equip anybody working in chemistry and others with the necessary knowledge and tools to take responsibility for the benefit of humankind, the protection of the environment and to ensure relevant and meaningful engagement with the general public.

3. Awareness and Engagement

Teachers, chemistry practitioners, and policymakers should be aware of the multiple uses of chemicals, specifically their use as chemical weapons or their precursors. They should promote the peaceful applications of chemicals and work to prevent any misuse of chemicals, scientific knowledge, tools and technologies, and any harmful or unethical developments in research and innovation. They should disseminate relevant information about national and international laws, regulations, policies and practices.

4. Ethics

To adequately respond to societal challenges, education, research and innovation must respect fundamental rights and apply the highest ethical standards. Ethics should be perceived as a way of ensuring high-quality results in science.

5. Safety and Security

Chemistry practitioners should promote the beneficial applications, uses, and development of science and technology while encouraging and maintaining a strong culture of safety, health, and security.

6. Accountability

Chemistry practitioners have a responsibility to ensure that chemicals, equipment and facilities are protected against theft and diversion and are not used for illegal, harmful or destructive purposes. These persons should be aware of applicable laws and regulations governing the manufacture and use of chemicals, and they should report any misuse of chemicals, scientific knowledge, equipment and facilities to the relevant authorities.

7. Oversight

Chemistry practitioners who supervise others have the additional responsibility to ensure that chemicals, equipment and facilities are not used by those persons for illegal, harmful or destructive purposes.

*8. Exchange of Information*Chemistry practitioners should promote the exchange of scientific and technical information relating to the development and application of chemistry for peaceful purposes.

Source: OPCW, 2015[40]

4. Key Considerations in the Development and Implementation of Codes

Codes of conduct and codes of ethics are essential elements of professional culture, as they outline a set of shared principles and norms that practitioners agree to abide by. These principles and norms reflect both the way a given profession has evolved and the way it related to its broader social milieu. By design, codes of conduct and codes of ethics are self-governance instruments that enable practitioners in different domains to maintain a certain degree of autonomy in their affairs and preserve the integrity of their professional culture.[41] Hence, the processes of developing and amending existing codes of conduct and codes of ethics are deliberative processes that primarily involve representatives of the respective professional domain. It follows from here that the process of developing an Aspirational (Ethical) Code of Conduct for Life Scientists within the framework of the BTWC should ensure the active engagement of life science stakeholders in academia, industry, and government. As life science, stakeholders will also be the ones directly involved in the implementation of the code, so it is vital that they take ownership of the development process and view the code as an integral element of their professional practice.

As regards the practical development of codes, there is a vast literature devoted to the questions of how these should be developed and implemented. We do not need to go into great detail here as it was done thoroughly by the OPCW in its work on the *Hague Ethical Guidelines*. However, in the presentations by the OPCW's Scientific Advisory Board to the BTWC, the importance of the resources available in the *Ethics Codes Collection* at the Illinois Institute of Technology was acknowledged.[42] This contains, for example, a guide to developing an effective code of conduct with a list of 15 points that need to be checked.[43] We have extracted some of the points to be checked that seem to be most relevant here in Table 6.

TABLE 6: Best Practices Checklist for Developing an Effective Code of Conduct

- Are the code's provisions in line with the goals of the organization's overall ethics program?
- Does the code use clear, concise language that can be easily understood by employees at all levels of the organization?
- Does the code adequately address all areas that impact the organization, particularly those areas that offer the highest potential for risk?
- Are appropriate training methods being used, both during the code implementation phase as well as on an ongoing basis?
- Does the code include a decision tree or similar mechanism to guide employees when faced with an ethical dilemma?
- Does the code include relevant examples, case studies, or real-world scenarios that employees typically face on a daily basis?
- Is top leadership on board with the code development process, and has it been consulted as the process unfolds?
- Has input been sought from employees and stakeholders during the information gathering process?

Source: Lighthouse, 2013[44]

The collection of material on the Illinois website also includes a long article devoted entirely to the question of how to write a code.[45] One particular section asks what should be said about each element (termed a standard) in the code. These requirements are set out in Table 7.

TABLE 7: Key Components for each Element of the Code

1. Provide a rationale to explain the need for the element.
2. Provide a clear definition of the element.
3. Provide clear guidance through examples so that people understand their responsibilities.
4. Discuss additional resources for information.

Source: Martens, 2005[46]

It may appear that this is too detailed for an Aspirational (Ethical) Code but the general point stands: it is necessary to have a very clear idea of what is stated about each element of the code and why it is stated. This is particularly relevant here as it is clearly not easy to communicate ethical and security issues to practicing life scientists.

5. Comparison of the IAP Statement, the Hague Ethical Guidelines and the Proposed Code

Despite the differences in the issues addressed and the methodologies employed, it is useful for our purposes to compare the elements in these three Aspirational (Ethical) Codes: the proposed China-Pakistan code under the BTWC (Table 1); the IAP *Statement on Biosecurity* (Table 4); and the *Hague Ethical Guidelines* under the CWC (Table 5), and to investigate where and why they are similar or different.

5.1 The Elements of the Code and their ordering

On the OPCW website, the *Hague Ethical Guidelines* are contextualised by an introductory text setting out their nature and purpose i.e. "a set of ethical guidelines informed by the Chemical Weapons Convention", intended "to promote a culture of responsible conduct in the chemical sciences and to guard against the misuse of chemistry", whilst a more extensive introduction is provided in the OPCW's *Hague Guideline Brochure*.[47] The framing on the website is reminiscent of the introduction to the 2008 Netherlands national code of conduct which began by stating that:

> "The aim of this Code of Conduct is to prevent life sciences research or its application from directly or indirectly contributing to the development, production or stockpiling of biological weapons, as described in the Biological and Toxin Weapons Convention (BTWC), or to any other misuse of biological agents and toxins."[48]

An analogous approach would also seem to be sensible for an Aspirational (Ethical) Code as it meets the need of ensuring that the objective of having the code is clearly understood from the very outset without having to have a separate justification in each element of the code.

It should also be noted that the elements of the *Hague Ethical Guidelines* are directly focused on the chemical practitioner and what he or she should do. By contrast, the elements of the proposed code under the BTWC frequently do not focus directly on the life science practitioner. Indeed, after a long paragraph of introduction, the elements are clearly stated to be aimed at "biological scientists and research institutions" in a short paragraph immediately prior to the elements. For comparison under the *Hague Ethical Guidelines* "chemical practitioners" are mentioned in elements 1, 3, 5, 6, 7 and 8; and additionally, "education providers" (i.e., chemists) are mentioned in element 2. Only element 4 on ethics does not take this general approach. It would seem sensible to consider the approach of the guidelines in any revision of the proposed code. We suggest that the effectiveness of the China-Pakistan code to promote awareness and change behaviour would be significantly increased if it were reframed so that most elements specifically addressed its key audience: individual life science practitioners in academic, industry, or government settings. However, it is important that the elements of the code directed at research institutions and other entities are preserved, as they help underscore the role that organisational culture plays in reinforcing and strengthening professional norms and practices.

It is also clear that some elements of the guidelines and the proposed code relate to the same issue: so element 1 of the code on Ethical standard covers the same topic as element 4 of the guidelines on Ethics; element 8 of the code on Education covers the same issue as element 2 of the guidelines on Education; element 9 of the code on Awareness and engagement covers the same element 3 of the guidelines on Awareness and engagement; element 10 of the code on International exchanges covers the same issue as element 8 of the guidelines on Exchange of information. While it is not quite so easy to see just from the titles, there are

also commonalities between element 2 of the code on Research integrity and element 5 of the guidelines on Safety and security, between element 4 of the code on Process management for science research and element 7 of guidelines on Oversight and also between element 7 of the code on Institution's role and element 6 of the guidelines on Accountability. These corresponding elements are set out in Table 8.

TABLE 8: Corresponding Elements of the China Pakistan Code and the Guidelines

CHINA PAKISTAN CODE	HAGUE *GUIDELINES*
Element 1: Ethical standards	Element 4: Ethics
Element 8: Education and training	Element 2: Education
Element 9: Awareness and engagement	Element 3: Awareness and engagement
Element 10: International exchanges	Element 8: Exchange of information
Element 2: Research integrity	Element 5: Safety and security
Element 4: Process management	Element 7: Oversight
Element 7: Institution's role	Element 6: Accountability

These commonalities are to be expected in the closely related fields of chemistry and the life sciences. There are also elements in which the code and the guidelines differ, and again these are understandable. The guidelines start with element 1 on Sustainability and must relate to concerns about achieving the UN Development Goals without despoiling the environment with dangerous chemicals. Safely achieving these goals is just as important in regards to the life sciences, but element 3 of the code on Respect for the object of research relates to the more likely possibility of life scientists being involved in research on animals and human beings. The code also has two more elements than the guidelines and these two elements – 6 on the Popularisation of science and technology and 5 on Constraint on the spread of research outcome – relate to the problem of both publicising the gains to society from scientific advances and preventing the misuse of such gains.

Finally, it is clear from the diversity of codes under the BTWC put forward since 2005[49] that it will not be easy to find agreement on the elements that should be in a code. One way that may help to decide what should be the elements might be to ask what would be the simplest way forward? For example, given that the OPCW has made important progress in developing, disseminating and promoting the *Hague Ethical Guidelines* and has resources available to foster further action, notably through its ABEO, and that there is a clear ongoing integration (convergence) of chemistry and the life sciences that will continue well into the future, it may be sensible for the aspirational code's drafters and the BTWC States Parties more generally to consider the potential scope for synergy in the promotion of ethical guidance amongst the chemical and life science communities. This may be facilitated by examining how best to reinforce the common messages from both codes, which in turn may, in part, be aided by examining the possible structural alignment of the two codes by reordering certain elements of the proposed aspirational code so that they fit

more closely to the order of the guidelines. The two extra elements of the code on information spread and constraint could then come at the end. The ordering of the elements of such a rearranged code is set out in Table 9.

TABLE 9: A Rearrangement of the Elements of the Proposed Aspirational Code

Introduction: Annunciating the role and purpose of the Code in promoting respect for the BTWC
Element 1: Ethical Standards
Element 2: Education and training
Element 3: Awareness and engagement
Element 4: Respect for the object/subject of research
Element 5: Research integrity
Element 6: Process management for dual-use science research
Element 7: Institution's role/Oversight
Element 8: International exchanges
Element 9: Constraint on the spread of research
Element 10: Popularisation of science and technology

We also think that the position of education and awareness and engagement is well placed as elements 2 and 3 of the code as there is considerable later evidence that Australia (see Section 2) was completely correct in its 2005 judgement that without systematic awareness-raising and extensive educational foundation no code is going to be effectively implemented and really affect the behaviour of people for the common good.[50]

5.2 The Content (Wording) of the Elements of the Code

Turning then to what might be the *content* of each of the elements in the code, it is easy to see that there is a very close resemblance in the elements of the *IAP Statement on Biosecurity* and the *Hague Ethical Guidelines* as shown in Table 10.

Table 10: Comparison of the Elements of the IAP Statement and the Hague Ethical Guidelines

IAP STATEMENT	*HAGUE GUIDELINES*
1. Awareness	3. Awareness and Engagement
2. Safety and Security	5. Safety and Security
3. Education and Information	2. Education/8. Exchange of Information
4. Accountability	6. Accountability
5. Oversight	7. Oversight
	1. Sustainability
	4. Ethics

So, the *Hague Ethical Guidelines* have the extra elements of Sustainability (1) and Ethics (4) and have separated Exchange of Information (8) from Education (2). The inclusion of Sustainability is understandable as the issue of sustainable development had loomed much larger in 2015 than in 2005, and the same might well be said in regard to Ethics. The wording of the common elements in the IAP Statement and the Hague Guidelines are set out in Table 11.

Table 11: Wording for the Common Elements of the IAP Statement and the Hague Guidelines

The elements of the IAP *Statement on Biosecurity* are shown first with the Element shown in **bold** and the Element from the *Hague Ethical Guidelines* with the Element shown in *italics*.

1. Awareness. Scientists have the obligation to do no harm. They should always take into consideration the reasonably foreseeable consequences of their own activities. They should, therefore:

1) always bear in mind the potential consequences - possibly harmful - of their research and recognize that individual good conscience does not justify ignoring the possible misuse of their scientific endeavour;

2) refuse to undertake research that has only harmful consequences for humankind.

3. Awareness and Engagement Teachers, chemistry practitioners, and policymakers should be aware of the multiple uses of chemicals, specifically their use as chemical weapons or their precursors. They should promote the peaceful applications of chemicals and work to prevent any misuse of chemicals, scientific knowledge, tools and technologies, and any harmful or unethical developments in research and innovation. They should disseminate relevant information about national and international laws, regulations, policies and practices.

2. Safety and Security. Scientists working with agents such as pathogenic organisms or dangerous toxins have a responsibility to use good, safe and secure laboratory procedures, whether codified by law or by common practice.

5. Safety and Security Chemistry practitioners should promote the beneficial applications, uses, and development of science and technology while encouraging and maintaining a strong culture of safety, health, and security.

3. Education and Information. Scientists should be aware of, disseminate and teach the national and international law and regulations, as well as policies and principles aimed at preventing the misuse of biological research.

2 Education Formal and informal educational providers, enterprise, industry and civil society should cooperate to equip anybody working in chemistry and others with the necessary knowledge and tools to take responsibility for the benefit of humankind, the protection of the environment and to ensure relevant and meaningful engagement with the general public.

8. Exchange of Information Chemistry practitioners should promote the exchange of scientific and technical information relating to the development and application of chemistry for peaceful purposes.

4. Accountability. Scientists who become aware of activities that violate the Biological and Toxin Weapons Convention or international customary law should raise their concerns with appropriate people, authorities and agencies.

6. Accountability Chemistry practitioners have a responsibility to ensure that chemicals, equipment and facilities are protected against theft and diversion and are not used for illegal, harmful or destructive purposes. These persons should be aware of applicable laws and regulations governing the manufacture and use of chemicals, and they should report any misuse of chemicals, scientific knowledge, equipment and facilities to the relevant authorities.

5. Oversight. Scientists with responsibility for oversight of research or for evaluation of projects or publications should promote adherence to these principles by those under their control, supervision or evaluation.

7. Oversight Chemistry practitioners who supervise others have the additional responsibility to ensure that chemicals, equipment and facilities are not used by those persons for illegal, harmful or destructive purposes.

Given that all of this wording has already been widely accepted within the scientific community it would seem sensible to use such wording in the revised aspirational code under the BTWC where that is appropriate.

6. Conclusions

We suggest that in the further discussions of the Aspirational (Ethical) Code under the BTWC and the development of the proposal by China and Pakistan it would be useful to consider the following ideas:

1. All of the elements of the code should have wording (content) that is as short and concise as possible so that the whole code is easily understood and remembered by practicing scientists.

2. The code should be introduced by a very concise statement of its purpose analogous to that used in the national code of conduct developed by the Royal Netherlands Academy of Arts and Sciences in 2008.

3. As far as is possible, the elements of the code should focus on the 'science practitioner' in an analogous way to the way that the *Hague Ethical Guidelines* for the Chemical Weapons Convention focus on the 'chemical practitioner.'

4. While it might be difficult to achieve a consensus on the elements of a universal biological security code and their contents, there is sufficient commonality in the elements and contents in the existing codes related to the BTWC for a compromise solution to be possible.

5. Because of the continuing integration of the chemical and biological sciences the order of the elements of the aspirational code should be aligned as far as possible with the order of the comparable elements in the *Hague Ethical Guidelines*.

6. In order to emphasise the necessity of regular, mandatory, certificated courses in biological security for all life science

practitioners to underpin the code, education and awareness-raising should be placed high on the order of the elements of the code just after the ethics element.

7. Advantage should be taken of the fact that the wording in the IAP *Biosecurity Statement* and the *Hague Ethical Guidelines* is widely known within the scientific community to use the wording in these two documents where it is appropriate in the Aspiration (Ethical) Code under the BTWC.

8. In order to facilitate the effective promulgation and consequent implementation of the proposed Aspirational (Ethical) Code under the BTWC, it is important to ensure that life science stakeholders are actively engaged in the process of the development of the code as in the participatory approach used to develop the *Hague Ethical Guidelines*.

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Endnotes:

* The terminology traditionally used for codes is confusing as 'code of conduct' is sometimes used to cover different kinds of codes – aspirational, conduct and practice, and the particular type of code - of conduct - that gives guidance on appropriate behaviour in the workplace. We have sought to avoid confusion in the rest of this paper by using just the word 'code' to cover codes in general and 'code of conduct' to refer only to codes that give guidance in the workplace.

For reasons explained in the paper, we describe this as an Aspirational (Ethical) Code similar to the Hippocratic Oath and the Hague Ethical Guidelines for chemists.

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