20th Pugwash Workshop Study Group on the Implementation of the CBW Conventions: *The BWC Intersessional Process towards the Sixth Review Conference and Beyond* Geneva, Switzerland, 8-9 November 2003

Reactions to Self-censorship

by? C.A. McLeish
SPRU ? Science and Technology Policy Research
University of Sussex

Abstract:

Earlier this year a proposal was put forward by representatives of 32 scientific journals for new guidelines on publication . These guidelines were deemed necessary because of a heightened threat perception and the potential that some publications might be aiding biological warfare development. This paper uses the idea of ?adoption of threat models? for its context to present a reaction to that statement. By deconstructing the threat? model contradictions between the embedded assumptions of the? model and the group behaviour associated with scientists are noticed. It concludes that whilst the statement is a good beginning those contradictions mean it is an inadequate final product. The discussion about adoption of models has important implications for the upcoming discussions about codes of conduct.

After a meeting on 9th January 2003 members of the Journal Editors and Authors Group, comprising of 32 leading journal editors including *Nature, Nature Medicine* and *Critical Reviews in Microbiology,* agreed a statement on guidelines for publication.[1] The statement, reprinted in full in *Nature* on February 20th 2003, contained the following points

> We recognize that the prospect of bioterrorism has raised legitimate concerns about the potential abuse of published information? We are committed to dealing responsibly and effectively with safety and security issues that may be raised by papers submitted for publication, and to increasing our capacity to identify such issues as they arise?[O]n occasions an editor may conclude that the potential harm of publication outweighs the potential societal benefits? the paper should be modified, or not be published? [2]

By issuing this statement, these journal editors were perceiving the threat from biological warfare (BW) as sufficiently high to warrant a system of self-censorship on the public dissemination of certain aspects of their community?s research.

At the heart of their statement is the issue of ?dual use? for it is this quality of tangible and intangible elements of technology to have current and potential applicability to illegitimate as well as legitimate purposes which is being recognised by the journal editors. But why is this statement being made now? Has the contribution made by dual-use technologies to BW development suddenly increased, thereby increasing the BW threat?

This paper will present one context in which a reaction to that statement can be made. The reaction is based on the belief that the journal editors have uncritically accepted as true a model of BW threat which has embedded within it two assumptions: that advances in biology equal enhancements to BW agents and that increased availability of dual use technologies is increasing the likelihood of their use. These assumptions are widely accepted in political fields and are therefore seen as leading to an implicit and reasonable assessment of threat. However, if uncritical acceptance of this model and its assumptions has taken place by these members of the scientific community, then an identity crisis could be provoked ? for the group identity of scientists sees them as rational and questioning individuals who, before accepting new knowledge, will examine and test evidence.

Background to the journal editors statement

Traditionally viewed, the scientific community is shown to wrestle with ideas of secrecy: the Mertonian norms of science - communism, universalism, disinterestedness, and organised scepticism (CUDOS) - are invoked by those who wish to show an inimical and unnatural relationship between science and secrecy.[3] The norms of 'communism' and 'organised scepticism' in particular are most at odds with the idea of censorship. The first necessitates full disclosure of scientific findings and methods which in turn permits the second norm, that all claims be subjected to trials of replication and verification, without insult to the claimant, thereby making it impossible for false or wrongly founded theories to persist.

In reality, this model of science as pursuit of ?public knowledge' is primitive employing unrealistic notions and descriptions of the contemporary practice of science. Science as practised today has numerous examples of conscious and unconscious acts of censorship, ranging from tacit knowledge, to research conducted under proprietary rules, to defence-related pursuits of

scientific and engineering knowledge under conditions of restricted access. The idea of censoring dissemination of scientific research then is not new and should not provoke controversy.?

However in biology, controversy has emerged. The publication of several pieces of ?contentious research?[4] during 2001-2002, such as a paper on the synthesis of polio virus cDNA without natural template; another on the design of variola virus immune evasion; and a third on how to overcome genetic resistance to mousepox[5], led to concerns being raised about the risks of unrestricted publication of certain research in an atmosphere of heightened perception of threat from biological weapons.

The media, for example, interpreted the publication of one of those papers (the Cello et al paper on the synthesis of polio virus cDNA without natural template) as proving that any virus could be synthesised from chemical reagents purchased on the open market.[6] Highly sensitive to the issue of BW after the anthrax letters campaign, media reports engendered mass nervousness about the possible contribution advancing biology was giving to those who wished to use biological weapons against them. The media was not the only group to react to the Cello et al paper. Political reaction reached the extent of Representative Dave Weldon of Florida introducing House Resolution 514 which criticised the publication of it on the basis that the paper ?publish[ed] a blueprint that could conceivably enable terrorists to inexpensively create human pathogens for release on the people of the United States.?[7] The resolution included propositions that

> (3) The scientific community should develop ethical standards and exercise restraint to ensure that information that may be used by terrorists is not made widely available; and
>
> (4) The executive branch should examine all policies, including national security directives, relevant to the classification or publication of federally funded research to ensure that, although the free exchange of information is encouraged, information that could be useful in the development of chemical, biological, or nuclear weapons is not made accessible to terrorists or countries of proliferation concern.

Despite many in the scientific community ?conclud[ing] that the Cello et al experiment was neither a novel discovery nor a potential threat?[8] the debate about unrestricted publication of potentially relevant BW information was taken up in a series of workshops which examined possible guidelines for publication of such material.[9] These workshops were not only responding to the observed mass nervousness but can also be thought of as an attempt to draw the wider biological community into becoming members of a ?community of those with shared fate? ? the public with their increased nervousness following the anthrax letters campaign, government officials and other national members of the arms control and disarmament community who had been raising the issue of the threat from biological weapons, and the wider international community that had spent 10 years negotiating what came to be a failed compliance-verification regime for the Biological Weapons Convention.

According to the journal editors statement published in *Nature*, it was a day after one of these workshops (the January 9th 2003 workshop) that ?a group of journal editors, augmented by scientist authors, government officials, and others, held a separate meeting designed to explore possible approaches?What follow[ed they said] reflect[ed] some outcomes of that preliminary discussion.?[10]

What seems to be apparent from both the reaction to the publication of one of those pieces of 'contentious research' by the media and politicians and the action taken by the scientific community is that their concerns centre around the familiar and challenging problem of governance of 'dual-use' technologies. In its short-hand understanding, 'dual-use' refers to tangible resources which can be converted from military to non-military purposes.[11] This definition is unsatisfactory. A more comprehensive understanding, realising the full range of opportunities where duality could be exploited, can be gained by applying a multi-disciplinary approach toward the definition of ?technology?. For example, applying Autio and Laamanen?s view of technology allows consideration not only of the duality to be found in tangible components of technology but also of those to be found in

> the ability to recognise technical problems, the ability to develop new concepts and tangible solutions to technical problems, the concepts and tangibles developed to solve technical problems, and the ability to exploit the concepts and tangibles in an effective way [12]

These are qualities embodied in people and have the same capacity to be dual-use as the artefacts they produce. A more satisfactory definition of 'dual-use technologies' is therefore achieved when it is understood that tangible and intangible technological components can be considered dual-use if they have current and/or potential military and civilian application.[13] In the case of these pieces of 'contentious research' the issue is the management of intangible dual use

technologies - the tacit and codified knowledge within the published research. The concern is that from the publication of a piece of legitimate dual-use research, a scientist with skills such as the ability to recognise technical problems and to solve them, and the ability to use these solutions effectively, could use the publication for illegitimate reasons. [14]

But why is attention now being drawn to the potential contribution scientific literature could have to BW development? In order to answer this question it is necessary to look at the current construction of the model of threat.

Models

Models of the real world are used in a variety of fields to facilitate the understanding of real-world scenarios by introducing assumptions of what factors influence the scenario and their effect. Therefore idealised and oversimplified realities are constructed within definite boundaries that isolate what happens inside the model from the chaotic influences of external forces.

Models of groups also offer individual and social identity. Adopting a model allows a group of individuals to identify, or be identified with, certain norms of behaviour. For example, one norm found when modelling scientists is that the pursuit of science should be for social good. Those scientists and non scientists who adopt this model are provided with a norm that gives them social identity and importantly provides them with both a guide to behaviour and a reason to behave in a certain way. Should a scientist? adopt a norm of behaviour and then act in a manner that goes against it, an identity crisis occurs. A similar identity crisis would also? take place if mutually exclusive models are adopted: a scientist cannot adopt a model that permits hostile use of science if he already adheres to a model that forecloses this path of behaviour.

Models can be novel or ?pre-packaged? offering ?ready-made solutions [taken from] other jurisdictions."[15] They are particularly useful in policy making. According to Braithwaite and Drahos policy makers tend to adopt the ?pre-packaged? variety because

> A state does not ? cannot ? search for the best solution to the problems it would like to do something about. Solutions that are good enough will do. Hence when someone offers a pre-packaged model that is good enough, it is often an efficient use of the state?s time to buy [into] it. [16]

Should a ?pre-packaged model? or ?ready-made solution? be adopted in a different policy area from that which it was created for, then model-users in the new policy area have to inherit some of the basic assumptions created for its previous use i.e. they have to identify with some of the assumptions in order to make the ?good enough? solutions work.

Threat model

Models of threat are distinctive because of the complex and abstract characteristics of the environment. Their abstract tendencies become apparent when examining how model assumptions are created. According to Cohen, assumptions are created by a series of ?anticipation[s] on the part of the observer, the decision maker, of impending harm.?[17] These anticipations can be either ?actual?, i.e. inferred from definite signals of intent, or ?potential? meaning they are inferred from some state of the environment or capability of an opponent. In circumstances of creating threat assumptions Cohen believes that

> it is [rare] that the decision-maker comes into possession of evidence of a syllogistic kind sufficiently adequate or reliable to enable him to draw certain conclusions. In other words, the perception of threat is invariably based on a deductive step - a leap in the dark - that necessarily goes beyond the limited information inherent in the original statement [18]

What Cohen is arguing is that when creating assumptions of threat, and therefore the models themselves, an anticipation of the real world, not the real world itself, is being described. Unlike other models which used observed or known factors, the factors and effects in threat models are not logical or reasoned, but created by deductive methods that can be influenced by all kinds of external factors. Those who wish to adopt the model and be identified with it are therefore associating themselves with unreasoned methods susceptible to international, institutional and political biases.

All current commentaries on BW seem to contain two embedded assumptions which are then interlinked to form a model of threat. These two assumptions are:

> *Increased availability of dual use technologies is increasing the possibility of BW use*
>
> *Advancing biology is widening the ability of disease to be put to hostile purposes.*

Interlinked, they flow into a model of threat which perceives an increased likelihood of BW weapons use. The model as read also reveals an ?implicit? course of action to reduce the level of perceived threat: g*overn the availability of relevant dual-use technologies*.

This current model of threat is widely accepted in political fields as a reasonable assessment of the real world situation and as providing an implicit course of action to follow.[19] So accepted is this model that it is hard to imagine an alternative, or alternative course of action to put forward for adoption. However, the embedded assumptions of the current threat model cause conflict with the model of scientific inquiry and therefore provokes an identity crisis for a scientist accepting it uncritically. What follows is a deconstruction of the current threat model, elaborating on the assumptions and course of action providing a genealogy of their acceptance.

Assumption 1: Increased availability of dual use technologies is increasing the possibility of BW use

The most public declaration of this assumption came in the January 1992 summit session of the United National Security Council where the proliferation of weapons of mass destruction was considered as a threat to international peace and security. The statement, made by heads of state and government, went on:

> The members of the Council commit themselves to working to prevent the spread of technology related to the research for or production of such weapons and to take appropriate action to that end.[20]

This statement is significant because it was the first time since the end of the Cold War that a collective definition of what was considered a threat was made. The threat as defined was the proliferation of weapons of mass destruction with ?proliferation? referring to the growth and spread of an object, if that growth is left unchecked. This understanding then became the basis for an agreed model of threat with its course of action being that heads of state and government ?commit[ted] themselves to working to *prevent the spread of technology* related to the research for or production of such weapons? (emphasis added).

Since the 1992 United Nations redefinition of the threat environment, the notion that proliferation of weapons of mass destruction technology (including biological dual-use technologies) is the new threat to world peace and stability has been repeatedly expressed. President Clinton, for example, addressing the United Nations General Assembly in September 1993 said:

> One of our most urgent priorities must be attacking the proliferation of weapons of mass destruction, whether they are nuclear, chemical or biological; and the ballistic missiles that can rain them down on populations hundreds of miles away. If we do not stem the proliferation of the world's deadliest weapons, no democracy can feel secure.[21]

Similar concerns were raised by the communiqu? issued after the North Atlantic Council meeting in January 1994. The communiqu? stated "proliferation of weapons of mass destruction and their delivery means constitutes a threat to international security and is a matter of concern to NATO. We have decided to expand Nato?s political and defence efforts against proliferation, taking into account the work already underway in other international fora and institutions."[22] As the notion of an increase in threat from biological weapons became embedded in the consciousness of governments, so did the converse: that conceivable benefits from their use were increasing.

The assumption that increased availability of dual use technologies increases the likelihood of BW use can be traced to before the 1992 Summit Statement. For example the year before at the Third Review Conference for the BWC, the states explicitly referenced this assumption. In the UK contribution, they said:?

> There can be no doubt that the proliferation of legitimate civilian industrial microbiology activities, and the continuing development of the underlying theory and equipment, has increased the potential world-wide for developing and producing biological weapons?[23]

Because this view was shared by so many others at that Review Conference? the Final Declaration welcomed statements from States who ?have made to the effect that they have not transferred agents, toxins, weapons, equipment or means of delivery, specified in Article I of the Convention, to any recipient whatsoever and have not furnished assistance, encouragement or inducement to any State, group of States or international organizations to manufacture or otherwise acquire them.?[24] With this number of states reiterating the same assumption, previous acceptance of it is implied.

As already mentioned when "confronted with the need to solve a problem? there is probably a tendency to? search for ready-made solutions in other jurisdictions"[25] which often entails inheriting assumptions. In this case, the belief that unchecked spread of certain technologies increases a threat, as implied at the Third Review Conference as well as the 1992 UN Summit Statement, is not without precedents.

The basic assumption of the members of the Co-ordinating Committee for Multilateral Export Controls (CoCom) set up in 1949 for example, was that danger will increase if some military relevant technologies fall into the hands of the Soviet bloc countries and China. The action resulting from that assumption was for the members to restrict the availability of certain technologies in order to prevent and/or delay acquisition of military relevant Western technology by those countries. [26]

This assumption, and course of action, was in turn adopted in another policy context: by those countries who in 1984, responded to the findings of a special investigatory mission, sent by the UN Secretary General to Iran, that chemical weapons had been used in the Iran-Iraq war. Their action established export controls on certain dual-use technologies to ensure that their industries were not, either on purpose or inadvertently, assisting other states to acquire and use chemical weapons. In other words technology distribution was curtailed. Some of these countries then went on to form the Australia Group, which continued this process for dual-use chemical technologies, expanding it in 1990 to include dual-use biological technologies.

By 1992 therefore, when the heads of state and government made their declaration about working to prevent the spread of technology underlying weapons of mass destruction, the assumption had already been accepted and was used by some governments as a policy tool. This assumption has since been perpetuated by a series of external events such as the transgression of the norm by the Soviet Union and Iraq, revelations about the South African programme, the anthrax letter campaign, and the globalisation of biotechnology, which have all helped to increase the perception of threat by proliferating dual-use biological technologies. The assumption continues to be repeated by Governments at Review Conferences including Switzerland at the Fourth Review Conference in 1996 when it said

> The methods of bio- and gene technology [have become] *widespread and are therefore more and more accessible to less experienced scientists, which enhances the danger of proliferation of BW technologies.* [emphasis added] [27]

The UK at the same conference said

> *The growing use of high quality chemical engineering in fermentation processes in all geographical regions of the world also increases the opportunities for misuse of this technology for the production of pathogens or toxins as BW? Increasingly worldwide use of technologies including bioprocessing in the civilian sector has further increased the opportunities for BW proliferation* [emphasis added] [28]

And at the Fifth Review Conference the USA:

> The global availability of massive amounts of genomic information and capabilities to manipulate that information for both peaceful and non-peaceful purposes is both encouraging and unsettling. These technological achievements have implications for enhancing biological weapons proliferation, but they also provide mechanisms for enhancing protection and prophylaxis against such weapons, thereby strengthening the BWC. [29]

Comments such as these made by states parties reflect the collective acceptance that the perception of? threat from BW, and so the conceivable benefit that could be gained from resorting to it, has increased because of increased availability of dual-use biological technologies. In turn, possession of dual-use technologies or dual-use industries seems to have created a perception that exploitation of them? for hostile use will be actualised.

Assumption 2: Advancing biology is widening the ability of disease to be put to hostile purposes.

This assumption is based on a concern that advancing biology could potentially lead to enhanced BW agents. It is an assumption that has been well studied. [30] The potential contribution that biology could make to BW developments was also recognised by the writers of the BWC when in Article 1 they included the enlightened words of the General Purpose Criterion. These words are underlined below

> [Each states party] undertakes never under in any circumstances to develop, produce, stockpile or otherwise acquire or retain:
>
> (1) Microbial or other biological agents or toxins, whatever their origin or method of production, of types and in quantities that have no justification for prophylactic, protective or other peaceful purposes;
>
> (2) Weapons, equipment or means of delivery designed to use such agents or toxins for

hostile purposes or in armed conflict.

By prohibiting purposes not things, the General Purpose Criterion allows the BWC to be relevant to any advances made in biology. At the heart of this assumption is the translation made between advancing biology, particularly biotechnology,? the widening ability of disease to be put to hostile use,? and actualisation of weapon use. Like the previous assumption this translation is also evident in passages from the science and technology papers submitted to the BWC Review Conferences.

A clear shift from the sanguine attitude displayed during the First Review Conference towards science and technology developments can be identified during the Second Review Conference when in the Final Declaration of that Conference states parties noted:

> The Conference, conscious of apprehensions, arising from relevant scientific and technological developments, inter alia, in the fields of microbiology, genetic engineering and biotechnology, and the possibilities of their use for purposes inconsistent with the objectives and provisions of the Convention, reaffirms that the undertaking given by the States parties in Article I applies to all such developments.
>
> The Conference also reaffirms that the Convention unequivocally applies to all natural or artificially created microbial or other biological agents or toxins whatever their origin or method of production. Consequently toxins (both proteinaceous and non-proteinaceous) of a microbial, animal or vegetable nature and their synthetically produced analogues are covered. ? [31]

The intervening Review Conferences did nothing to reduce the rising tide of apprehension about potential abuse

> Our concerns expressed in 1991 remain, that while promising great benefits to mankind *the advances in technology could be used to produce new substances or modify old ones and lead to a new and significant toxin, biological or biochemical weapons threat and we all must remain aware and cognizant of this potential*? [emphasis added]. [32]

Other countries besides the USA also expressed concern at the conference, including Sweden

> Advances in molecular biology are providing new insights into the molecular pathology of diseases and have already affected the way drug discovery is undertaken. The research is focused on molecular targets and is organized around the mechanisms underlying disease processes. Co-evolution of mammalian cells and microorganisms has ensured that virulence factors are extremely well adapted and the study of the interface between cell biology and microbiology is one driving force in this development. Gene therapy is another area of research that is important in the characterization and validation of potential molecular targets. *While these developments have been and are beneficial in the context of public health, animal health and agriculture, it has also the potential, if misused, to be a base for development of new or modified BW agents or toxins?. The growing knowledge about disease-causing mechanisms and about fine tuned control of processes in the human body explores new avenues for therapy and prophylaxis but also increases the risk of misuse.*[emphasis added] [33]

Sweden made similar remarks at the Fifth Review Conference, but added:

> While these developments have been and are mostly beneficial they can also be misused. *Biotechnology could be used to create an increasingly complex set of pathogens and toxic molecules targeted at humans, plants or animals?* [emphasis added] [34]

Each Final Declaration expanded the scope of scientific fields over which the Conference held apprehensions. In the last of those statements made at the Fourth Review Conference in 1996, the Conference stated apprehension about the potential misuse of "microbiology, biotechnology, molecular biology, genetic engineering, and any applications resulting from genome

studies".[35]

In the submissions to the Review Conferences quoted above, the emphasis placed on the advances in biology illustrates the framing of the dual-use dilemma by the diplomats of participating governments. They perceived, that as the science base of biology advanced in its civilian industrial setting, the mass of technology that might be put to use to create advanced BW agents was increasing. When coupled with the previous assumption the increasing availability of these technologies? was translated into a perceived threat that it was becoming easier for a determined country to acquire the necessary technology to develop advanced biological weapons. Each successive advance in the technology - whether in terms of knowledge base of life processes, technology development, or increased availability - caused the states parties greater concern about the threat posed from biological weapons.

The linkage in assumptions made by states parties between perceived threat, advances in biotechnology, and increased availability of relevant technologies, meant model-users were able to predict that: *a determined BW proliferator will use advanced biology in order to create enhanced BW agents and use dual use technologies achieve this end.*

Action 1: Govern the availability of relevant dual-use technologies

The assumptions described above have similarities with other control mechanisms suggesting a 'pre-packaged solution'. Likewise this action is not without its own precedents. Supply-side control mechanism, such as export controls, are used to control the flow of technology in order to prevent or impede the acquisition of technology for illegitimate reasons. The core belief of such an action is to "manipulate global access to... technology"[36]? and maintain stability. For example, when CoCom members assumed that ?danger will increase if some technology was to fall into the hands of the Soviet bloc countries and China? the implicit action they undertook was to curtail access to the 'dangerous' technology by ?circulating lists of embargoed goods, including the international lists which name goods that have dual civilian and military application.? Before an embargoed technology could be exported to a Soviet bloc country or China the consent of all CoCom members was required.[37]

The Wassanaar Arrangement on Export Controls for Conventional Arms and Dual-Use Goods and Technologies which followed CoCom was "established in order to contribute to *regional and international security and stability*, by promoting transparency and greater responsibility in transfers of conventional arms and dual-use goods and technologies, thus preventing*destabilising accumulations*." [emphasis added][38] Like CoCom, the Wassanaar Arrangement circulated lists of sensitive technologies but unlike CoCom, transfers of these technologies did not require group approval. Denial of transfer by one member did not necessitate the denial by all members of the same transfer and vigilance was not limited to the Former Soviet Union and China. Similarly members of the Australia Group have also adopted the belief that preventing acquisition of technology will prevent destabilising accumulations of chemical and biological warfare materials. Through the use of 'common control lists' and harmonisation of national export control systems development of chemical and biological weapons are thought to be impeded.

It follows, that to control technology flows, countries have to be identified which are seen as posing a threat to the status quo if they were to be in possession of those technologies. Whilst this implies that assessments of intention are conducted, it also means that assessments of threat are used - for if there was no threat then all intentions and unchecked possession would be allowed.

That controlling the flow of technology is the predicted action from such a model is not a surprise: the assumptions allow for few other options to be considered. The point of using the examples of technology control regimes above, was to show that by the time the Australia Group adopted this course of action for biological technologies, the assumptions of the model are third generation: first CoCom and Wassanaar, second the Australia Group for chemicals, then the Australia Group for biological technologies. Moreover, CoCom was established in 1949 at the beginning of the Cold War, yet the Australia Group adopted the course of action for biological technologies forty-one years later in 1990 at the end of the Cold War. Despite the changes in the international technology environment (the progression from a buyers market to a sellers market), the differences in the international political environment including international threat assessments (Cold War to post Cold War political climate, national to sub-national threat) and the differences in the technologies being controlled (predominately single use technologies to dual use technologies) the model being used is almost the same, so the course of action remains the same.

Returning to the journal editors statement: reactions to self-censorship

Returning to examine the journal editors statement after such a discussion of context, suggests that the journal editors are not simply proposing a system of self-censorship, but also identifying and validating a widely accepted threat model and continuing the belief that? third generation pre-packaged solutions are an appropriate response to the threat.

A textual analysis of the journal editors statement shows that the group does indeed seem to have accepted (inherited) the model of threat and therefore accepted (inherited) those embedded assumptions described above. Contained in the statement is assumption 1:

> Fundamental is a view, shared by nearly all, that there is information that? presents enough risk of use by terrorists that it should not be published

and assumption 2

> ?the prospect of bioterrorism has raised legitimate concerns about the potential abuse of published information

The implicit course of action offered by the model is also present:

> We recognize that on occasion an editor may conclude that the potential harm of publication outweighs the potential societal benefits. Under such circumstances, the paper should be modified, or not be published

By suggesting a path of self-censorship, the journal editors are 'buying into' the model?s linear assumptions that increased availability of technology and increased ability of biology to be put to hostile uses will increase the likelihood of BW use. By doing so, the journal editors are publicly identifying themselves with a fight against a social harm and therefore strengthening the groups identity as working for social good. They are also given a guide for action: curtail relevant technology, in this case scientific research, and there will be a decrease in a social harm.

The repetition of the assumptions within the statement, whether consciously or unconsciously, does suggest acceptance of them. Should the adoption of the model have taken place without recognising that these assumptions also require acceptance then there is sufficient conflict with the model of scientific behaviour to provoke an identity crisis. For this latter model, to which most scientists identify with, has an established social behaviour pattern of critical examination of the validity of new assumptions. This is performed without insult to the claimant.

Given that the workshop lasted one day, and the time constraints for formulating a consensus statement, perhaps? it was impossible to thoroughly test? the model of threat before accepting it.? As such, it is hoped that this statement is just the beginning of a process which is now seeing a series of tests being conducted, rather than a final product. If this is so then examination of the threat model and its evidence might indeed identify several areas where tests of validity, without insult to the claimant, could be contemplated.

General areas might include testing the causal and linear aspects of the assumptions, the inability to measure the effectiveness of past curtailments of technology in terms of how much they contributed to a decrease in threat, and the inability to measure the effectiveness this proposed action will have on reduction of threat. Further tests might include questioning the model's reliance on Cold War arms control theories, the notion of there being a 'status quo' in the international arena, and the usefulness of still adhering to third generation 'pre-packaged solutions' despite changes to the international environment and differences in the three technologies (nuclear, chemical and biological) being controlled.

The adoption of the same model to control the diffusion of three quite different technologies is perhaps the most important test that could be conducted. Biological technologies, unlike nuclear and chemical, are predominantly dual-use and control of them poses difficult challenges: access needs to be 'governed' rather than curtailed. The difference is subtle, but important - governance allows the beneficial aspects to proliferate whilst controlling potential malign uses.

Viewing governance rather than curtailment as the correct course of action could lead to specific challenges to the model being considered. The assumption that dual-use technology will fulfil its potential and be used for hostile purposes is both linear and deterministic and is incompatible with the normative structure of the model of scientists which sees pursuit of science as a social good. Also incompatible is viewing advancing biology as equating to enhanced BW agent development. Furthermore, neither threat assumption takes adequate account of the *dual* aspect of dual-use technologies because intentionality of the user is not at the core of the response. Should the journal editors carry through with this editorial proposal, all scientists, no matter what their intentions or purpose for interest, will have certain information contained within research papers foreclosed to them. Yes this will mean that ?bad? scientists won?t be able to apply the research for hostile ends, but it also means that ?good? scientists won?t be able to use the research for positive purposes. [39]

If this is indeed only the beginning of a process and the journal editors only adopted this model of threat because of the time constraints involved in having to agree and formulate a position for publication, then the one page statement is a positive start. What the journal editors have done is to identify and ask a crucial question when considering control of dual-use technologies:*what is an acceptable level of risk?* As this is an important and serious question to ask, it is encouraging that a precautionary response has been taken by the journal editors whilst investigations continue as to the validity of the threat model.

However, this statement is only that, a positive start. The real work should now be underway. The question the journal editors have identified about levels of risk is very important, but the action they are proposing is contradictory to the social identification of scientists. More information is essential in order for others to accept this reason to behave in a different way. Questions that need answering in order for this to be accepted include:

What is the level of acceptable risk?

What criteria do they intend to use to identify research pieces which rise above this level of acceptability?

Will the criteria be based on the general or the acute characteristics of the research?

Will ease of transferral from legitimate to illegitimate intents be considered?

In light of the fact that the journal editors say they need to increase their capacity in identifying such pieces, who will set this criteria and identify those pieces whilst they do increase their capacity?

Will this be a scientific community only criteria-setting and identification process or a process open to the wider community, just as the 9th January meeting was open to ?government officials and others??

If the latter, how do the journal editors intend to remove the institutional biases from the wider community?

And finally, why now????

These questions remain unanswered. The journal editors group has not as yet described in any more detail the criteria or processes by which they intend to carry out this proposal. Until such time as they do, implications will be had for the upcoming discussions regarding codes of conduct for scientists.

A code of conduct by definition is a guide to behaviour which requires a model to either confirm or dismiss (in which case a new model is created). During this time of potential crisis when there are two competing models of science and a new behaviour guide is being proposed, which model of science will the code of conduct use as its basis? Will a new model be created or adopted in order to develop a new code of conduct? If so what are the new model?s embedded assumptions? The same processes described above - deconstruction and examination of evidence supporting a model?s embedded assumptions - also needs to be undertaken to create this code of conduct. Failure to do so, could create yet another crisis of identity within the scientific community.

---

[1] The author?s list also included editors representing *Molecular Biology of the Cell, Proceedings of the National Academy of Sciences, The Institute for Genome Research, Biochemistry, Science Infection and Immunity, Journal of Clinical Microbiology, Journal of Immunology, Journal of Biological Chemistry* and*Journal of Virology*

[2] ?Statement on the consideration of biodefence and biosecurity,? *Nature* vol 421 no 6925, 20th February 2003 p771

[3] Merton, R K? ?The Normative Structure of Science,? in, Storer N *The Sociology of Science: Theoretical and Empirical Investigations*, ed. (Chicago: University of Chicago Press, 1973), pp. 267-78.

[4] Meaning experiments that result in the creation of organisms or knowledge with ?dual use? potential

[5] See Cello J, A Paul and E Wimmner ?Chemical Synthesis of Poliovirous CDNA: genera of infectious virus in the absence of natural template?, *Science* vol 297 no 5583, 9th August 2002, pp1016-1018; Rosengard A, Y Liu, Z Nie and R Jimenez ?From the cover: Variola virus immune evasion design: expression of a highly efficient inhibitor of human complement?, *Proceedings of the National Academy of Sciences*, vol 99 2002 pp8808-8813 and Jackson R, A Ramsay, C Christensen, S Beaton D Hall and I Ramshaw ?Expression of mouse interleukin-4 by recombinant ectromelia virus suppresses cytolytic lymphocyte responses and overcomes genetic resistance to mousepox? *Journal of Virology*, vol 75 2001 pp 1205-1210.

[6] Pollack, A. "Scientists create a live polio virus", *New York Times,* 12th July 2002 and Weiss, R. "polio-causing virus created in NY lab", *Washington Post,* 12th July 2002

[7] Weldon, D. *Expressing serious concern regarding the publication of instructions on how to create a synthetic human polio virus, and for other purposes*. House of Representatives, H. RES. 514, 26th July 2002. As downloaded from http://www.fas.org/sgp/congress/2002/hres514.html This resolution was not enacted.

[8] National Research Council of the National Academies, Committee on Research Standards and Practices to Prevent the Destructive Application of Biotechnology.*Biotechnology Research in An Age Of Terrorism: Confronting The Dual Use Dilemma.* Pre-publication copy. p 22. As downloaded fromhttp://books.nap.edu/html/biotechnology_research/0309089778.pdf

[9] For example, Monterey Institute, Center for Non-proliferation Studies *Workshop on Guidelines*

for the Publication of scientific research potentially related to biological and toxin warfare, Washington DC 12 August 2002, and the National Academy of Sciences and the Center for Strategic and International Studies, *Scientific openness and national security*, Washington DC, 9th January 2003.

[10] ?Statement on the consideration of biodefence and biosecurity,? *Nature* vol 421 no 6925, 20th February 2003 p771

[11] United Nations General Assembly. *Economic and social consequences of the armaments and its extremely harmful effects on world peace and security, Report of the Secretary General*, A/32/88 12th August 1977, pp 85-125.?

[12] Autio E and T Laamanen. ?Measurement and evaluation of technology transfer: review of technology transfer mechanisms and indicators.? *International Journal of Technology Management* vol. 10, no 7/8 1995, p 647 quoted in Molas-Gallart J. *Developing Dual-Use technology transfer methodologies: taxonomy of policy alternatives.* Report prepared for the National Engineering Laboratory (Brighton: SPRU) July 1996 p5.

[13] Molas-Gallart J and J P P Robinson. "An assessment of dual-use technologies in the context of European security and defence" *Report for the Scientific and Technological Options Assessment (STOA) European Parliament*, SPRU November 1997 p16

[14] Molas-Gallart J. *Dual-use technologies and the different transfer mechanisms*, Paper prepared for The International School on Disarmament Research on Conflicts (ISODARCO) 19th Summer Course Candriai, 26 August-2 September 1998, CoPS Publication No. 55, p 2.

[15] Bennett C. ?Understanding ripple effects: the cross-national adoption of policy instruments for bureaucratic accountability?, *Governance*, vol. 10, no 3, July 1997 p213

[16] Braithwaite J and P Drahos *Global Business Regulation*, Cambridge University Press, 2000 p589

[17] Cohen, R. *Threat perception in international crisis?,* Wisconsin: The University of Wisconsin Press, 1971 p 1

[18] ibid p 164.

[19] See for example: *Acquisition of Technology Relating to Weapons of Mass Destruction and Advanced Conventional Munitions, 1 January Through 30 June 2002,* Unclassified Report to Congress from the Director of Central Intelligence, April 2003; Department of Defense. *Proliferation: Threat and Response - 2001*January 10, 2001.

[20] United Nations Security Council, *Note by the President of the Security Council*, 31st January 1992, S/23500

[21] United Nations General Assembly, *Address by Mr William J. Clinton, President of the United States of America*, Forty-eighth Session, 4th Plenary Meeting, 27 September 1993, A/48/PV.4, 4 October 1993

[22] NATO, *Declaration of Heads of State and Government participating in the meeting of the North Atlantic Council, held at NATO headquarters, Brussels on 10-11th January 1994,* Press Communiqu?, M-I(94)3, 11th January 1994.

[23] United Kingdom of Great Britain and Northern Ireland. *New Scientific and Technological Developments Relevant to the Convention on the Prohibition of the Development, Production and Stockpiling of Bacteriological (Biological) and Toxin Weapons and on their Destruction,* 13th July 1991, p8.

[24] Third Review Conference of the Parties to the Convention on the Prohibition of the Development, Production and Stockpiling of Bacteriological (Biological) and Toxin Weapons and

on their Destruction *Final Document Part II* BWC/CONF.III/23 Part II, p13

[25] Bennett C. ?Understanding ripple effects: the cross-national adoption of policy instruments for bureaucratic accountability?, *Governance*, vol. 10, no 3 July1997 p213

[26] CoCom was a mechanism set up to control the export of defence-sensitive technology to the Soviet bloc and China.

[27] Switzerland *Scientific and Technological Developments relevant to the BW-Convention* [Presented as part of Background Document on New Scientific and Technological Developments Relevant to the Convention on the Prohibition of the Development, Production and Stockpiling of Bacteriological (Biological) and Toxin Weapons and on their Destruction], BWC/CONFIV/4, 30th October 1996, p7.

[28] United Kingdom of Great Britain and Northern Ireland. *New Scientific and technological developments relevant to the Biological and Toxin Weapons Convention* ibid p16 & 18.

[29] United States of America [Paper prepared as part of Background Paper On New Scientific And Technological Developments Relevant To The Convention On The Prohibition Of The Development, Production And Stockpiling Of Bacteriological (Biological) And Toxin Weapons And On Their Destruction], BWC/CONF.V/4, 14thSeptember 2001 p22.

[30] See for example: Meselson M. ?Averting the hostile exploitation of biotechnology? *The CBW Conventions Bulletin*, no 48, June 2000, pp 16-18. Dando M ?The impact of the development of modern biology and medicine on the evolution of offensive biological warfare programs in the twentieth century?, *Defense Analysis*, vol. 15 no 1, 1st April 1999, pp 43-62; British Medical Association *Biotechnology, Weapons and Humanity* Harwood Academic Publishers, 1999; *The New Biological Weapons. Threat, Proliferation, and Control.* London: Lynne Rienner Publishers, 2000.

[31] Article 1. Second Review Convention on the Prohibition of the Development, Production and Stockpiling of Bacteriological (Biological) and Toxin Weapons and on their Destruction, *Final Document,* Geneva 8th - 26th September 1986, BWC/CONF.II/13/II

[32] United States of America. *Technological developments of relevance to the Biological and Toxin Weapons Convention,* [Presented as part of Background Document on New Scientific and Technological Developments Relevant to the Convention on the Prohibition of the Development, Production and Stockpiling of Bacteriological (Biological) and Toxin Weapons and on their Destruction, BWC/CONFIV/4, 30th October 1996, p19

[33] Sweden. *Background information on new scientific and technological developments relevant to the Biological and Toxin Weapons Convention* [Presented as part of Background Document on New Scientific and Technological Developments Relevant to the Convention on the Prohibition of the Development, Production and Stockpiling of Bacteriological (Biological) and Toxin Weapons and on their Destruction] BWC/CONFIV/4 Add 1, 21st November 1996, p 2 & 7

[34] Sweden [Paper prepared as part of *Background Paper On New Scientific And Technological Developments Relevant To The Convention On The Prohibition Of The Development, Production And Stockpiling Of Bacteriological (Biological) And Toxin Weapons And On Their Destruction*] BWC/CONF.V/4, 14thSeptember 2001p12

[35] Fourth Review Convention on the Prohibition of the Development, Production and Stockpiling of Bacteriological (Biological) and Toxin Weapons and on their Destruction, *Final Document* Geneva, 25 November-6 December 1996, BWC/CONF.IV/9

[36] Defense Science Board. "Export controls: an imperfect panacea: excerpt from the December 1999 report", *The Monitor*, vol 6 no 2, 2000,p3.

[37] Braithwaite J and P Drahos *Global Business Regulation*, Cambridge University Press, 2000 p312

[38] As downloaded from http://www.wassenaar.org/welcomepage.html

[39] Whilst intentionality is and should be at the heart of controlling dual-use technologies it should not be equated with a belief that science or scientific knowledge is neutral and only the intentions of users makes it good or bad. This is notso: values and interests drive both the substance and direction of science meaning it cannot be a neutral object.?