Ethics and the application of genetic technology to warfare

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'By engaging in science, scientists are committed to certain rules which go beyond those that inform their special expertise. They therefore have a moral responsibility to act in accordance with these rules and hence can be responsible for the outcomes of their research.'– John Forge

'Concern for man himself and his fate must always for the chief interest of all technical endeavors in order that the creation of our minds shall be a blessing and not a curse to mankind. Never forget this in the midst of your diagrams and equations.' – Joseph Byrne

While both biological warfare and biotechnology are widely discussed by the public today, little mention is made of the link between the two. The application of biotechnological advances to warfare has rarely been discussed outside of security studies, and ethical issues are rarely raised in the security context. At the Stockholm International Peace Research Institute (SIPRI) we hope to address this situation by increasing awareness about the norm against biological weapons, the Biological and Toxin Weapons Convention (BTWC) and the ethical implications of scientists' work. Initial studies conducted by SIPRI have revealed a dearth of knowledge in the scientific community on chemical and biological weapon issues and the ethical, normative and legal prohibitions which surround them. I hope that our discussions here today will further these goals.

Most biotechnology is dual-use; that is, it has both peaceful and harmful purposes. The same technologies can have both legitimate therapeutic, pharmaceutical or scientific applications and also military uses. Recent advances in biotechnology and genetic engineering can therefore be utilized to make biological agents which have greater resistance to both detection and treatment, stability in the atmosphere and during dispersal, and increased specificity. Another possibility is that novel agents could also be produced using formerly benign micro-organisms. Toxins could also be used to cripple an individual's immune and neurological systems, and technological advances may improve the delivery systems for biological weapons.

The Biological and Toxin Weapons Convention, an international disarmament treaty signed in 1972, prohibits the development, production, stockpiling and other acquisition or retention of biological weapons or toxins but permits research for defensive or 'prophylactic', 'protective' or 'other peaceful purposes'. It does not explicitly prohibit the use of these weapons, but refers back to the Geneva Protocol of 1925, which essentially prohibited first-use of these

weapons. Also, at the Fourth Review Conference of the BTWC in 1996 states parties explicitly acknowledged that Article I of the treaty covers use.

At the time that the BTWC was formulated biological weapons were viewed as having limited military utility, and so it was not believed that a comprehensive treaty or implementing mechanisms were required. With recent advances in biotechnology, however, biological weapons have the potential to be much more attractive to proliferants since they are more deadly and more versatile. These developments could not have been predicted when the BTWC was signed—the first successful genetic engineering experiment was in fact carried out shortly after the conclusion of the treaty. However, although the treaty formulators could not have predicted specific advances, they recognized the need to address them in order to ensure that the treaty would remain relevant. Rather than prohibiting certain objects or activities leading to their creation, the treaties prohibit certain purposes to which they may be employed. The permitted and prohibited purposes are outlined in what is known as the General Purpose Criterion, contained in Article I of the treaty.

The deeper understanding of the human genome and of pathogenesis offered by recent scientific developments could allow scientists to create targeted biological weapons of increased lethality. These developments necessitate a stronger BTWC regime. To address this need, a protocol to the BTWC which would enhance confidence about compliance and create an implementing organization has been under negotiation since 1995 in an Ad Hoc Group to the BTWC. It is also essential that there be clear understanding of the application of the General Purpose Criterion to the latest technologies.

The difficulties in attempting to control dual-use technology mean that we cannot rely solely upon treaties but must also look to complementary strategies. One of these strategies is to address the issue of proliferation at the level of the individuals involved in the research programmes. States are not autonomous rational actors but are instead composed of many individuals interacting in their various roles and functions. As a group, the role of scientists and researchers in the proliferation process has been overlooked. They have historically played a key role in introducing, developing, and promoting chemical and biological weapon technologies. This historical precedent is of grave concern.

Scientists and researchers determine to a large extent whether their research will be used for harmful or peaceful purposes—for purposes either prohibited or permitted by the Biological and Toxin Weapons Convention and the 1993 Chemical Weapons Convention. Technologies do not act on their own but are acted upon by individuals. The human factor cannot be taken out of the proliferation process if we are to have a complete understanding of it. It is thus the intent of the developer and the user which determine whether the technology will be peaceful or hostile. While the BTWC bans activities that violate the object and purpose of the convention, it permits research for defence, protection and prophylaxis.

Individual researchers are asked to foresee the potential applications of their work and to possibly discontinue or redirect work if they are concerned about

the consequences of their research. Scientists need to take into account the broader social consequences of their work and recognize that it does not occur in a ‘pure science’ bubble.

It is also very important that those in the science community become more aware of the international and national legal, normative and ethical prohibitions against CBW weapon work. Due to the limitations and weaknesses of treaties and legislation, it is necessary to take steps to prevent the proliferation of chemical and biological weapons at the level of the individual. Whether at the level of the state or the individual, there is a need to address the motivations of the potential proliferant.

Increased acceptance and awareness of scientific responsibility with regard to warfare followed World War II and the dropping of atomic bombs on Hiroshima and Nagasaki. This change was called for not only by society at large but also from within the scientific community and indeed from many of those involved with the creation of the bomb. This movement was reflected in the creation of the Pugwash Group, which remains a vital forum of conscience for scientists today. Other groups of a similar nature include the Federation of American Scientists, Union of Concerned Scientists and the Educational Foundation for Nuclear Science.

Recent developments in genetic technology have the potential to change society like nothing before, and as a result scientists are seeking greater guidance from society in this area. In order to receive educated guidance, the scientific community must keep the public and especially policy makers informed and alert to the foreseeable consequences of developments. In order to maximize the benefits of these technologies and minimize the risks, these issues must be brought to light. Scientific responsibility entails attempting to foresee all of the potential consequences of their work *and* informing the public about these consequences.

Researchers must be given the tools to make decisions in this ambiguous environment. These tools can include ethical guidelines or the integration into science curricula of discussions and material which provides students with (*a*) an awareness of the ethical issues involved, and (*b*) with the intellectual tools to make ethical decisions. Successful proliferation policies for the future must address this issue and include action at the level of the individual or group, and reminding us all of our ethical responsibilities is one way to do that.