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Nagasaki's Voice: Remember Your Humanity

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Working Group 8 Report: "Challenges of Advanced Technologies and the Social Responsibility of Scientists"

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At the 61st Pugwash Conference on Science & World Affairs, a working group was convened to discuss the nature of social responsibility for scientists in the 21st century. Since the Russell-Einstein Manifesto was written, significant technological change has occurred. Working Group 8 explored the implications of that change for the pursuit of socially responsible science.

Throughout its discussions, there was broad agreement in the group about the need for foresight. Scientists and decision-makers alike have a responsibility for the future. There are no experts on the future, and little evidence exists. Because of the uncertainty inherent in discussions about the future, it is especially important for science advisors to focus on anticipation and long-term risk management.

Communication of science to the public

In the nuclear age, the rapid advancement of technology poses great threats to humanity. Military applications of technology are seldom regulated sufficiently. Additionally, environmental threats from climate change continue to threaten human communities. Those people who possess scientific or technical knowledge are in a special position to inform the public about these threats and to shape decisions that will mitigate them. Working Group 8 sought to discern what the responsibility of scientists looks like today and how that responsibility can be discharged effectively.

The responsibility of scientists to communicate is especially salient in the context of crisis. Working Group 8 highlighted the Fukushima nuclear disaster as a case study in the failure of civilian technology. The diverse national backgrounds of our group members allowed us to form a broad perspective on the Fukushima disaster's impact on public opinion. National responses to Fukushima varied. Some national science bodies coordinated authoritative responses, providing citizens with timely and trustworthy information. Elsewhere, information was over-regulated so that little reliable information was conveyed to the public. In the latter case, the informational void was filled with unreliable information and speculation. Working Group 8 noted that public officials can deliberately propagate misinformation or fail entirely to communicate such as is politically expedient for them. These failures of communication exacerbate panic after an emergency event and lead to public distrust of scientific experts.

The Intergovernmental Panel on Climate Change was cited as a shining example of a body that disseminates sound scientific information. Working Group 8 looked favourably on the creation of a similar process for other pressing issues. It was also noted that specific scientists can communicate with small subsections of the public, in their civilian capacity, by disseminating and interpreting news: a useful task, albeit in a limited sphere.

- In view of threats posed by technological crises, emergent technologies, and existing risks, Working Group 8 recommends setting up mechanisms so that reliable, scientifically proven information can be communicated by scientific experts to the public and to decision-makers in a transparent manner.

Value-ladenness of science

Having established the importance of reliable science communication, Working Group 8 moved on to discuss how responsible science advice ought to be given.

Some working group members referred to an idealized, completely objective form of science. Indeed, the scientific endeavour is supposed to be impartial. The majority opinion in Working Group 8, however, was that science, as an endeavour carried out by fallible humans, is value-laden and political. In contrast to the usual call for evidence-based policy, several working group members identified the phenomenon of "policy-based evidence" taking place. The concept of policy-based evidence refers to the deliberate imposition of bias on scientific activities by political bodies. It was emphasized that scientists and science advisors must endeavour to be free of conflicts of interest. There is no perfect objectivity, but it is imperative to minimize the influence of political and economic interests as far as possible.

Even in the absence of political influences, sociological elements in the practice of science alter results. Scientific training and civic life imbue researchers with differing assumptions and values, which implicitly inform their scientific work. The Pugwash process emphasizes dialogue; Working Group 8, in that spirit, emphasized the importance of discussing assumptions and values in the process of science. Dialogue is necessary for all scientific advice. The sociology and anthropology of the scientific process must be acknowledged and investigated. Expert advice should also be reflexive and adaptive.

To that end, one group member proposed "extended peer review," which would require seeking review from individuals with different values and training in order to maximize objectivity. Such a process is valuable in analyzing the social complexity of the scientific process and minimizing the politicization of science. Being composed of professionals from natural science, the military, social science, etc., Working Group 8 had disciplinary diversity that enriched our discussions. We agreed that scientific advisory councils would benefit from being similarly multidisciplinary.

It is common for science journalism and scientific advice to overemphasize the degree of certainty in any given scientific result in a way that is not reflective of the practice of science. Scientists and science advisors need to explicitly reflect on uncertainty. Communication to a wide audience about uncertainty is also necessary.

Especially in the context of risk management, scientific communication should be nuanced, conveying the degree of confidence that can be placed in the results. When communicating about science, conveying the degree of reliability is as important as describing the outcome itself. It was suggested that much of the confusion over climate change is due to the lack of this kind of communication. The widely-communicated scientific results of the first committee of the Intergovernmental Panel on Climate Change represent the consensus view of a broad group of natural scientists and are thus very trustworthy. However, this methodological reliability is not always communicated along with the results. Scientific advice should include information about the degree of reliability, whether statistical or methodological.

Science communication is not possible without transparency. Working Group 8 emphasized that the privatization of knowledge poses challenges to that transparency; it enables institutions to hold monopolies on basic and applied knowledge and prevents the independent scrutiny of scientific work.

Furthermore, decision-makers must increase their reliance on scientific and technological advice. In view of technological advances and threats to human and environmental health, sound understanding of science is advantageous.

Managing specific technologies

Working Group 8 discussed an alarming class of weapons technology before discussing dual-use technology in general.

– *Lethal autonomous weapons systems*

The development of lethal autonomous weapons systems (LAWS), also known as "killer robots," was condemned by Working Group 8. On this issue, the intersection of science and policy is very tight. WG8 affirmed the importance of such international legal principles as proportionality, necessity, etc., which protect human dignity in the face of conflict. Lethal autonomous weapons systems and associated technologies cannot respect those principles, and hence pose serious threats to the human being.

If LAWS are introduced in combat, decisions about whether to kill civilians will be delegated beyond any human control. The nature of that delegation is not well understood. Robotics and computer science cannot be taken as common public knowledge. Thus, those with the relevant expertise should communicate with the public about the salient technical details of LAWS. Since algorithms will be responsible for belligerent actions normally carried out by humans, expert communication about those algorithms is necessary if there is to be any transparency about LAWS. It is also important that risks inherent in LAWS, such as connection problems, are understood by the public. As control is removed from humans, "smart technology" carries a great imperative for regulation. Outside the laboratories, legal mechanisms are needed to uphold standards of civilian protection. The targeting and indiscriminate killing of civilians must be criminalized.

Our discussion of LAWS and associated technologies was timely. Japan has recently lifted the ban on arms exports. Japanese experts design robotics for constructive civilian purposes such as medical assistance, disaster rescue, and radioactive clearance; foreign defense companies are now seeking access to this technology. The lifted ban leaves room for academic openness to be abused by potential military appliers. Foreign access to advanced robotic technology would accelerate LAWS' pace of development.

Currently, there is no regulatory body or treaty governing robotic weapons. It will be much easier to prevent LAWS from being introduced than to ban them after. Such a preemptive ban would not be unprecedented: blinding lasers were banned in this way. Seventy years into the nuclear era, Pugwashites surely recognize the difficulties of eliminating existing weapons systems.

- Working Group 8 supports efforts to arrive at a preemptive ban on lethal autonomous weapons systems and associated technologies. Given Japan's excellence in robotics technology, WG8 recommends that Japanese Pugwash convene a study group to that effect.

– *The dual-use nature of technology: toward a code of conduct*

Nuclear technology is very well-managed, but elsewhere, management of civilian technology is somewhat anarchic. Working Group 8 discussed the role of scientists in ensuring the responsible use of dual-use technology.

There are many difficulties inherent in influencing the application of dual-use technologies. Joseph Rotblat made the exemplary decision to leave the Manhattan Project on ethical grounds, and he was the only scientist to do so; his decision was made in a clearly defined political context. By contrast, scientific work at lesser degrees of application can be used for either military or civil purposes, leaving researchers with the difficult task of discerning how to act ethically in a context where technology could have multiple applications.

Working Group 8 emphasized the need for transparency and integrity in scientific development at all levels of application, from basic science to specialized military technology. Transparency is crucial, especially where there is room for advanced dual-use technologies to be abused in order to target civilian populations and infrastructure. Cyber warfare was discussed as a critical means by which offensive actions could have dire ramifications for civilian populations. The grave nature of threats inherent cyber warfare was emphasized.

In view of the enormity of the task of ensuring the responsible use of dual-use technology, WG8 considered various precedents for a code of conduct for scientists. Joseph Rotblat proposed creating a Hippocratic Oath for scientists. A peace pledge adopted by Japanese academic societies prevented academics in post-war Japan from collaborating with military research and development. More recently, the Argentine Committee on Science and Technology produced a national code of conduct for scientists: although the document is non-binding, it provides researchers with proposals to guide socially responsible research.

Working Group 8 discussed the challenges inherent in formulating a code of conduct for the international scientific community. We suggested ethics requirements in undergraduate science, technology, engineering, and mathematics programs as a useful educational measure. However, even in the absence of such a code of conduct, WG8 stressed that institutions and societies must promote the ethical behaviour of their researchers.

<u>Promoting regional and international cooperation</u>

Working Group 8 discussed the potential for scientific research to be used as a constructive point of commonality. We were encouraged by possibilities for promoting collaboration beyond national boundaries. One member informed the group of their project to transform Guantanamo Bay into an international science centre with a Caribbean-Latin American focus; the centre would address problems in a targeted manner, e.g. investigating adaptation to climate change. More broadly, internationalisation provides scientists with opportunities to exercise social responsibility by promoting science in less developed nations, fostering collaborations, etc.

- In the interest of promoting regional and international scientific cooperation, WG8 recommends further exploration of this project as well as other measures to facilitate collaboration beyond national boundaries.