Freedom and Responsibility in Science in the 21st Century

A framing document

July 2020

1. Preamble

This piece is intended to form a basis for the development of an ISC Position Paper on freedom and responsibility in science, with particular reference to developments in the 21st century. Its purpose is to identify the main issues for deliberation and clarification in the position paper.

The last three decades have been witness to a range of technological and social developments that are influencing profoundly the ways in which science is practised. The advent of artificial intelligence, big data, and the propagation of ideas and opinions through social media, all bear promise of significant benefits to humanity. These are however accompanied by concerns relating to the responsible and ethical use of scientific and technological knowledge.

Similar considerations apply to the manner in which scientific knowledge is tested, shared, and made accessible, with significant benefits following from shifts towards open science. However, at the same time, there are problems associated with reproducibility of research, the rise of predatory journals and conferences, and the shortcomings of favoured methods for evaluating research.

The contemporary challenges of science, and the accompanying freedoms and responsibilities, are captured in the notion of post-normal science[1]:

"The activity of science now encompasses the management of irreducible uncertainties in knowledge and in ethics, and the recognition of different legitimate perspectives and ways of knowing. In this way, its practice is becoming more akin to the workings of a democratic society, characterized by extensive participation and toleration of diversity. As the political process now recognizes our obligations to future generations, to other species and indeed to the global environment, science also expands the scope of its concerns. We are living in the midst of this rapid and deep transition, so we cannot predict its outcome. But we can help to create the conditions and the intellectual tools whereby the process of change can be managed for the best benefit of the global environment and humanity."[2]

The Principle of Freedom and Responsibility in Science, a core principle of the ISC, sets out the freedoms that scientists ought to enjoy, balanced by their obligation to engage in responsible scientific practice and behaviour. The developments in this century demand a review of the

[1] Welcome to postnormal times, Sardar Z, *Futures*. **42** (5), 2010: 435–444.
[2] Science for the post normal age, Funtowicz SO and Ravetz JR, In Westra L and Lemons J, eds., *Perspectives on Ecological Integrity* (1995) Springer, Dordrecht.

meaning of this Principle, and of the role of bodies such as the ISC in upholding its basic tenets in this new and rapidly evolving context.

This piece intends to lay the groundwork for a Position Paper that will address the following:

- The meaning and interpretation of scientific freedom;
- The responsibilities of scientists that include engagement in advice to policymakers, communication of scientific results in comprehensible form to the general public; and advocating for the value of science and for scientific values;
- Determining the ethical dimensions of these various interactions, and the boundaries of advocacy as these relate to the underpinnings of consensus views;
- Developing guidelines which serve as the basis for promoting science communication that deals fundamentally with the values of the scientific enterprise, at the same time ensuring respect for audience, for evidence, and transparency;
- The responsibility to provide guidance to members, research and educational institutions, and individual scientists, on what constitutes freedom, and responsible conduct in science, in the contemporary context.

In addition to selected items in the open literature, this framing document and the Position Paper will draw on various ISC strategic and planning documents[3].

2. The Position Paper's intended audience and readership

The Position Paper is intended to have a readership and audience that includes but extends well beyond the scientific community.

Academies of science, social sciences, health sciences and engineering will be important loci for considering and debating the interpretation of scientific freedom and responsibility as set out in the Position Paper; for developing localised versions for use at national and regional level; and for using these works as a guide to individual members on freedom and responsible conduct in science. While such resources do exist, the specific reference to issues that have become prominent in the 21st century will provide important new perspectives. Likewise, international scientific unions and associations and related organisations are an important audience.

There is great diversity in the global scientific community: by discipline, geography, language, culture, socio-economic circumstances, and the extent of development of science systems. Generational considerations are also important, with early career scientists being a cohort of particular relevance. The Position Paper will need to bear in mind the different layers of diversity, so that some of the issues it addresses might be of particular significance to subsets of the broader scientific community.

[3]For example, *Action Plan for Freedom and Responsibility in the 21st Century*, document GB4/12; the GB Working Paper on *Science as a Global Public Good* [GB6/4.4]; and the project description *Freedom and responsibility in science in the 21st century: a contemporary perspective of the responsible practice of science* (CFRS1_3.3)

Bodies such as academies might use the Position Paper as a guide to reviewing and extending their existing resources on freedom and responsibility in science, while for other bodies this would serve as a guide to developing such resources de novo.

The Position Paper needs to be of value not only to scientists in public and private R&D organizations, but also to those sectors of leadership that interface with scientists and scientific developments, and for whom issues of responsible conduct are of central importance.

Beyond the scientific community, policymakers in relevant areas, and officials responsible for developing and implementing policy on matters informed by or of relevance to science, require a good grasp of the complexities of freedom and responsibility in science.

Within broader society, the intended readership of the Position Paper includes journalists, and individuals who influence public opinion.

3. The International Science Council and scientific freedom and responsibility

The International Science Council (ISC) aims to work on behalf of the global scientific community at the global and regional levels to advance science, to catalyze, convene and share scientific expertise, to provide advice and influence on major issues of concern to both science and society, and to *promote and safeguard freedom and responsibility in science.*

The ISC's vision is of science as a global public good. Its mission is to be the global voice for science; a trusted voice that speaks for the value of all science. The vision and mission are pursued through four strategic objectives:

- To promote international research and scholarship on key global challenges;
- To increase evidence-informed understanding and decision-making at all levels of public policy, discourse and action;
- To promote the continued and equal advancement of scientific rigour, creativity and relevance in all parts of the world;
- *To protect scientific freedom and advocate principles for the responsible practice of science.*

The Principle of Freedom and Responsibility in Science, enshrined in ISC's Statues, requires researchers and institutions at all levels to conduct and communicate their research with 'integrity, respect, fairness, trustworthiness, and transparency, recognising its benefits and possible harms.'

4. The Universal Declaration of Human Rights and scientific freedom

The United Nations Universal Declaration of Human Rights includes the explicit right to benefit from advances in science and technology, and to access scientific information, whether as a practising scientist or a lay citizen. The right to scientific freedom, that is, the freedom to engage in

scientific inquiry, pursue and communicate knowledge, and to associate freely in such engagements, is likewise upheld[4]. Thus, Article 27 of the Declaration states that

Everyone has the right freely to participate in the cultural life of the community, to enjoy the arts and to share in scientific advancement and its benefits;

Everyone has the right to the protection of the moral and material interests resulting from any scientific, literary or artistic production of which he is the author.

5. Freedom and responsibility in relation to science as a global public good

Science is a global public good, and is indispensable to an understanding of the world in which we live, to socio-economic advancement, and to cultural well-being. The scientific community has a responsibility not only to disseminate scientific knowledge within its ranks, through journals and other specialist media, but also to ensure that it is made accessible to the public.

Furthermore, this knowledge will have value only if it is accessible and comprehensible. In this regard the scientific community has to exercise judgment and skill in conveying technical material in a manner that allows this to be understood at appropriate levels by different sectors of society.

Scientists have a responsibility to ensure accessibility to findings by those scientific communities that are distant from and poorly connected to the loci of major activity, for reasons of geography, levels of economic development, and various forms of discrimination, intentional or otherwise.

Freedom and responsibility in science are fundamental to scientific advancement and to the role of science as a universal public good.

6. Freedom in science

For science to progress efficiently and for its benefits to be shared fairly, scientists must have intellectual freedom. This includes individual freedom of enquiry and exchange of ideas, freedom to reach scientifically defensible conclusions, and institutional freedom to apply collectively scientific standards of validity, replicability and accuracy.

There are four fundamental freedoms that fall within the mission of the ISC[5]: freedom of movement, of association, of expression and communication, and of access to information, data, and scientific material.

Freedom of movement entails the ability of scientists to travel freely within and outside of their countries of residence to attend scientific meetings and to conduct scientific exchange in any other country. They should furthermore enjoy freedom in developing personal contact and

[4] See also *UNESCO Recommendation on Science and Scientific Researchers*, UNESCO, 2018
[5] Note that the ISC statement https://council.science/what-we-do/freedoms-and-responsibilities-of-scientists/ does not refer to freedom of enquiry and some of the other freedoms mentioned here.

exchange with fellow scientists and other communities, depending on the area of activity. This does beg the question though as to why scientists from a particular country, say, should enjoy these freedoms whilst their fellow citizens may not.

Scientists should have the right to express their ideas and opinions freely by writing, speaking or through other means of communication.

Access to and sharing scientific data and information are essential to the conduct of science and for scientific progress. In practice, there are many obstacles to providing universal and equitable access to information. These may be technical, such as poor internet access for online resources, or poor infrastructure for providing resources for processing data or housing research materials. They may also be financial, such as charges for access to scientific journals, or security-related, such as controls on access to certain categories of equipment and materials deemed sensitive to a country's security.

Threats to freedom[6] fall broadly into two categories:

(i) general threats to freedom of movement and association, arising, for example, from government policies or socio-economic circumstances, including entrenched inequality, general threats to the integrity of the science community or the conduct of science, and the politicisation of science; and

(ii) individual cases of discrimination, harassment, or restriction of movement.

Examples of issues relating to general freedom include the need to maintain free circulation in scientific meetings; discrimination and harassment in the science system or of scientists, for their scientific views; and precautions for research in hazardous conditions. Responses to such threats might include articles or public statements, directed towards the scientific community, researchers, academic institutions, or the public.

A further example pertains to the competition between nations for the capture and exploitation of new knowledge for their economic and political gain. This may play out in the setting of, for example, national immigration and security policies that appear to limit freedom and open access in science. Scientists have a responsibility to recognize these tensions and to assist governments in managing such tensions.

Individual cases of threats to scientific freedom involve harassment, discrimination, or the violation of personal rights of scientists as a result of their scientific activities. Responses to these individual cases depend on available information and specific circumstances. Governments and other stakeholders are important avenues of recourse in cases of systemic threats to scientific freedom. Avenues of responses would include letters to government authorities, pursuit through diplomatic channels, and through agencies such as the UN Committee for Human Rights.

[6] *Confronting Rights Abuse: A guide for Supporting Scientists, Engineers, and Health Professionals Under Threat*. US National Academies, Committee on Human Rights. http://www.confront-rights-abuse.org

A further effective and ethically sound approach, from the perspective of the ISC, entails the pursuit of cases of individual freedom through partnership agreements with human rights groups such as Scholars at Risk (SAR) or the International Human Rights Network of Academies and Scholarly Societies (IHRN), whose mandate is to address the immediate and longer term needs of academics subject to discrimination, detention, exile, and other forms of sanction. These partnerships are also an avenue through which CFRS and the ISC may be alerted to new issues that might require its attention and involvement.

Access to the expertise of bodies such SAR and IHRN should not rule out actions by the ISC such as developing comments for posting on social media as appropriate to show support for individuals in dire circumstances and where an immediate response is necessary.

7. Responsibility in science, and trust in science

The responsible practice of science refers to a commitment by scientists to conduct and communicate scientific work with integrity, respect, fairness, trustworthiness and transparency, and to consider the consequences, both beneficial and harmful, of scientific knowledge and its application.

Responsible conduct and practice include the expectation that scientists will act in a way that ensures that science is trusted by the global communities that benefit from it, thus providing new knowledge, and a benchmark against which factual claims of others can be assessed. Furthermore, scientists are expected to act to build trust within the science community, and to place principles of good science above personal interests.

Responsibility implies that researchers and their stakeholder communities commit to developing and following good practice guidelines, and to engage effectively with society to develop a shared understanding of science priorities and their implications for citizens.

Trust in the scientific community has been compromised by well-publicised cases of scientific misconduct in the form of fraud, fabrication and falsification, and lack of reproducibility[7]. These practices, which do harm to the reputation of science and efforts to engender trust in scientific results, have however led to concerted efforts across many fronts to uncover and to combat such practices.

Post-normal times present additional challenges to trust in science: for example, distorted incentives in recognition/reward systems; bureaucratic interference; relationships with specialized and mainstream media; and tensions at the public/private interface.

It is nevertheless the case that levels of trust in science are relatively high, and on the increase, albeit with some variation across different regions of the world[8].

[7] How science goes wrong, *The Economist*, 19-25 October 2013; Brainard J and You J, What a massive database of retracted papers reveals about science publishing's `death penalty', Science, Oct. 25, 2018.
[8] See for example *Wellcome Global Monitor Trust in Science Index 2018,* Wellcome Trust, 2019.

8. Ethical issues

There are major and dramatic scientific developments that carry the promise of major benefits, but which at the same time beg serious ethical questions. The domains of gene and germline editing provide such an example. In a matter of less than a decade, scientific progress has carried with it the reality of unprecedented potential in agriculture and in the treatment of genetically based disease. At the same time, these developments have outstripped the ability to achieve globally accepted regulation by governments and self-regulation within the scientific community. This reality has been emphasized by instances of germline editing which, it has been widely agreed, have exceeded the bounds of what is ethically acceptable[9].

Unethical practices, real or perceived, among some scientists may have political repercussions, where these are deemed for example to threaten the security of a country. It may be that governments feel compelled to respond by introducing policies whose ultimate effect would be to restrict scientific collaborations and associated movements of scientists across countries. The scientific community has a responsibility to assist policymakers in arriving at policies that ensure actions and incentives to prevent unethical practices, as well as the necessary protection against the consequences of unethical scientific practices, yet without restricting scientific collaboration, the lifeblood of good scientific work.

The rapid development of new technologies and procedures and their myriad uses, often coupled to the collection and use of big data, is changing the way in which we conduct science. It has also provoked a re-examination of the responsibility of scientists in relation to the use of such technologies beyond the laboratory or scientific community. Researchers have a responsibility to consider how data is collected, managed and used, including but not limited to the need to obtain informed and voluntary consent and to ensure privacy and security of the data.

It is essential that scientists speak out to draw attention to unethical or harmful practices relating to the use of scientific and technological knowledge. An example would be the use of tools that infringe on basic rights to privacy of individuals and minority groups, and which are deployed in unethical surveillance and tracking practices. Likewise, inadvertently or otherwise, the deployment of artificial intelligence systems may be accompanied by social biases. Scientists, particularly from computer science and the social sciences, have a responsibility to understand the nature of such biases, to advise on uses of AI that are ethically sound, and to incorporate the teaching of ethics in curricula on AI. A prerequisite for successful engagement would be that attention be given to structural changes that allow social scientists to be an integrated part of interdisciplinary initiatives and at the science-policy interface.

9. Ethical and responsible conduct in times of disasters and emergencies

The role of scientists in advising policymakers is significantly amplified during times of disasters and emergencies. The current SARS-Cov-2 pandemic provides examples of the special circumstances that determine the nature both of advice and of communication with the public.

[9] See for example Cohen J, Inside the circle of trust, *Science* 2019, 365 (6452), 430-437.

The ability of scientists to provide rapid responses in advising policymakers becomes a significant challenge in the face of major and fast-evolving threats. It is particularly in relation to such risks that preparedness plans play an essential role – these allow scientists and others to address emergencies in a systematic, often iterative way.

A further feature is that of uncertainties in evidence, and therefore in how this translates to advice. This is an integral component of the scientific method generally, and there is good understanding at least within the scientific community about the role of uncertainty, alternative conclusions, and indeed errors, before a consensus is reached. In the context of emergencies it is likely that these factors will become more evident as scientists grapple in a context of great urgency and pressure. It is therefore all the more vital that scientists abide by the basic tenets of their work and approach uncertainties and the route to consensus with complete openness[10].

The SARS-Cov-2 pandemic, and emergencies generally, provide a real-time illustration to the general public of the importance of good scientific advice, but also of the complexity of such interventions. Public engagement is especially important, so that the nuances of the scientific process and decision-making may be widely understood, rather than lead to sentiments of mistrust or antagonism.

During times of crises leadership assumes or is granted more power to make decisions for the 'public good'. Broader ethical considerations should be kept in mind as the safeguards that are usually in place (e.g. to protect the environment, vulnerable sectors of society, ethnic groups etc.) may be circumvented in situations in which decisions are made with little or no consultation. The exceptional levels of cooperation among scientists and health professionals during the Covid-19 crisis stand in stark contrast to the responses at the political level where, with some exceptions, there has been a reluctance to cooperate, fueled by factors that lie outside the health emergency[11]. Scientists have the responsibility to prevail on governments to put aside political differences that might inhibit international scientific collaboration and collaborative science advice efforts.

For their part, scientists must steer away from being motivated by considerations of priority, and assumptions about the superiority of their models. The most effective means of combating the emergency must take precedence.

10. Responsibilities within the broader scientific community

Equitable access to knowledge is a tenet that applies also to the global scientific community. There are significant variations in the extent of development of national science systems, of the ability to access scientific knowledge, and to be an integral part of scientific research and innovation. As a

[10] Ethical responsibilities of scientists at a time of a global threat, *Statement by Committee for Freedom and Responsibility in Science, International Science Council,* https://council.science/current/press/cfrs-statement-15-june-2020/

[11] E. W. Colglazier, Response to the COVID-19 pandemic: catastrophic failures of the science-policy interface, Science and Diplomacy, editorial, 9 April 2020, http://www.sciencediplomacy.org

result, scientific activity and the capacity to advance scientific knowledge are unevenly distributed, with inequality of opportunity and of access to knowledge being significant factors.

Outreach and engagement efforts should recognize the needs not only of civil society and policymakers, but also the responsibility to ensure access to and participation in scientific developments by those scientific communities that are distant from and poorly connected to the loci of major activity, for reasons of geography or levels of economic development, for example. It is particularly in this context that the development of open science vehicles can have a most powerful impact: by facilitating access to data resources, scientific literature, and by promoting genuine collaboration involving scientists from across high-, medium- and low-income countries.

There exist various guides to responsible conduct and basic values in science, aimed at the scientific community broadly and, in some cases, at students and early career scholars[12]. The developments in the 21st century that have had a new and profound effect on science make it essential that these guides be reviewed, with the impact of these developments in mind.

11. Scientific responsibility, public engagement and communication

A broadly scientifically literate population is vital to success in addressing challenges that impact on societal and economic development, for example as captured in the Sustainable Development Goals. In addition, major contemporary scientific developments carry the promise of substantial benefits, and at the same time beg serious ethical questions. It is the responsibility of the scientific community to take steps that would allow the public to consider and understand the impact of such developments on individual lives and on society as a whole, and to formulate views on ethical and related questions.

Beyond regarding the general public only as recipients of knowledge about scientific developments, it is important also to seek and promote opportunities for transdisciplinary activities, in which there is true collaboration between the scientific community and the public in co-creation and co-development. This has the great benefit of further enhancing scientific literacy in the broader population.

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[12] See for example

a) Rigour Respect Responsibility: A universal ethical code for scientists. UK Government Office for Science, 2007 https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/f283157/universal-ethical-code-scientists.pdf;

b) World Economic Forum Code of Ethics for Researchers, 2017 https://widgets.weforum.org/coe/

c) UNESCO Recommendation on Science and Scientific Researchers, 2017 http://portal.unesco.org/en/ev.php-URL_ID=49455&URL_DO=DO_TOPIC&URL_SECTION=201.html

d) Freedom, responsibility and universality in science. ICSU booklet, 2014.

e) InterAcademy Council (now InterAcademy Partnership), Responsible Conduct in the Global Research Enterprise, 2012 https://www.interacademies.org/33362/Responsible-Conduct-in-the-Global- Research-Enterprise

f) InterAcademy Partnership, Doing Global Science: A guide to Responsible Conduct in the Global Research Enterprise, 2016. Princeton University Press https://www.interacademies.org/33345/Doing-Global-Science-A-Guide-to-Responsible-Conduct-in- the-Global-Research-Enterprise

The digital age has changed irrevocably the circumstances under which news and information are communicated. A particular feature is the growth of the dissemination of manipulated, biased or fabricated information, in addition to a lack of editorial norms and processes for ensuring accuracy and credibility of information. Furthermore, the politicization of some issues at the science-society interface has contributed to the adoption of ideological positions or anti-scientific stances that are diametrically opposed to and in conflict with the scientific consensus on these issues. These developments constitute a fundamental attack on the public value of science, and pose a serious threat to the integrity of processes by which science informs policymaking.

It is incumbent upon scientists and scientific organizations to re-evaluate fundamentally their role as mere brokers of scientific information. Responses to such challenges would include advocating strongly for the scientific method, and setting out in the public domain the arguments that support consensus on issues such as climate change, vaccination, and genetic modification.

A central component of science communication relates to the need to engage with broader society on how science works, how scientific advances are arrived at, and the nature of scientific consensus. Scientists have the responsibility to communicate uncertainties, where they exist, to policy-makers and the public. What counts as a "reasonable risk" depends in part on one's values. For this reason the communication of uncertainties is crucial to an understanding by broader society of the interpretation of scientific results, and is essential to building trust in science.

The extent to which the public is able to engage with scientific issues depends to a great extent on the ability of scientists and science communicators to develop effective and ethical means of communication. These should be tailored for purpose, whether among specialists, in the educational sphere, to policymakers, or to sectors of civil society, so that knowledge, findings and scientific advice are appropriately comprehensible[13].

Organizations such as the ISC have a role to play in setting out guidelines for responsible and effective media engagement. These would include guidance on ethical science communication and advice; and on explaining uncertainties and the provisional nature of some scientific results.

In engaging on controversial and politicized scientific issues it is vital to respect feelings, moral intuitions, religious and other belief systems, cultural diversity, and knowledge systems that complement the established scientific method. [14]. Merely repeating scientific opinions and outcomes, either more clearly or more loudly, is not the way to success. Direct engagement with those outside the scientific community and a deeper understanding of how people receive and respond to messages both individually and collectively are vital. This requires leadership at the nexus of science education, communication and public outreach, sociology and behavioural sciences.

[13] https://ec.europa.eu/jrc/en/publication/eur-scientific-and-technical-research-reports/understanding-our-political-nature-how-put-knowledge-and-reason-heart-political-decision
[14] *Seeds of Science: Why we got it so wrong on GMOs*, Lynas M, Bloomsbury Sigma, 2018 https://www.bloomsbury.com/uk/seeds-of-science-9781472946959/

Communication is a communal rather than individual responsibility of the scientific community. Its role should extend to the identification of individuals who are or who have the potential to be effective and skilled communicators, to promote and support their efforts, and to recognize and reward their activities appropriately.

12. Scientific responsibility and the private sector

Scientists in the private sector work under different conditions of employment to those in the academic community or in public research institutions, and the institutions and mechanisms that ensure trust in public science (e.g. peer review, ethics oversight) are not necessarily present in the private sector. Nevertheless the responsibility of scientists to broader society includes the private sector: the norms and ethical guidelines to which scientists should adhere are applicable regardless of the sector in which they are active.

Private sector funded research constitutes a significant and growing proportion in public institutions. This is to be welcomed. However, it is essential to engender trust in such science by putting in place the highest standards of transparency, for example in regard to funding, the role of the sponsor in experimental design, any editorial role, and access to the data.

There is a natural tension between science as a global public good – in particular its open and timely distribution and communication to the public – and the opportunities for socio-economic progress and wellbeing through innovation that become possible through protection of new knowledge, for example developed in the private sector and leading to patents and other forms of intellectual property. This tension becomes more acute as the private sector seeks opportunities to exploit big data or to use artificial intelligence to transform working practices. In such cases, the public good is best served by an appropriate level of protection from which all citizens gain. However, given that the nature of such advances is not easily visible, there is a real challenge in determining how to communicate with the public about the risks and opportunities that arise, and how to ensure transparency in the relationships with the private sector.

The questions arising from these tensions, and the freedoms and responsibilities appropriate to the private sector or in sectors where protection is justified, will be explored further in the Position Paper

13. Links to ISC projects

The ISC Action plan sets out details of 12 projects, located within four domains of impact. The following projects intersect in their scope with issues of freedom and responsibility in science, as set out in this paper.

The public value of science: This relevance of this project lies in the central place in the ISC vision of science as a global public good, and the responsibilities that flow from this vision.

Science in the private sector: The central issues of trust in science conducted in the private sector, and the conduct of scientists working in the private sector, intersect with questions of

responsibility in science.

Refugee scientists: awareness and action: Refugee and displaced scientists ought to enjoy the freedom that is a right of all scientists, to seek opportunities for scientific work and to associate freely in the pursuit of such activities. This aspect of this project is of particular relevance.

Knowledge production and diffusion as global public goods: The distorted forms of evaluation of research, and their impact on the health of science systems and the careers of scientists, have a direct bearing on what constitutes ethical and responsible conduct in science.