

Promoting responsible conduct while doing global science

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*How are the ethical rules for conducting global research defined? An InterAcademy Partnership committee comprised of leading scientists from around the world released a book entitled *Doing Global Science*. This book is for anyone concerned about the responsible conduct of science in today's global community.*

One of the most exciting adventures of our time is the rapidly growing global research enterprise. It involves many highly trained professionals working across national borders and cultures and – perhaps more importantly – across traditional disciplines. Researchers form a global community that is producing new knowledge and transforming our society at an unprecedented rate. Curing disease through the use of new tools such as gene editing, discovering the origins of the universe, and gaining a better understanding of human behaviour by analysing social media data are some examples. Governments realize the potential of new knowledge and are investing large sums of money in science. Research collaborations form an important part of foreign policy for many nations and bring economic benefit. Large international projects hasten the production of knowledge with costs being shared by the participating countries. Moreover, internationally co-authored papers are cited more than work undertaken in one country¹.

The research landscape has thus become more diverse and complex and presents stakeholders with both opportunities and significant challenges, such as the need to promote and foster integrity in research. Recent high profile cases of research misconduct from around the world have drawn attention to the risks and threats posed by irresponsible behaviour. With this in view, the InterAcademy Partnership (IAP), a global network of over 130 academies that reach governments representing 95% of the world's population, tasked an international committee of experts with developing educational materials for use by the global research enterprise in promoting responsible conduct and avoiding misuse.

The IAP committee released a book entitled *Doing Global Science: A Guide to Responsible Conduct in Global Research Enterprise*^{2,3}, which was released earlier this year. The end result is a re-

source to be used in educational and training settings by young researchers, educators and institutional managers. It states the broad principles underlying global science and explains the practical aspects of responsible conduct of research. This guidance is meant to be adapted to the requirements of different nations which may differ in specific regulations and laws. What sets the book apart is its emphasis on harmonization of good practices by nations to be followed in a rapidly developing global science enterprise.

Doing Global Science follows the steps in the research process, from planning research and securing funding, to performing experiments and analysing data, to publishing and communicating results. It includes hypothetical scenarios that raise difficult issues for group discussions and an extensive list of references that can be used for further studies.

The seven fundamental principles of responsible conduct in science that are discussed in the book are honesty, fairness, reliability, openness, accountability, objectivity and skepticism. Irresponsible research behaviour that harms the research enterprise such as falsification, fabrication and plagiarism are defined and discussed. To maintain trust, everyone involved in research must work to ensure responsible conduct. Universities and other research institutions should sustain an environment that fosters good practices, and ensure that the next generation of researchers receives effective training and mentoring.

Given the importance of reliable data to the advancement of knowledge, researchers need to keep clear, accurate and secure records. They should also clarify responsibilities for data integrity at the initial stages of research, particularly where the research team consists of multiple investigators and groups from different countries or institutions. Discussions on data sharing, authorship criteria and primary responsibilities for various aspects of the work should also

be agreed upon at an early stage. New technologies make it possible to share data for reuse by larger communities, pointing to the need for harmonization of national and disciplinary rules and practices related to data. In addition to supporting integrity, open sharing of data will contribute to the reproducibility of scientific results, an issue that has gained considerable attention recently. Open data generated by others may be reused and reanalysed with commercial potential. This is a grey area that needs further discussion. As a minimum, origin of the data should be acknowledged. Some kind of financial reward may be offered to those who created the data (and their institutions), in case the data contribute to a commercially relevant result.

Doing Global Science also covers the processes involved in peer review at the level of research funding and publication decisions, since evaluating interdisciplinary and international research is complex and requires broad expertise. Review panels should include experts from different disciplines as needed, and be inclusive of underrepresented groups. Incorporating international perspectives into peer review is an emerging practice that is needed in smaller countries where expertise in a particular area of research is limited, and can be useful even in larger countries with more research activity.

A central message that we emphasize is that preventing irresponsible behaviour through training and education is preferable to having to take corrective action after such behaviour has occurred. This is especially important in preventing misuse of research and related technologies. It is difficult to predict the future course or consequences of an emerging research field. Nuclear weapons emerged from basic research in subatomic particles, and genetic engineering arose from research into antibiotic resistance. CRISPER-Cas9 technology arose while studying bacterial resistance to viruses. Nevertheless, researchers need to take responsibility for trying to anticipate and

minimize the possible risks of research that may cause harm, if misused. The 1975 Asilomar Conference on Recombinant DNA and the 2016 International Summit on Human Gene Editing held in Washington, DC, USA are examples of the research community exercising that responsibility. Challenges will continue to arise in the life sciences and in other disciplines that will possibly require new guidelines and codes of conduct.

Researchers also need to familiarize themselves with the laws and regulations governing the protection of human subjects and laboratory animals, laboratory safety, environmental protection, and the collection and transfer of biological resources. These laws and regulations differ among nations, and in international collaborations a shared understanding among the participating research groups is needed. For example, regulations covering biodiversity research in some countries may include detailed guidance to ensure that local indigenous communities approve of the collection of specimens and share in the benefits of any resulting commercialization activity.

Since research is competitive, and may produce results that can be commercialized, it is necessary to ensure that the financial and personal interests of researchers and research organizations are aligned with responsible conduct. Many research institutions, research sponsors and journals require individual research-

ers to disclose possible financial conflicts of interest. Research institutions and even nations may find it difficult to objectively investigate allegations of research misconduct made against prominent researchers, or impose appropriate penalties due to fear of damaging their reputation, losing financial support, or national pride. Corporate sponsorship of academic research is another area where tensions may develop if inappropriate influence is exercised on research activities. Funders of international projects should ensure that clear-cut guidelines have been provided by the researchers and the collaborating institutions.

Scientific journals also have an important role to play in promoting responsible conduct by ensuring a fair and effective review process that avoids bias. When articles need to be retracted due to irresponsible behaviour or honest error, the retraction notices should be prominently displayed.

Doing Global Science builds on the efforts of many individuals and groups around the world who have contributed to promoting and fostering research integrity at the international level through the World Conferences on Research Integrity and in other forums (www.wcri2017.org). The release of the guide comes at a time when universities around the world are expanding education and training in the responsible conduct of research. The IAP committee hopes that

Doing Global Science will contribute to this movement. In order for the global research enterprise to maximize its positive impact on society, universal awareness and adherence to the principles of good science and responsible conduct are needed.

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1. Adams, J., *Nature*, 2013, **497**, 557–560.
 2. *Doing Global Science: A Guide to Responsible Conduct in the Global Research Enterprise*, InterAcademy Partnership, Princeton University Press, Princeton, USA, 2016; ISBN: 9780691170756.
 3. Nath, I. and Winnacker, E. L., <http://blog.press.princeton.edu/2016/07/11/protecting-human-subjects-while-doing-global-science/>

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