

## 2. An Overview of Research Values

Responsible conduct in research is based on many of the same human values that apply in daily life, but these values have specific implications in the context of research.<sup>2</sup> The discussion in this guide draws on seven overlapping fundamental values:

- Honesty
- Fairness
- Objectivity
- Reliability
- Skepticism
- Accountability
- Openness

In research, being *honest* implies doing research and communicating about research results and their possible applications fully and without deception, whether of others or oneself.

Being *fair* means treating others with respect and consideration, whether in citing a colleague's ideas in a paper or mentoring a student in the proper conduct of research. In research—as in life—scientists and scholars should treat others as they hope and expect to be treated in return.

*Objectivity* implies that researchers try to look beyond their own preconceptions and biases to the empirical evidence that justifies conclusions. Researchers cannot totally eliminate the influence of their own perspectives from their work, but they can strive to be as objective as possible.

Research communities over many years have developed methods to enhance the *reliability* of the results they obtain, and researchers have an obligation to adhere to these methods or demonstrate that an alternative approach does not reduce the reliability of research results.

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<sup>2</sup> There are many discussions of scientific values that the committee drew on for this section, including CAS, 2007; CCA, 2010; ESF, 2010; GBAU, 2004; IAS, 2005; IOM-NRC, 2002; NAS-NAE-IOM, 2009; NHMRC-ARC-UA, 2007; and Steneck, 2007.

An allegiance to empirical evidence requires that researchers maintain a degree of *skepticism* toward research results and conclusions so that results and explanations are continually reexamined and improved.

Researchers are *accountable* to other researchers, to the broader society, and to nature. If challenged, they cannot appeal to authority but must demonstrate that their results or statements are reliable.

Finally, researchers need to be *open* with others for research to progress. All researchers deserve to work independently as they balance the competing considerations of “what if?” and “what if I am wrong?” But they ultimately need to convey to others their conclusions and the evidence and reasoning on which their conclusions are based so that those conclusions can be examined and extended. This requires careful storage of data and making data available to colleagues whenever possible.<sup>3</sup>

The primacy of these seven values explains why trust is a fundamental characteristic of the research enterprise. Researchers expect that their colleagues will act in accord with these values. When a researcher violates one of the values, that person’s trustworthiness is diminished among other researchers. In addition, the public’s trust in research can be damaged, with harmful effects on the entire research community.

### Other Prerequisites for Research Excellence

Beyond the basic values that all researchers are expected to observe, the research enterprise has developed other procedures and principles that enhance the productivity of science and scholarship.

Successful research systems have ways of checking the integrity of results. The most obvious is replicating and building on previous results. If data or results reported by researchers to others are flawed, efforts to replicate or build on those data or results will be unsuccessful. Peer review, which is discussed at length in Chapter 3, is another way to bring a collective judgment of the research community to bear on the results of research.

Researchers have a responsibility to respect and care for the subjects of their research, whether those subjects are humans, laboratory animals, or some aspect of the physical environment that affects living organisms. Many research institutions and countries have created bodies to oversee research on particular subjects and ensure that researchers adhere to relevant laws and regulations.

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<sup>3</sup> In some situations and for certain types of data, sharing may be delayed, restricted, or prohibited. The specific practices and regulations will vary by country. Examples include information that identifies particular individuals, information that might be sensitive for national security reasons, and information related to patentable inventions.

Most results meet general expectations, but some lead in unexpected directions and can lead to the “creative destruction” of existing worldviews. Researchers should welcome rather than resist new results despite their disruptive potential. At the same time, they need to avoid unjustified claims of novel results. Successfully balancing the desire for novelty against the cumulative weight of past research is one measure of a good researcher.

Indigenous and traditional knowledge systems have much to contribute to research and should be respected for their potential contributions to human understanding and well-being. Researchers cannot assume that only one pathway leads to knowledge.

A successful research system embraces and encourages the contributions of groups that are underrepresented in particular fields, for example women, minority groups, and people with disabilities. Multiple perspectives can speed and broaden research, and the members of all groups can make vital contributions to human knowledge.

A successful research system draws on and contributes to a vigorous and effective system for higher education. Researchers have a responsibility to convey the methods and cumulative knowledge of research to the next generation. In particular, beginning researchers need guidance in absorbing and applying the ethical codes of research. Early-career researchers also need both independence and support to establish their careers while following their passions and interests.

Researchers need financial support to advance the frontiers of knowledge. Because the results of research can be difficult to predict, this financial support often must give researchers considerable latitude in deciding which questions to pursue and how to pursue them. Researchers need to be willing to disclose the sources of their support to avoid real or perceived conflicts of interest.

Valuable research is undertaken in a variety of settings: academic and non-profit institutions, industrial laboratories, and government organizations. Much of the research performed by commercial or government entities may not have publication as an end goal, but much of it does. The principles and guidelines in this report apply to all research that is performed with the aim of being reported publicly as part of the world’s stock of available knowledge.

Finally, research systems that function effectively accord respect and recognition to those who perform research, both within the research enterprise and in the broader society. In the past, society has given great prestige to research and to researchers. Maintaining this respect requires that researchers act in accordance with the values of research.