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## Scientific Imagination and Integrity

The Commission on Research Integrity (CRI) was created in 1993 by Congress to attack problems that neither the government nor the scientific community had dealt with effectively during the prior decade. These problems are not limited to an occasional high-profile case of research misconduct but stem from the failure of many institutions receiving federal research funding to deal adequately with misconduct when it occurs. Moreover, the scientific community has been reluctant to discourage misconduct or sloppy research by developing guidelines for data handling, responsible authorship, and supervision of students or fellows in a research project. Even the National Academy of Sciences (NAS) has indicated that such standards should be strictly voluntary.\*

The current research environment seems to foster cynicism about simple virtues such as honesty and fairness, and it clearly fosters hostility toward anyone who makes claims about misconduct. Although NAS and a few other professional societies have issued reports and recommendations about research misconduct, there has been no widespread action on or interest about the subject. Perhaps the controversy generated by the 1995 CRI report *Integrity and Misconduct in Research*† will stimulate the sort of wide-ranging discussion of integrity and misconduct that has been lacking in the scientific community for so long.

The report's recommendations to Congress and the secretary of the Department of Health and Human Services include a new definition of misconduct that is based on the principle that scientists be truthful and fair in the conduct of research and the dissemination of its results, a requirement that institutions provide educational programs about sound research practices, a bill of rights for whistleblowers, administrative changes to improve institutional and governmental handling of misconduct, and an exhortation to professional societies to develop and disseminate codes of ethics for their disciplines. A recent editorial in *Science* by Frederick Grinnell‡ claims that CRI's recommended definition of misconduct will inhibit scientific creativity and does not account for the ambiguity inherent in the practice of science. The risk of inhibiting that creativity would be a serious problem if it were real, but there is little evidence or likelihood that asking scientists to be honest and fair will constrain them. Furthermore, CRI knows of no case in which an agency attempted to treat novel research as misconduct. In "On the Art of Scientific Imagination," the author Gerald Holten argues that science is an artistic as well as a logical process.§ He affirms that "it would also be wrong if one were to neglect the ever-present, complementary set of skills—logical reasoning, craftsmanship, and other disciplined expertise—that must be learned and can be shared." It is these skills that I believe are being neglected in the arguments over ambiguity and the setting of guidelines for sound research practices.

Although CRI decided on truth and fairness as fundamental principles, "in framing its definition, the Commission chose to describe legally enforceable language." A definition that is ultimately put into regulatory language must be specific, and the examples provided by CRI under the category of misappropriation, interference, and misrepresentation (MIM) are not easily confused with honest error or the ambiguities of scientific practice. Moreover, the definition of MIM reflects the types of problems that actually arose in misconduct cases that were brought to the attention of CRI over 15 months of open public hearings.

CRI believes that "research integrity is best fostered by developing and disseminating clear standards of behavior in science (whether by professional organizations or by research institutions or both), and reinforcing those standards through education and example at all stages of scientific development and at all levels of research administration." Regardless of the response to its recommendations, if the CRI report encourages constructive discussion and new educational programs in the scientific community on the issues of research integrity and misconduct, it will have achieved an important objective.

Kenneth J. Ryan

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\**Responsible Science* (National Academy Press, Washington, DC, 1992), vol. 1. †*Integrity and Misconduct in Research* (Report of the Commission on Research Integrity, U.S. Department of Health and Human Services, Washington, DC, 1995). ‡*Science* **272**, 333 (1996). §*Daedalus* **125**, 183 (1996).