ARTICLE

FOSTERING PROFESSIONALISM AND INTEGRITY IN RESEARCH*

NICHOLAS H. STENECK, PHD

While many professionals refer to themselves as researchers, they usually do so in reference to a particular field of study that defines their professional affiliation. They are physicists or sociologists or biologists who do research, not researchers who happen to study physics, sociology or biology. I am an historian who does research on the history of research and research institutions, not a researcher who studies history. The goal of this paper is to examine researchers as researchers, with particular attention to their ideals for professional behavior, the extent to which they achieve these ideals and methods for fostering the formation of an awareness of their ethical obligations during professional education. Currently this is done on a field-specific basis. I assert in this paper that we must do more to promote a general sense of ethical awareness in research by embracing a general code of ethics and developing best practices that apply across different fields of study, institutions and national boundaries.

I. DEFINITIONS AND SCOPE

Research is widely recognized as an identifiable and important function of society. In 2009, the United States will spend approximately 4.7 percent of its $3.1 trillion budget on research and development divided about equally between the military and non-military sectors.[1] Private industry will spend similar amounts.[2] The public and private funds spent on research support a large research establishment, which is made up of research agencies (e.g., the National Science Foundation and the National Institutes of Health), research institutions (universities, corporate and government

* Symposium on the Formation of an Ethical Professional Identity during Professional Education, Feb. 2, 2008.

1. Press Release, Am. Ass'n for the Advancement of Sci., 2009 Budget Proposes Physical Sciences and Development Increases, Flat Funding for Biomedical Research (Feb. 7, 2008), *available at* www.aaas.org/spp/rd/prel09p.pdf.

2. NAT'L SCI. FOUND., DIV. OF SCI. RESEARCH STATISTICS, SCIENCE AND ENGINEERING INDICATORS 2006 (2006), *available at* http://www.nsf.gov/statistics/seind06/pdfstart.htm.

laboratories), research publications, research libraries and many other ancillary organizations.[3] Even if it is difficult to define precisely the characteristics that distinguish an activity as research, politicians, educators, policy makers, journalists and others have no problem talking about, funding and making decisions relating to research.

This paper is concerned with the individuals who conduct research, that is, with researchers. As with research, researchers are recognized as an identifiable and important segment of society. They gain public attention when they make discoveries. Society relies on their advice when making a wide range of decisions, from setting standards to protect public health and safety to grappling with issues such as climate change or the consequences of finite energy supplies. Society designs education programs to train researchers and worries when it is not training enough of them. Most major universities expect their faculty to be researchers, and some faculty (e.g., research faculty and professional researchers) are hired primarily to conduct research. Even if it is difficult to define precisely the characteristics that distinguish a person as a researcher, in general there exists a widespread understanding of the meaning of the term used to describe this category of work.

There is, of course, a great deal of variation within the general category of researcher. A grade-schooler who collects information for a research paper is, to some extent, a researcher. The same is true for individuals who research their family history. These untrained or amateur researchers are not the focus of this paper; instead, I am interested in individuals who have been specially trained to do research, usually through graduate or professional education. I am also interested in this group of individuals in their research capacity and not more generally as academics or scholars.[4] The major challenge posed by the conference at which this paper was first presented is how we can get professionals—professional researchers in our case—to recognize and act on a mature understanding of ethical professional identity, which in practical terms comes down to acting on a sense of right or proper professional behavior.

Of necessity, most of the evidence cited in this paper derives from discussions of science rather than research. This is due primarily to the fact that scientific research is, by most measures, the dominant component of research, particularly if the social sciences are included.[5] Science and re-

3. See *id.* for a comprehensive overview and analysis of this establishment.

4. I have avoided using the term "scholar" in this paper to further emphasize the fact that I am interested in this group of professionals only in relation to their research activities and not other activities. For a recent work that discusses professional identity in the larger context of scholarship and doctoral training, see GEORGE E. WALKER, ET AL., THE FORMATION OF SCHOLARS: RETHINKING DOCTORAL EDUCATION FOR THE TWENTY-FIRST CENTURY (2008).

5. The National Endowment for the Humanities requested $144 million in funding for fiscal year 2009, a figure that is 0.1 percent of the total Federal Research & Development budget. Press Release, Nat'l Endowment for the Humanities, NEH Budget Secures Support for High Quality

search are commonly used interchangeably as if they were one and the same,[6] which they are not. Engineers, humanists, creative artists and others do research and should not be left out of discussions of professional ethical awareness in research. The fact remains, however, that thinking about science drives discussions of research and therefore cannot be ignored. Moreover, I would argue, but cannot do so in this paper, that the fundamental principles underlying scientific research and shaping its ethic are applicable to all research, whatever the field.

II. IDEALS

The way researchers should behave is clearly set out in institutional research policies and the codes of ethics of professional societies. These policies and codes set high standards for behavior and leave little room for improper or unprofessional behavior. The most demanding policies strive to achieve the highest levels of integrity. For example, in 1990, the University of California issued a policy that confirmed its longstanding commitment "to encourage and maintain the highest ethical standards in research."[7] More generally, research institutions and funding agencies are committed to fostering reliability, truth, accuracy, honesty and similar standards in their research programs. The central message in these policies is not difficult to interpret: dishonesty and deception have no place in research. As summarized by one researcher over forty years ago: "[T]he principle of 'scientific honesty' and the complete realization that this is the very essence of science."[8]

The central role that truth and honesty play in scientific research and the values on which they rest were explained in detail a half-century ago by sociologist Robert Merton. His research identified four norms—communalism, universalism, disinterestedness and organized skepticism—that are basic to professionalism in science.[9] These norms, which have been generally accepted as applying to all serious academic researchers, assured scientists, researchers more generally and presumably the public, that the search for truth will win out over all other interests in research. Merton's four norms further provide clarification as to how researchers should behave. Researchers should share information with colleagues, seek common understanding,

---

Humanities Programs, Agency requests $144.335 million for FY 2009 (Feb. 4, 2008), *available at* http://www.neh.gov/news/archive/20080204.html.

6. *See, e.g.*, NAT'L ACAD. OF SCI., COMM. ON SCI., ENG'G, AND PUB. POLICY, ON BEING A SCIENTIST: RESPONSIBLE CONDUCT IN RESEARCH (1995), *available at* http://www.nap.edu/html.

7. Letter from David Pierpont Gardner, President, Univ. of Cal., to Univ. of Cal. Staff, University Policy on Integrity in Research (June 19, 1990), *available at* http://www.ucop.edu/ucophome/coordrev/policy/6-19-90.html.

8. F. R. Fosberg, *Code of Ethics*, 142 SCI. 916, 916 (1963).

9. *See generally* ROBERT K. MERTON, THE SOCIOLOGY OF SCIENCE (1973).

eschew personal gain and question every new finding or claim to assure that it is true.[10]

Finally, as professionals, researchers have a responsibility to report others who do not meet professional expectations. As with other professions, this responsibility stems from the privilege of self regulation. This privilege was eagerly sought by the chief architect of U.S. science policy, Vannevar Bush, at the end of World War II. In the document that established the foundation of U.S. science policy, *Science the Endless Frontier*, Bush argued that science would advance fastest and best serve the public if it were allowed to direct its own affairs.[11] Others felt that an activity that was so important should have public oversight, but, in the years following World War II, Bush's self-regulation model won out.[12] With this model came the professional responsibility placed on all members to take an active role in maintaining the integrity of their professions, which presumably includes reporting errant colleagues.[13]

This ideal view of professional research is central to one of the most influential publications describing the professional foundations of research, the National Academies' *On Being a Scientist*.[14] In line with Merton's norms, *On Being a Scientist* is organized around the premise that the communal search for truth is fundamental to, and protects the integrity of, science:

> The object of research is to extend human knowledge of the physical, biological, or social world beyond what is already known. But an individual's knowledge properly enters the domain of science only after it is presented to others in such a fashion that they can independently judge its validity. . . .[15]

The communal nature of research helps assure its objectivity:

> [The] ongoing process of review and revision [in research] is critically important. It minimizes the influence of individual subjectivity by requiring that research results be accepted by other scientists. It also is a powerful inducement for researchers to be

10. For an example of the later acceptance and expansion of Merton's norms into a code of ethics, see Andre Cournand, *The Code of the Scientist and Its Relationship to Ethics*, 198 SCI. 699, 699–705 (1977).

11. VANNEVAR BUSH, DIR. OF THE OFFICE OF SCI. RESEARCH AND DEV., SCIENCE, THE ENDLESS FRONTIER: A REPORT TO THE PRESIDENT (1945), *available at* http://www.nsf.gov/about/history/vbush1945.htm.

12. *See generally* SCIENCE FOR THE TWENTY-FIRST CENTURY: THE BUSH REPORT REVISITED (Claude E. Barfield ed., 1997); GREGG PASCAL ZACHARY, ENDLESS FRONTIER (1997).

13. U.S. DEP'T OF HEALTH AND HUMAN SERVICES, COMM'N ON RESEARCH INTEGRITY, INTEGRITY AND MISCONDUCT IN RESEARCH: REPORT OF THE COMMISSION ON RESEARCH INTEGRITY 17, 45 (1995), *available at* ori.dhhs.gov/documents/report_commission.pdf.

14. NAT'L ACAD. OF SCI., COMM. ON SCI., ENG'G, AND PUB. POLICY, *supra* note 6.

15. *Id.* at 3.

> critical of their own conclusions because they know that their objective must be to try to convince their ablest colleagues.[16]

Ultimately the community's "social mechanisms," which is another way of saying its professional structure, assure its responsibility:

> The social mechanisms of science do more than validate what comes to be known as scientific knowledge. They also help generate and sustain the body of experimental techniques, social conventions, and other "methods" that scientists use in doing and reporting research . . . . Because they reflect socially accepted standards in science, their application is a key element of responsible scientific practice.[17]

For the past fifty years, this view has reassured most researchers that they can, and are, managing their own professional affairs quite nicely and that no additional help is needed, particularly from government.[18]

III. REALITIES

Ideals are goals to be achieved and do not necessarily reflect real behavior. Not long after the Bush plan was adopted, doubts about the Cold War and the emergence of environmental awareness led some to question whether the autonomy given to scientists was truly serving the public's interest. Focusing on one of the central tenants of post-war science, the "control of nature," science writer Rachel Carson argued that it is:

> . . . a phrase conceived in arrogance, born of the Neanderthal age of biology and philosophy, when it was supposed that nature exists for the convenience of man. The concepts and practices of applied entomology for the most part date from that Stone Age of science. It is our alarming misfortune that so primitive a science has armed itself with the most modern and terrible weapons, and that in turning them against the insects it has also turned them against the earth.[19]

Such critiques opened the door to subsequent, broader debate about the moral responsibilities of scientists, which quickly spilled over into most fields of research.[20]

The debate over moral and social responsibility started by Carson and others resulted in the development of an STS (science, technology and society) movement,[21] which further spawned such research programs as the

16. *Id.* at 3–4.

17. *Id.* at 4.

18. UNITED STATES CONGRESS & COMMITTEE, L. A. H. R. (1981) hearings.

19. RACHEL CARSON, SILENT SPRING 297 (1962).

20. *See, e.g.*, DANIEL S. GREENBERG, THE POLITICS OF PURE SCIENCE (1967).

21. *See, e.g.*, STS EDUCATION: INTERNATIONAL PERSPECTIVES ON REFORM (Joan Solomon & Glen Aikenhead eds., 1994).

NSF Ethics and Values in Science and Technology (EVIST) program[22] and the NIH Ethical, Legal, and Social Implications (ELSI) program.[23] These developments challenged the notion that research is inherently beneficial. Some critics proposed that researchers have an obligation to think more deeply about their own social responsibilities and to engage society in discussions about social responsibility.[24] At roughly the same time, doubts about social responsibility led a few researchers to look more closely at their own behavior and question whether the so-called Mertonian norms were, in fact, followed in practice. One key study, Ian Mitroff's work on the Apollo astronauts, concluded that, in practice, researchers often subscribed to norms that are directly the opposite of the Mertonian norms,[25] a finding that has been confirmed by recent studies.[26]

Further doubts about the moral character of research emerged with the discovery of widespread unethical and improper research practices: beginning in the 1960s with objections to the way animals were used in research;[27] to the reports of gross violations of codes for human experimentation in the 1970s;[28] and to the more recent discovery of research misconduct, failure to properly manage conflicts of interest, authorship violations and other practices that fall short of responsible professional behavior in research.[29] These discoveries, and a growing body of research on research integrity, provide a view of research behavior that contrasts sharply with the ideals that researchers believe should prevail.

---

22. Rochelle D. Hollander & Nicholas H. Steneck, *Science- and Engineering-Related Ethics and Values Studies: Characteristics of an Emerging Field of Research*, 15 SCI., TECH. & HUM. VALUES 84, 84–104 (1990).

23. Nat'l Inst. of Health, Nat'l Hum. Genome Research Inst., The Ethical, Legal, and Social Implications (ELSI) Research Program. This program was founded in 1990, and their website is available at http://www.genome.gov/10001618.

24. For a discussion of the origins of the new philosophies of the 1960s, see ANDREW JAMISON & RON EYERMAN, SEEDS OF THE SIXTIES (1994). The need for more emphasis on social responsibilities is expressed in many books and articles. *See, e.g.*, FRITJOF CAPRA, THE TAO OF PHYSICS (1975); FRITJOF CAPRA, THE TURNING POINT: SCIENCE, SOCIETY AND THE RISING CULTURE (1982); E.F. SHUMACHER, SMALL IS BEAUTIFUL: ECONOMICS AS IF PEOPLE MATTERED (Harper & Row 1989) (1973).

25. *See generally* IAN MITROFF, THE SUBJECTIVE SIDE OF SCIENCE (1983); MASSIMIANO BUCCHI, SCIENCE IN SOCIETY: AN INTRODUCTION TO SOCIAL STUDIES OF SCIENCE (Adrian Belton trans., Routledge 2004) (2002).

26. Melissa S. Anderson, Brian C. Martinson & Raymond De Vries, *Normative Dissonance in Science: Results from a National Survey of U.S. Scientists*, J. EMPIRICAL RES. ON HUM. RES. ETHICS 3, 3–14 (2007).

27. For basic information on the rules governing the use of animal subjects in research, see NICHOLAS H. STENECK, ORI INTRODUCTION TO THE RESPONSIBLE CONDUCT OF RESEARCH 52, 52–55 (2007), *available at* ori.dhhs.gov/documents/rcrintro.pdf.

28. For basic information on the rules governing the use of human subjects in research, see *id.* at 36–38.

29. For a summary of recent research on research integrity, see Nicholas H. Steneck, *Fostering Integrity in Research: Definitions, Current Knowledge, and Future Directions*, 12 SCI. & ENG'G ETHICS 53, 53–74 (2006).

The gap between ideals and reality exists in all aspects of research. Researchers accept or demand credit for authorship they do not deserve.[30] They fail to properly manage and report conflicts of interest.[31] They do not share data with colleagues or protect the privacy of privileged information.[32] They allow bias to influence peer review.[33] They oversell findings in research abstracts,[34] do not keep proper research records[35] and include inad-

30. *See* Joan C. Bevan, *Ethical Behaviour of Authors in Biomedical Journalism*, 35 ANNALS ROYAL C. PHYSICIANS & SURGEONS CANADA 81, 81–85 (2002); Larry D. Claxton, *Scientific Authorship: Part 2: History, Recurring Issues, Practices, and Guidelines*, 589 MUTATION RES. 31, 31–45 (2005); Larry D. Claxton, *Scientific Authorship: Part 1. A Window into Scientific Fraud?*, 589 MUTATION RES. 17, 17–30 (2005); Covell, et al., *Misrepresentation and Responsibility in Medical Research*, 317 NEW ENG. J. MED. 1383, 1383–89 (1987); Lisa A. Carey, et al., *Prevalence of Articles With Honorary Authors and Ghost Authors in Peer-Reviewed Medical Journals*, 280 JAMA 222, 222–24 (1998); Jun Hyun Balk, et al., *Researcher Contributions and Fulfillment of ICMJE Authorship Criteria: Analysis of Author Contribution Lists in Research Articles with Multiple Authors Published in Radiology*, 226 RADIOLOGY 16, 16–23 (2003); Barton Moffatt & Carl Elliot, *Ghost Marketing: Pharmaceutical Companies and Ghostwritten Journal Articles*, 50 PERSP. BIOLOGY & MED. 18, 18–31 (2007); Lisa A. Bero, et al., *Prevalence of Honorary and Ghost Authorship in Cochrane Reviews*, 287 JAMA, 2769, 2769–71 (2002); Shapiro, et al., *The Contributions of Authors to Multiauthored Biomedical Research Papers*, 271 JAMA 438, 438–442 (1994).

31. *See* David Blumenthal et al., *Participation of Life-Science Faculty in Research Relationships with Industry*, 335 NEW ENG. J. MED. 1734, 1734 (1996); Michael L. Callaham et al., *Positive-Outcome Bias and Other Limitations in the Outcome of Research Abstracts Submitted to a Scientific Meeting*, 280 JAMA 254, 256 (1998); Anastasia L. Misakian & Lisa A. Bero, *Publication Bias and Research on Passive Smoking: Comparison of Published and Unpublished Studies*, 280 JAMA 250, 250–53 (1998); Joan C. Bevan, *Ethical Behavior of Authors in Biomedical Journalism*, 35 ANN. R. COLL. PHYSICIANS SURG. CAN. 2, 81–85 (2002); Jane Levine et al., *Authors' Financial Relationships with the Food and Beverage Industry and Their Published Positions on the Fat Substitute Olestra*, 93 AM. J. PUB. HEALTH 664, 664–669 (2003); Joel Lexchin et al., *Pharmaceutical Industry Sponsorship and Research Outcome and Quality: Systematic Review*, 326 BRIT. MED. J. 1167, 1169–70 (2003); *see also* SHELDON KRIMSKY, SCIENCE IN THE PRIVATE INTEREST: HAS THE LURE OF PROFITS CORRUPTED BIOMEDICAL RESEARCH? (2003); Elizabeth A. Boyd & Lisa A. Bero, *Assessing Faculty Financial Relationships with Industry: A Case Study*, 284 JAMA 2209 (2000); Henry Thomas Stelfox et al., *Conflict of Interest in the Debate Over Calcium-Channel Antagonists*, 338 NEW ENG. J. MED. 101 (1998); MARCIA ANGELL, THE TRUTH ABOUT DRUG COMPANIES: HOW THEY DECEIVE US AND WHAT TO DO ABOUT IT (2004).

32. Eric G. Campbell et al., *Data Withholding in Academic Genetics: Evidence from a National Survey*, 287 JAMA 473, 479 (2002).

33. Michael J. Mahoney, *Publication Prejudices: An Experimental Study of Confirmatory Bias in the Peer Review System*, 1 COGNITIVE THERAPY & RES. 161, 173 (1977). *See* Kay Dickersin et al., *Factors Influencing Publication of Research Results: Follow-up of Applications Submitted to Two Institutional Review Boards*, 267 JAMA 374 (1992); Joseph M. Garfunkel et al., *Effect of Institutional Prestige on Reviewers' Recommendations and Editorial Decisions*, 272 JAMA 137, 137–38 (1994); Kay Dickersin et al., *Is There a Sex Bias in Choosing Editors? Epidemiology Journals as an Example*, 280 JAMA 260 (1998); John Joyce et al., *Reviewing the Reviews: The Example of Chronic Fatigue Syndrome*, 280 JAMA 264 (1998); Ann M. Link, *U.S. and Non-U.S. Submissions: An Analysis of Reviewer Bias*, 280 JAMA 246, 246–47 (1998); Addeane Calleigh et al., *Effects of Reviewers' Gender on Assessments of a Gender-Related Standardized Manuscript*, 15 TEACH LEARN MED. 163 (2003).

34. *See* Callaham et al., *supra* note 31.; Honest Honest & Khalid S. Khan, *Reporting of Measures of Accuracy in Systematic Reviews of Diagnostic Literature*, 2 BMC HEALTH SERV. RES. 4 (2002).

equate or misleading information in notes.[36] Most significantly, as far as the public and policymakers are concerned, they fabricate, falsify and plagiarize their research results at rates that far exceed the, too often presumed, "rare" occurrence of these behaviors.[37] In practice, research is a competitive, demanding, at times ruthless and not-always-fair profession.[38] This is the side of research students and young researchers too often encounter when they begin their professional careers. The challenge educators face is how to motivate new researchers to strive for the ideal in a world that can be seen as rewarding counter values.

IV. Current Approaches to Fostering Professionalism and Integrity in Research

In line with the view that research progresses best when it is left to set its own agenda, the current approach to fostering professionalism and integrity in research relies heavily on universities, professional societies, journals and other local institutions to develop researchers' sense of right or proper professional behavior—their professional ethical identity. There are, of course, exceptions. The federal government requires that anyone who uses animals[39] or humans[40] in research receive some training on responsible practices. Research training programs funded by the NSF[41] and NIH[42] must

35. *See* Am. Insts. for Research, *Survey of Research Integrity Measures Utilized in Biomedical Research Laboratories Final Report* (2003), http://ori.dhhs.gov/documents/research/intergity_measures_final_report_11_07_03.pdf.

36. *See, e.g.*, Carol A. Doms, *A Survey of Reference Accuracy in Five National Dental Journals*, 68 J. Dent. Res. 442 (1989); J. T. Evans et al., *Quotational and Reference Accuracy in Surgical Journals*, 263 JAMA 1353, 1353–54 (1990); Pierre George & Kathryn Robbins, *Reference Accuracy in the Dermatologic Literature*, 31 J. Am. Acad. Dermatology 61 (1994); Migiwa Asano et al., *The Accuracy of References in Anesthesia*, 50 Anesthesia 1080, 1080–82 (1995); Lisa Schulmeister, *Quotation and Reference Accuracy of Three Nursing Journals*, 30 Image J. Nurs. Sch. 143 (1998); J.E. Fenton et al., *The Accuracy of Citation and Quotation in Otolaryngology/Head and Neck Surgery Journals*, 25 Clinical Otolaryngyology 40 (2000); C. Gosling et al., *Referencing and Quotation Accuracy in Four Manual Therapy Journals*, 9 Manual Therapy 36 (2004); U. Y. Raja & J. G. Cooper, *How Accurate Are the References in Emergency Medical Journal?*, 23 Emergency Med. J. 625 (2006).

37. *See* Brian C. Martinson et al., *Scientists Behaving Badly*, 435 Nature 737 (2005). For estimates of the rate of misconduct, see Nicholas H. Steneck, *Fostering Integrity in Research: Definitions, Current Knowledge, and Future Directions*, 12 Sci. Eng'g Ethics 53 (2006).

38. *See* Raymond De Vries et al., *The Perverse Effects of Competition on Scientists' Work and Relationships*, 13 Sci. Eng'g Ethics 437 (2007); Raymond De Vries et al., *Normal Misbehavior: Scientists Talk About the Ethics of Research*, 1 J. Empirical Res. on Human Res. Ethics 43 (2006).

39. Nicholas H. Steneck, *ORI Introduction to the Responsible Conduct of Research*, at 4a (2004), http://ori.hhs.gov/steneck/RCRintro/c04/1c4.html.

40. *Id.* at 4d.

41. *See* Nat'l Sci. Found., Integrative Graduate Education and Research Traineeship Program (IGERT), http://www.igert.org (last visited June 12, 2008).

42. *See* Nat'l Inst. Health Guide for Grants & Contracts, *Reminder and Update: Requirement for Instruction in the Responsible Conduct of Research in National Research Service Award Institutional Training Grants*, 21 NIH Guide 2-3 (1992).

provide some specific instruction on responsible research practices. Research institutions that receive government funding are also expected to establish policies for investigating misconduct[43] and assuring oversight of conflicts of interest.[44] These and other federal research policies, supplemented by some state policies, have been instrumental in getting the research establishment to recognize its responsibility to promote professionalism in research. However, government has for the most part taken a hands-off approach to implementation, relying primarily on three major elements of the research establishment—journals, professional societies and universities—to develop, implement and assess efforts to foster professional development in researchers. The accomplishments of these institutions in meeting these challenges have been mixed.

A. Journals

Considering the fact that federal regulations by and large do not apply to journals, the efforts journal editors have made to promote integrity in research are commendable. We know more about integrity in publication than any other area of research, due in large measure to the editor-initiated Peer Review Congresses, which have met every four years since 1989.[45] Through these Congresses and other research on publication, key integrity issues in research publication have been identified, steps have been taken to deal with them, and the success of some interventions has been assessed.[46] Large numbers of journals have joined together to set common standards for publication in research, such as the ICJME.[47] There is even an organization, started in the United Kingdom—the Committee on Publication Ethics—that addresses and provides guidance to editors on publication ethics.[48]

B. Professional Societies

In the wake of public concern about misconduct in research, a few professional societies published general accounts of the norms and principles that guide responsible professional behavior in research, such as the

43. Proposed Federal Policy on Research Misconduct to Protect the Integrity of the Research Record, 64 Fed. Reg. 55,722, 55,723 (proposed Oct. 14, 1999).

44. Steneck, *supra* note 39, at 4d.

45. *See* Peer Review Congress Home Page, http://www.ama-assn.org/public/peer/peerhome.htm (last visited June 12, 2008).

46. Publications from the Peer Review Congresses can be found in the Journal of the American Medical Association issues dated June 5, 2002, July 15, 1998 and July 13, 1994. *See* Journal of the American Medical Association, Past Online Issues, http://jama.ama-assn.org/contents-by-date.0.dtl (last visited June 12, 2008).

47. *See* Int'l Comm. of Med. J. Editors, *Uniform Requirements for Manuscripts Submitted to Biomedical Journals: Writing and Editing for Biomedical Publication*, http://www.icmje.org/index.html#references (last visited May 9, 2008).

48. *See generally* Committee of Publication Ethics, http://www.publicationethics.org.uk (last visited May 9, 2008).

National Academies' *On Being a Scientist*[49] and two publications by the scientific research society Sigma Xi—*Honor in Science*[50] and *The Responsible Researcher*.[51] These publications are designed to be read independently or used in courses. Unfortunately, their impact has not been assessed, making it difficult to know what role they play in the development of an awareness of professional ethical responsibility in research. Moreover, these examples are the exceptions, not the rule. Five years ago, when the American Association for the Advancement of Science (AAAS) surveyed its member organizations to find out what they were doing to promote integrity in research, the results were less than promising. The good news was that some of the member societies were aware of their responsibility to promote integrity and had initiated some efforts to clarify standards and promote education; however, the efforts overall were small in number and often not carefully thought out or assessed for effectiveness.[52]

Scarce resources are often cited as the reason for a lack of attention to ethics and integrity by professional societies, but this seems to be more of an excuse than a reason. In 2002, the Office of Research Integrity and the Association of Academic Medical Colleges joined together "to encourage academic societies to provide leadership to the research community through initiatives designed to promote the responsible conduct of research."[53] Over four years, the program provided one million dollars through thirty-nine awards to thirty-three professional societies to develop and promote responsible research practices among their members.[54] However, the program did not generate enough interest—particularly from the largest, most influential societies—to justify its continuation.

C. Universities

As the place where most researchers are trained, universities are ideally situated to instill professional ethics and responsible research practices. Nonetheless, universities offered little formal training on responsible practices before they were required to do so in the early 1990s. Early reports,

49. *See* Nat'l Acad. Press, *On Being a Scientist: Responsible Conduct in Research*, *available at* http://www.nap.edu/html/obas (last visited May 9, 2008).

50. *See* SIGMA XI: THE SCI. RESEARCH SOC'Y STAFF, HONOR IN SCIENCE (2000).

51. *See* SIGMA XI: THE SCI. RESEARCH SOC'Y STAFF, THE RESPONSIBLE RESEARCHER: PATHS AND PITFALLS (1999).

52. *See* Margot Iverson et al., *Scientific Societies and Research Integrity: What Are They Doing and How Well Are They Doing It?*, 9 SCI. & ENG'G ETHICS 141 (2003). For additional information on the efforts of societies, see Francis L. Macrina, *Scientific Societies and Promotion of the Responsible Conduct of Research: Codes, Policies, and Education*, 82 ACAD. MED. 865 (2007).

53. Office of Research Integrity, Responsible Conduct of Research (RCR) Program for Academic Societies, http://ori.dhhs.gov/education/pas.shtml (last visited June 12, 2008).

54. Ass'n of Am. Med. Colleges, AAMC-ORI Responsible Conduct of Research (RCR) Program for Academic Societies, http://www.aamc.org/programs/ori/start.htm (last visited May 9, 2008).

such as one issued by the University of Michigan Task Force on Integrity in Scholarship,[55] or pioneering courses, such as one at the University of Texas at Galveston,[56] were not embraced by other universities. Only after the National Academy's Institute of Medicine recommended more emphasis on formal training[57] and the NIH required such training,[58] did universities began to develop seminars, courses, web sites and other ways to provide students with formal training on responsible research practices.[59] These efforts initially were planned mostly for biomedical and behavioral science students, but they have slowly expanded. NSF began requiring formal RCR instruction for its trainees in 1997,[60] and it is currently under a Congressional directive to extend this training to all students working on NSF-funded programs.[61]

Looking at these efforts as a whole, they reflect significant progress. Twenty years ago, institutions offered little training in responsible research practices. Many professional societies had done little to define the responsibilities of their members, and journal policies focused primarily on technical details—not authorship qualifications or the need to report conflicts of interest. Through the events of the last twenty years, many steps have been taken to clarify and develop approaches that are designed to raise awareness of ethical responsibility in professional researchers.

With so many different sources of guidance, however, it is difficult to plan and track the professional ethical development of researchers. What are the goals of these efforts?[62] Are they designed to impart basic information, develop skills, raise ethical awareness, change behavior or achieve other objectives? Over the past two decades, the concern raised by the discovery of misconduct and other misbehavior in research has spurred a great deal of action, but there has been little central planning and few efforts to

55. U. OF MICH. TASK FORCE ON INTEGRITY IN SCHOLARSHIP, MAINTAINING THE INTEGRITY OF SCHOLARSHIP (1984).

56. Ruth E. Bulger & Stanley J. Reiser, *Studying Science in the Context of Ethics*, 68 ACAD. MED. S5-9 (1993).

57. INST. OF MED. COMM. ON THE RESPONSIBLE CONDUCT OF RESEARCH, THE RESPONSIBLE CONDUCT OF RESEARCH IN THE HEALTH SCIENCES 4 (1989).

58. *See* Nat'l Inst. Health Guide for Grants & Contracts, *supra* note 42.

59. For a fuller discussion of this history, see Nicholas H. Steneck & Ruth E. Bulger, *The History, Purpose, and Future of Instruction in the Responsible Conduct of Research*, 82 ACAD. MED. 829 (2007).

60. Integrative Graduate Education and Research Traineeship Program (IGERT) Home Page, http://www.igert.org. An introduction to the IGERT program is available at http://www.nsf.gov/crssprgm/igert/intro.jsp.

61. America Creating Opportunities to Meaningfully Promote Excellence in Technology, Education, and Science Act (America Competes Act), Pub. L. No. 110-69, § 7009, 121 Stat. 572, 574 (2007).

62. *See* Michael W. Kalichman, *Responding to Challenges in Educating for the Responsible Conduct of Research*, 82 ACAD. MED. 870 (2007); Michael W. Kalichman & Dena K. Plemmons, *Reported Goals for Responsible Conduct of Research Courses*, 82 ACAD. MED. 846 (2007), for a discussion of different goals.

think deeply or carefully about research as a professional endeavor with shared values and common goals. This, in turn, makes it difficult to even discuss, much less implement, a plan for fostering ethical responsibility in research. Before any serious planning can be done, researchers as a whole need to revisit two old but unresolved problems: the lack of a common code of ethics for research and inadequate formulation of best practices in research.

V. A Code of Ethics for Researchers

Scientists have on numerous occasions discussed whether they need a code of ethics. As early as 1927, an AAAS subcommittee endorsed and proposed the adoption of a *Code of Ethics for Scientific Men*. The Code proposed that scientists:

(1) Assume an obligation to do honest work and to impartially present the same to the public, regardless of political, economic or religious prejudice, pressure or tradition;

(2) Exemplify in [their] conduct and work a courageous regard for the whole people, and not alone some powerful and influential fraction thereof with which [they] come in close personal contact;

(3) Recognize and assume a dual obligation (a) to do the best possible work in [their] field, (b) to promote the social and economic welfare of [their] colleagues and [selves];

(4) Promote the dignity of [their] profession; avoid malicious criticism of colleagues; cultivate a professional consciousness;

. . . .

(10) Do not publish the work of colleagues or subordinates without giving full credit where credit is due; authorship should be determined on the basis of the responsibility for the ideas involved, conception and organization of the project, actual field or research work, and actual compilation and writing of the results;

(11) Avoid, alike, hasty and superficial publication, and the holding of real results indefinitely without publication;

(12) Take the public into your confidence; in the end the public pays the bills and has a right to know what is going on.[63]

Two decades later, concern that many articles were "not written so that the work can be repeated" led to a call for clearer standards for authorship,

63. The Comm. on Soc. and Econ. Welfare of Scientific Men, *A Code of Ethics for Scientific Men*, 66 Science 103, 103–04 (1927). The provisions left out (5–9) deal with fair employment practices, relationships with colleagues and contract work. The code was designed to assist the work of a broad AAAS committee interested in "the advancement of research and research workers."

publication and peer review in research and for better guidance for peer reviewers to reduce bias in publication.[64] The aim of these early proposals was to provide clearer common standards for expected behavior in the day-to-day practice of science, presumably to foster integrity and reduce unprofessional behavior.

The discussion of codes of ethics for science continued in the 1960s, but with a new focus. Driven by the divide between supporters and critics of science, social responsibility—not the day-to-day behavior of researchers—became the driving force behind proposals for codes of ethics for scientists. The new tone was reflected in a letter regarding standards of ethical conduct written in 1962 in reference to the role of Soviet physicists in promoting the Cold War:

> Is it not high time the scientific community, and specifically the great international scientific societies, acknowledge that the age of romantic innocence in science is dead? Is it not high time for them to set up standards of ethical conduct for the members of their professions, so that it may become plain for all the world to see that, whatever their professional skill, the scientific accomplices of test-ban cheating and atmosphere poisoning and nuclear blackmail are *not* honored colleagues among them?[65]

Two years later, Los Alamos researcher Lawrence Cranberg attempted to move the discussion of social responsibility forward by proposing that science follow the model of engineering and adopt a code of ethics.[66] However, the response to his proposal was mixed. One supportive letter in *Science* noted that the Society for Social Responsibility in Science had already adopted such a code, which committed each member:

> (1) to foresee, insofar as possible, the results of his professional work,
>
> (2) to assume personal moral responsibility for the consequences of this work, not delegating this responsibility to his employer,
>
> (3) to put his own efforts only into that work which he feels will be of lasting benefit to mankind, and
>
> (4) to share his scientific knowledge, and such ethical judgments as are based upon it, with government and laymen in order that they may intelligently use the tools which science provides.[67]

Others felt that the only code scientists needed was "the principle of 'scientific honesty' and the complete realization that this is the very essence of

64. Ward Pigman & Emmett B. Carmichael, *An Ethical Code for Scientists*, 111 SCIENCE 643, 644 (1950).

65. Alexander Wittenberg & Henry S. Kaplan, *Standards of Ethical Conduct*, 135 SCIENCE 997, 997 (1962).

66. Lawrence Cranberg, *Ethical Code for Scientists?*, 141 SCIENCE 1242 (1963).

67. W. E. Graham, *Ethical Code for Scientists?*, 142 SCIENCE 1257 (1963).

science."[68] "The mere thought of setting up a code of ethics for scientists," one commentator suggested, "is insulting!"[69]

In 1977, André Cournand tried to bring the two sides together by proposing a melding of a code for individual scientists with a broader "ethic of development." His recommendations for the code for individual scientists accepted Merton's four norms, summarized as: 1) intellectual integrity and objectivity, 2) tolerance, 3) doubt of certitude, 4) recognition of error and added two more: unselfish engagement and communal spirit.[70] The goal of the broader "ethic of development" was to promote "the conception of a worldwide scientific community as a source of humanizing influences on mankind's development."[71] As with earlier recommendations, these, too, were soon forgotten.

Discussion about the need for, and appropriate focus of, a code of ethics for science/research continues to this day. There remains strong support for some type of general statement about social responsibility, such as the one proposed by Student Pugwash USA (SPUSA) in the late 1990s. SPUSA urges each student to pledge that "I promise to":

> [W]ork for a better world, where science and technology are used in socially responsible ways. I will not use my education for any purpose intended to harm human beings or the environment. Throughout my career, I will consider the ethical implications of my work before I take action. While the demands placed upon me may be great, I sign this declaration because I recognize that individual responsibility is the first step on the path to peace.[72]

Others have suggested the adoption of short statements of principle covering all aspects of research, such as *The Universal Ethical Code for Scientists* proposed by the United Kingdom's former chief science advisor, Sir David King.[73] The three elements of the *Universal Code*, referred to as *Rigour*, include:

> Rigour: Rigour, honesty and integrity;
> Respect: Respect for life, the law and the public good;
> Responsibility: Responsible communication: listening and informing.[74]

---

68. F. R. Fosberg, *Code of Ethics*, 142 SCIENCE 916 (1963).

69. Henry Lanz, *Code of Ethics*, 142 SCIENCE 916 (1963).

70. André Cournand, *The Code of the Scientist and its Relationship to Ethics*, 198 SCIENCE 699, 700 (1977). See André Cournand & M. Meyer, *The Scientist's Code*, 14 MINERVA 79 (1976); André Cournand & H. Zuckerman, *The Code of Science: Analysis and Some Reflections on its Future*, 23 Studium Generale 941 (1970), for a more detailed discussion of Cournand's recommendations.

71. Cournand, 198 SCIENCE at 705.

72. Student Pugwash USA Pledge, *available at* http://www.spusa.org/pledge/index.html.

73. Donald MacLeod, *Ethics Code Seeks to Regulate Science*, GUARDIAN (London), Jan. 5, 2006.

74. UNITED KINGDOM GOVERNMENT OFFICE OF SCIENCE, RIGOUR, RESPECT, RESPONSIBILITY: A UNIVERSAL ETHICAL CODE FOR SCIENTISTS (2007).

Today the professional codes of conduct for research have become so complex and numerous that efforts have been undertaken to collect, codify and study them.[75]

The fact that scientists in particular, and researchers more generally, either cannot agree or do not have the will to agree to a statement of basic guiding principles undermines professionalism in research. Reviewing this situation as it pertains to the biological sciences, Jones concludes:

> The time is ripe for scientific communities to reinvigorate professionalism and define the basis of their social contracts. Codifying the social contract between science and society is a crucial step in sustaining public trust in the scientific enterprise. Appeals to the ideology of science and blind trust will no longer suffice.[76]

At the very least, the lack of a clear code of conduct for research makes it difficult to foster ethical responsibility during the professional education of researchers. Which code or codes should they embrace? What should they do if codes conflict? When working on interdisciplinary or international projects, which codes should they follow? Research has yet to establish a clear ethical foundation on which professional research is built. Instead, it has been comfortable with a fragmented network of general understandings, commonly accepted practices and a growing number of codes written for different purposes. This, in turn, makes it difficult to instill in new researchers the principles that should guide professional practice in research.

VI. Best Practices

Codes define the general principles that shape professional conduct. They do not provide the specific information needed to deal with difficult decisions about responsibility that arise in the day-to-day practice of research. Who should be listed as authors on a paper? When should data be shared, and when should it be protected? How closely should peers check the work they are reviewing? Research in all fields is a complex activity, making it difficult to know the difference between acceptable and unacceptable behavior. Its complexity can be reduced if information about best practices—practices that set the standard for responsible conduct—is well defined, consistent and readily available.

There is today considerable unacceptable variation in way best practices are established and disseminated in research. Advice on what one *should do* can be found in codes of ethics, regulations, policies, guidelines,

75. UNESCO, Div. of Ethics and Sci. Tech., Interim Analysis of Codes of Conduct and Codes of Ethics (2006); Simone Sholze, *Setting Standards for Scientists*, 7 EMBO Rep. 65 (2006); Kathinka Evers, Standards for Ethics and Responsibility in Science: An Analysis and Evaluation of Their Content, Background and Function (2001).

76. Nancy L. Jones, *A Code of Ethics for the Life Sciences*, 13 Sci. & Eng'g Ethics 25, 41 (2007).

textbooks and many other sources of information about research. There are also unwritten "rules," often referred to as "commonly accepted practices," that play an important role in guiding researchers' behavior.[77] As with codes, the absence of clear guidance for responsible practice makes it difficult to foster a sense of professional ethical responsibility during professional training, particularly in a profession that is known to tolerate questionable practices.[78]

Developing best practices for research is not an easy task. It can be, and has been done, through regulation. Institutional Review Boards (IRBs) must review government-funded research that uses human subjects. "Fabrication, falsification, and plagiarism" constitute "research misconduct" and subject researchers who engaged in these practices to disciplinary action. The federal government has made the decision that these are "best practices," that is, standards that must be followed.[79] However, even seemingly clear rules such as these are subject to interpretation. For example, in 2000, the Office of Science and Technology Policy established a uniform, federal definition for misconduct in research and outlined uniform procedures for reporting and responding to allegations.[80] In responding to this policy, different governmental agencies have adopted different mechanisms for reporting and responding, and research institutions have added to the federal definition of misconduct.[81] There is, therefore, no single "best practice" for reporting and responding to misconduct that can be applied without some further understanding of the details of the best practice and how or when it was applied. The same is true for human-subjects research and the work of IRBs, which is today undergoing significant reassessment while government and researchers debate best practices.[82]

Such limitations notwithstanding, there is considerable room between loosely described ideals and ironclad rules to clarify best practices in research. Substantial progress toward this end has already been made in a few key areas, particularly in describing best practices for publication and authorship. Thirty years ago, before misconduct in research became a major public concern, authorship and publication guidelines were largely set by individual journals or, when no authorship rules existed, by laboratories and

77. Raymond De Vries, Melissa S. Anderson & Brian C. Martinson, *Normative Dissonance in Science: Results from a National Survey of U.S. Scientists*, 2 J. EMPIRICAL RES. HUM. RES. ETHICS 3 (2007); Raymond De Vries, Melissa S. Anderson & Brian C. Martinson, *Normal Misbehavior: Scientists Talk About the Ethics of Research*, 1 J. EMPIRICAL RES. HUM. RES. ETHICS 43 (2006).

78. Martinson et al., *supra* note 37, at 737–38.

79. *Id.*

80. Federal Policy on Research Misconduct, 65 Fed. Reg. 76,260 (Dec. 6, 2000).

81. Nicholas H. Steneck, *An Interpretive History of Research Misconduct Policy in the United States and Canada*, *in* FRAUD AND MISCONDUCT IN BIOMEDICAL RESEARCH (F. Wells & M. Farthing eds., 2008).

82. Norman Fost & Robert J. Levine, *The Dysregulation of Human Subjects Research*, 298 JAMA 2196 (2007).

individual researchers. To bring more consistency to this aspect of research practice, a group of medical journal editors, known as the Vancouver Group after the site of the original meeting, established guidelines for submitting articles to its journals. Over time, the group formalized its name as the International Committee of Medical Journal Editors (ICMJE), and its guidelines became known as the ICMJE *Uniform Requirements*.[83] Similar rules for authorship and publication have been developed by the Committee on Publication Ethics, the World Medical Council and the Consolidated Standards of Reporting Trials (CONSORT) Group.[84]

The *Uniform Requirements* and other publication guidelines for best practices do not resolve all issues. There is still need for interpretation. Nonetheless, they do provide a foundation on which to begin to build a common understanding of responsible ethical practice to apply broadly across different research areas and institutions. For example, the *Uniform Requirements* set three minimum standards for determining authorship:

(1) substantial contributions to conception and design, or acquisition of data, or analysis and interpretation of data;

(2) drafting the article or revising it critically for important intellectual content; and

(3) final approval of the version to be published.[85]

To be considered an author by ICMJE standards, a researcher must meet all three criteria. This standard is now accepted by others, establishing some agreement on best practices for authorship.[86] Moreover, the continuing discussion of this standard and proposals for other ways to report authorship, such as describing authors' contributions in publications,[87] are promoting a much-needed and helpful discussion of professionalism in research. By confronting this aspect of professional behavior, the journal editors and others who have fostered this discussion are helping to define the ethics of professional research.

Similar efforts to define more clearly the best practices that should guide professional behavior in research are needed for all aspects of research—from responsible design, the choice of tools for analysis, and plans to collect and store data, to more day-to-day practices and all aspects of dissemination. Over twenty years ago, a committee at the University of Michigan chaired by this author briefly summarized these steps and pro-

83. Int'l Comm. of Med. Journal Editors, *ICMJE Uniform Requirements*, *available at* http://www.icmje.org (updated Oct. 2007).

84. Consol. Standards of Reporting Trials Group, *CONSORT Statement*, *available at* http://www.consort-statement.org.

85. Int'l Comm. of Med. Journal Editors, *supra* note 83, at § II.A.1.

86. Mich. State U. Research Council, *Michigan State University Guidelines on Authorship* (1998), *available at* http://www.msu.edu/unit/vprgs/authorshipguidelines.htm.

87. Council of Sci. Editors, *CSE Policies and Endorsement* (2008), *available at* http://www.councilscienceeditors.org/editorial_policies/policies_endorsement.cfm.

posed that they be expanded into a code for all scholars at the University (Figure 1). The proposal was not adopted at Michigan or at other universities that were developing their own policies at the same time. The same is true for steps that could or should be taken to improve the professional training of researchers (Figure 2) and for the responsibilities of research institutions (Figure 3).[88] If research is a professional activity, then more effort is needed to describe and establish clear standards for all that this professionalism implies.

Researchers have, however, a strain of independence and blind faith in truth that sometimes stands in the way of taking steps to foster professional development. During their discussion of rules for authorship, one researcher at the Council of Science Editors warned that:

> . . . [T]o solve these problems, I do not believe we need to change the "rules," but rather to attempt as best we can to be fair when assigning credit for contributions to research projects and programs. In other words, we need to be ethical. No matter how seemingly antiquated, and no matter that it sometimes fails, this method may be the best we can do. In fact, the very idea that we need some set of new rules could be taken to imply that we are often unethical in our conduct of science. If that is truly the case, no set of rules can help us.[89]

Rules in the form of clearly defined best practices, combined with a reasonably detailed code of ethics for all research, would make a difference, particularly for fostering a sense of professional ethical responsibility during the professional education of researchers. If truth, fairness, objectivity and the other general principles that are fundamental to all research, as well as to life in general, were self-evident in their application, then further explanation might not be necessary. The fact that they are not self-evident means that someone has to help new researchers understand and embrace their responsibilities as professionals. Defining those responsibilities more clearly, across different fields of study, institutions and national boundaries, is the most practical and achievable way to begin the important task of fostering a sense of ethical professional responsibility in research.

88. COMM. ON ASSESSING INTEGRITY IN RESEARCH ENV'TS, NAT'L RESEARCH COUNCIL, INST. OF MED., INTEGRITY IN SCIENTIFIC RESEARCH: CREATING AN ENVIRONMENT THAT PROMOTES RESPONSIBLE CONDUCT (Nat'l Aca. Press 2002).

89. Posting of Lawrence P. Reynolds to http://www.councilscienceeditors.org/services/messages2/11.html (Aug. 31, 2000, 13:36:20).

FIGURE 1. PROFESSIONAL RESPONSIBILITIES OF RESEARCHERS[90]

(1) Make sure that the plan of investigation fairly represents the intent of the work that is to be undertaken;

(2) Attribute appropriate credit to the contributions of others in the intended field of investigation;

(3) Consider the ethical and professional standards that should be maintained throughout the impending investigation;

(4) Realistically appraise the likelihood of the project being completed as described;

(5) Disclose any factors that might reasonably be seen as having a bearing on the objectivity of the study;

(6) Carry out research in keeping with the intent of the original plan of investigation, and, as appropriate, report significant departures from the work plan;

(7) Record and report data fully and accurately, keeping sufficient records to allow subsequent verification;

(8) Insure proper supervision of any work not directly undertaken by themselves (the guiding principle here should be a willingness to take full responsibility for any work undertaken under the primary scholar's name);

(9) Insure that all rules (e.g., of the parent institution, government and professional associations) for conducting such investigations are met;

(10) Insure that the results of their investigations are available to colleagues for use in furthering scholarly investigation;

(11) Insure that reports and publications are accurate;

(12) Give proper credit to all individuals who have worked on a particular project;

(13) Take credit for no more work than they conducted;

(14) Cite work that has been used in or will help readers understand the significance of the investigation;

(15) Be prudent in using dissemination as a means to personal advancement, whenever possible avoiding replicate or partial publication that may have limited intellectual benefits;

90. Adapted from U. OF MICH. TASK FORCE ON INTEGRITY IN SCHOLARSHIP, *supra* note 55.

(16) Take appropriate action to insure that unethical behavior is not tolerated in the scholarly world whenever or wherever such behavior surfaces;

(17) Maintain confidentiality when confidentiality is an accepted and integral part of scholarship;

(18) Be concerned about the broad social, political, economic and physical consequences of their work.

FIGURE 2. EDUCATION

(1) Introduce ethical considerations into content-oriented courses, i.e., into basic biology, psychology and other courses;

(2) Raise ethical considerations in research settings, especially when students begin to work as assistants or conduct their own original work in seminars;

(3) Make available and perhaps require courses that deal with professional ethics;

(4) Spell out clearly accepted standards of behavior with regard to cheating, plagiarism and other violations of ethical behavior;

(5) Set aside time to discuss the ethical aspects of research, particularly those pertaining to confidentiality, data collection, drawing conclusions, giving citations, acknowledgements and authorship;

(6) Make sure that students practice ethical responsibility when they begin to manage their own research projects;

(7) Encourage a healthy research atmosphere in their own laboratories.

FIGURE 3. INSTITUTIONAL RESPONSIBILITIES (UNIVERSITIES)

(1) Insure that guidelines for proper ethical conduct are clearly formulated, readily available and openly discussed;

(2) Encourage efforts to raise ethical issues in the context of scholarship;

(3) Remind scholars of their responsibility to help maintain high ethical standards;

(4) Support committees and units charged with insuring that research conforms to established guidelines (such as those established by human and animal use, recombinant DNA, radioisotopes and hazardous biological and chemical materials committees);

(5) Accept the responsibility to undertake impartial investigations of allegations of unethical behavior;

(6) Insure that the quality of research, not the quantity of research, is the primary scholarly requirement for promotion and salary raises, and that the quality of research is judged by competent peers;

(7) Try to avoid policy decisions that could place unreasonable burdens on scholars, e.g., increasing to too high a level the percentage of a scholar's salary that must be supported by sponsored, consulting or service activities;

(8) Keep the demand for scholarly productivity reasonably balanced with a recognition of the importance of teaching and service activities.