The Role and Activities of Scientific Societies in Promoting Research Integrity

A REPORT OF A CONFERENCE
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TABLE OF CONTENTS

INTRODUCTION

This report summarizes the proceedings of an April 2000 conference on "The Role and Activities of Scientific Societies in Promoting Research Integrity," co-sponsored by the American Association for the Advancement of Science (AAAS) and the U.S. Office of Research Integrity (ORI). It reviews some of the recent history of the perceived roles and activities of scientific societies in promoting ethical conduct, discusses codes of ethics and support activities, and concludes with some findings and recommendations for research and action related to the societies' roles in promoting research integrity. It is not possible in this summary to capture the full richness of the prepared talks and discussion that occurred during the conference. Many of the presentations will appear in a special issue of the journal, *Science & Engineering Ethics*, to be published in 2001, and readers are invited to refer to that issue for more content on the issues described in this report.

The impetus for convening a conference on how research integrity is and can be promoted by scientific societies has historical roots. In 1980, an AAAS survey of the professional ethics activities of its affiliate societies concluded that "little attention and only minimal resources have been directed toward professional ethics" among the scientific and engineering societies. Further, "formal enunciation of the objectives of the statements and the rules is rare; equally uncommon is detailed explanation of the values or underlying principles which determined those rules."[1] In 1989, the Institute of Medicine issued a report recommending that

> scientific organizations representing the research community should develop educational and training activities and materials to improve the integrity of research [and that] scientific journals should develop policies to promote responsible authorship practices, including procedures for responding to allegations or indications of misconduct in published research or reports submitted for publication.[2]

An international meeting of scholars in 1991 led to the development of "The Toronto Resolution." (http://scienceforpeace.sa.utoronto.ca/FrontPageFiles/TorResScien.html) It recommended twelve principles for incorporation into codes of ethics to help ensure that scientists recognize the potential consequences of their work in the broader social context. Among the principles were: articulation of guiding principles; measures for adherence to those principles; anticipation of consequences; respect for individual and collective human rights; promotion of peer review; general availability of research methods and results; identification and reporting of code violations; and broad dissemination of a code. As societies considered development or revision of a code of ethics, these principles were intended to provide a framework for their content.

In 1992, the National Academy of Sciences, the National Academy of Engineering, and the Institute of Medicine subsequently undertook a study to review factors affecting the integrity of scientific research processes and recommend steps for reinforcing responsible research practices. Their report, *Responsible Science*, found that ethics were still marginal in most scientific societies, and recommended far more systematic efforts to foster responsible research

practices. The report specifically noted that "guidelines for the conduct of research should be framed to fit local situations, including specific research fields and protocols, and should be formulated by the scientists who conduct research, since they know the specific matters relevant to their work."[3]

Also in 1992, AAAS issued the report, *Good Science and Responsible Scientists*, which examined misconduct in science and the response of the scientific community. The report noted that "scientific societies serve as custodians of their disciplines' distinct knowledge, traditions, and professional norms. The …standards of proper research practices adopted by a scientific society embody the collective conscience of the discipline and are an expression of its ethical responsibilities."[4] Among the report's findings was that scientific societies "play a major role in influencing the moral tone and ethical climate in which research is conducted."[5]

Finally, in its 1995 advisory report to the Secretary of Health and Human Services (DHHS) and the U.S. Congress, the Commission on Research Integrity recommended that "Professional societies [should] adopt a code of ethics in research…[and] should consider initiating activities that will further promote the ethical conduct of research."[6] This conference was, at least in part, an effort to determine what the societies are doing in light of these earlier studies and recommendations.

RESEARCH INTEGRITY AND ROLE RESPONSIBILITY

Role is characterized by both descriptive and prescriptive aspects. One can chose to affirm or deny role responsibility. Particularly when the occupant of a position is an engineer, researcher, or professional, it might be expected that the requisite knowledge and skills encumbent in these esteemed positions would be sufficient to guarantee research integrity except in a few extraordinary cases. So, what might explain why scientists and other professionals do not live up to their highest ideals? Professionalism entails a multiplicity of tasks and a variety of new roles; not all individuals occupying these roles of trust have been adequately prepared for and socialized to them. Society is characterized by autonomous spheres of endeavor within which only some roles are realized, and therefore accountability may be weak or lacking. Conversely, actions are often collective, i.e., via team approaches to problem posing and problem solving, which can undermine individual responsibility. Indeed, the importance of recognizing the role of the "system" in contributing to incidences of research misconduct was noted during conference discussions. All of these potentially conflicting factors may make it difficult for a researcher to know with confidence what is ethically expected of him or her.

Further, what constitutes integrity is, itself, subject to varying interpretations. So what is right and true, ethical and fair may not be readily definable. Although the federal government has in recent years moved to implement greater oversight of the conduct of federally-funded research, focusing on the government definition of research misconduct is too narrow to address the range of behaviors that could threaten the integrity of research.[7] Other questionable practices, while not covered by federal regulations, often are far more prevalent than instances of misconduct, and must be confronted in order to avoid the "normalization of deviance."

CODES OF ETHICS AND ETHICAL STANDARDS

Many scientific societies have developed codes of ethics that encompass a broad range of behaviors and practices as a means of fostering research integrity. These codes presumably represent the ideals and core values of a profession, and can be used to transmit those values and more detailed ethical prescriptions as part of the education of scientists and practitioners. They also provide a benchmark of standards for reviewing claims of misconduct and for sanctioning improper behavior. The potential for and the limitations of codes of ethics to ensure research integrity provoke varying points of view. While codes are intended to codify standards of behavior in professional roles, their limitations are such that conduct cannot be guaranteed and, in some instances, cannot be predicted. The contexts of scientific research can present unique circumstances that create difficulty in describing behavior that is uniformly right or wrong. Any decision or dilemma requires an examination of competing values as well as good judgment and common sense, and individuals' value systems must also be factored into decision-making.

Survey of Scientific Societies

In preparation for the conference, the AAAS Program on Scientific Freedom, Responsibility and Law conducted a survey in the fall of 1999 to determine what societies are doing to promote research integrity and to assess the effectiveness of their efforts. One hundred and twenty-six societies were surveyed; 46 (37%) useable surveys were returned. The societies surveyed ranged in size from less than 3,000 members to more than 50,000 members and included such disciplinary categories as agricultural/botanical, animal/life sciences, medical/dental, physical and atmospheric sciences/computing, and social sciences. The survey results presented at the conference are integrated into this report. [*]

The survey collected data about the prevalence of ethics codes (or similar documents) and their content. Of those responding to the survey, 34 (74%) reported having ethics statements of some sort. In descending order of frequency, the statements included provisions related to authorship determination (30%), reporting misconduct procedures (26%), plagiarism (26%), duplicate publication (24%), obligation to report misconduct (24%), data retention (22%), mentoring/supervising roles (20%), responsibility of authors (20%), timely/complete reporting of data (17%), and order of authors (9%). What the data do not reveal is how these provisions are interpreted by members of the societies and what impact they have on behavior. As noted later in this report, conference participants accorded high priority to conducting more studies related to such matters.

Survey of Codes of Ethics

Staff of the American Psychological Association conducted a comparative study of 16 codes of ethics of various societies to inquire how deeply and broadly their codes address

[*] Limited resources did not allow for a survey that would be representative of a larger population of societies. Hence, one cannot make inferences from this sample of societies to the larger group. This was a convenience sample, in the sense that societies were included based on their identification by AAAS staff as being likely to have developed ethics activities related to the conduct of research. The survey questionnaire, prepared by AAAS staff and included as part of this report, was sent to the societies' executive officers, or their equivalent.

research integrity issues, and how that coverage varies with regard to whether a society's members are involved in service and practice as well as research. The researchers found, however, that the concept of a continuum from practice to research was not useful because the manner by which societies addressed ethical conduct, including research integrity, could not be neatly categorized. They also noted variance in the power and value of the societies' efforts to devise ethics codes and to encourage ethical behavior. All codes, the authors concluded, encourage general good conduct, summarized as:

- Do what you do honestly (in conducting and reporting research, in giving expert consultation, in delivering service).
- Do it well (by working within the boundaries of competence, by following all applicable regulations and procedures).
- Do no harm (to the discipline, to research subjects, to institutions, to clients, to the public, to society).

The substantial commonalities among the codes were found in the following areas:

- Honesty in conducting and reporting research.
- Integrity in intellectual ownership and authorship.
- Respect and humane treatment of living subjects (when living subjects are involved).
- Informed consent, deception, privacy and confidentiality (when human subjects or clients are involved).

The differences among the codes were found to be in:

- Their breadth (i.e., greater responsibility to one's role or to society).
- Their level of specificity (i.e., articulated more abstractly as principles or as detailed expected behaviors).
- Their implied purpose (i.e., primarily to educate, to sanction, or to protect the public).

Differences in Ethics Codes of Medical Associations and Scientific Societies

The physician-researcher is, in a sense, a double agent with obligations to both patients and research objectives. The World Medical Association (WMA) adopted 12 basic principles for conducting human subjects research in 1965 (revised in 1989) known as the Declaration of Helsinki. This was followed in 1979 by the *Belmont Report*, issued by the U.S. National Commission for the Protection of Human Subjects of Biomedical and Behavioral Research. The Report made recommendations to govern research with humans, the main principles of which are: respect for persons, beneficence, and justice. From these basic principles, three ethical requirements have been derived: informed consent, assessment of risks and benefits, and the fair selection of study participants. The recommendations from the *Belmont Report* are the basis of the current federal policy for the protection of human subjects. [8]

For medical practitioners, these international codes and domestic regulations become practical and applicable when translated into ethical guidelines or codes of ethics. This role is best undertaken by medical associations and scientific societies. But many physician-researchers belong to both communities, leading one to question whether the ethical codes of conduct are complementary, conflicting, or redundant. The organizations have different characteristics and focuses. All of the medical association members have an M.D. or D.O. degree. Scientific

society members, on the other hand, have more diverse academic backgrounds. A fraction of a society's members are practicing physicians. The focus of the society activities is on research and the advancement of knowledge.

A comparison of the provisions of the codes of associations and societies reported at the conference found that although only a fraction of physicians conduct research, the medical association codes cover a wide range of research ethics issues. The scope and substance of the provisions vary widely, but the codes of the scientific societies do not contain any human subjects protection provisions. Two simply make general reference to the Declaration of Helsinki. It seems that scientific societies generally defer to the medical associations for implementing human subjects protection guidelines.

The foundational ethical guidelines for research integrity covered by the codes of the scientific societies include: scientific value, validity; falsification, fabrication, plagiarism; publication standards, authorship, conflicts disclosure, public/press announcements, data from unethical experiments, and confidentiality of review. The foundational ethical guidelines for human subjects protection found in the medical association codes include: informed, voluntary consent, right to withdraw, recruitment incentives, disclosure of alternatives, proxy consent, community consent, use of placebos, risk/benefit balance, fair distribution of risks/benefits, protection of vulnerable participants, research participant confidentiality, Institutional Review Board or other committee review, conflict of roles, physician referrals, and innovative therapy versus research. Further collaboration between the medical associations and the scientific societies in developing codes of ethics may be useful to ensure that their members, whatever their backgrounds, are familiar with the ethical requirements of research, whether at the bench or at the bedside.

ENFORCEMENT OF ETHICS CODES

One of the pivotal questions faced by a scientific society is whether to institute measures to enforce its code of ethics with disciplinary proceedings and sanctions. Many societies choose not to engage in enforcement, using their ethics codes primarily for educational purposes. For other societies, ethics code enforcement allows them to demonstrate their willingness to hold their members accountable for their conduct. Yet another option adopted by some societies is referral of a grievance to the institution that owns the data to conduct an investigation, with the society reserving the right to publicize the findings of that investigation.

Conference participants were reminded of a number of considerations for a society regarding enforcement:

- Due process considerations are essential in a review of misconduct if expulsion from society membership is a possible outcome.
- Reviewers of misconduct allegations must have the right to access all sources of relevant information.
- A plan for transmitting a finding of misconduct to appropriate persons/institutions should be in place to protect the integrity of the research record.
- All parties involved in the review of misconduct are vulnerable to being sued.

- Junior scientists may be reluctant to participate in disciplinary proceedings out of fear of professional vulnerability.
- Enforcement is not cheap; societies must be willing to expend sufficient resources to do it well.
- The question of whether enforcement will serve as a real deterrent to misconduct is by no means settled.
- Careful drafting of society codes may permit enforcement while addressing some of these concerns.

SOCIETY ACTIVITIES IN PROMOTING RESEARCH INTEGRITY

Many scientific societies realize that the adoption of a code of ethics can be an important, but insufficient step for fostering responsible research practices. In seeking ways to reinforce the message carried by their codes, societies may engage in a range of activities, some of which were highlighted in the AAAS survey and at the conference. The survey found that 57% of the societies currently engage in or plan to engage in activities to promote research integrity; 41% did not have or plan to have such activities. Of those engaged in activities designed to promote research integrity, they included programs at annual/regional meetings (41%), ethics committees (37%), columns/articles in professional journals/newsletters (33%), publications on research ethics (30%), workshops (17%), resource materials (15%), discussion groups (13%), mentorship programs (7%), special activities for students/trainees (7%), and awards to members exemplifying integrity in research (2%). Four percent indicated other activities that did not fit the designated categories. The range of activities reflects, at least in part, the fact that the societies are highly heterogeneous and some activities are a better fit than others.

Workshops

Society-sponsored workshops in research ethics and professional responsibility are among the activities sponsored by scientific societies. Conference participants heard a report on interactive teaching/learning methods that assist in developing skills for ethical problem solving, social impact, and professional responsibility. Such an effort might include: the discovery and realization of the problem; identification of the tools and resources to solve the problem; examination of alternative strategies for solution; implementation of a chosen solution; and reflection on the solution, assessment of the outcome, and reworking of the process of solution identification.

Partnering Agreements

Prevention – of dissention, of unwarranted competition, and of adversarial relationships - in what are intended to be collegial undertakings can be planned and implemented. Information was presented at the conference about a National Institutes of Health (NIH) program that uses partnering agreements for dispute resolution and mentoring to help promote cooperation and focus on interest-based problem solving. Such agreements can aid in anticipating problem areas, clarifying expectations, establishing open communication, and developing a plan for conflict resolution. It was suggested that a similar program could be implemented by scientific societies.

Role Models and Mentoring

Ideally, prevention of scientific misconduct is the best protection of the public as well as of the reputation of the various scientific disciplines. To develop an appropriate focus on ethics standards, one should consider how a scientific community functions. The behavioral messages of established faculty members, for instance, are a significant source of learning. The influence of the "hidden" or informal curriculum may run counter to the educational messages of the formal means of communicating normative behavior and expectations. Based on studies, it is observed that trainees and junior colleagues model their professional behavior, to a large extent, on what their leaders do, not what they say. Established scientists are effective if they openly explain their difficult decisions as based on issues of right and wrong. In other words, modeling is a primary factor in assuring ethical conduct. In the AAAS survey, at least one society had a statement encouraging senior scientists to "use the laboratory setting to ensure that those whom they supervise understand the values, ethical prescriptions, and institutional guidelines governing research."

RESEARCH INTEGRITY ACTIVITIES BY FOUR SCIENTIFIC SOCIETIES

In an effort to go beyond the aggregate data presented at the conference, there were reports on specific initiatives undertaken by four societies. This summary includes only brief highlights of these presentations.

American Society for Microbiology

The American Society for Microbiology developed a code of ethics in 1988 that is currently being revised. Because of the volume of publication activity handled by ASM, editorial policies and ethics standards have been developed. The "ethics review process" is detailed in the code, although if a charge is brought against a member, where appropriate, it is recommended that the academic or other institution that employs the member should make the investigation and resolve the issue. When the ASM adjudicates, once it is determined that an ethical violation has occurred, a recommendation is made to the President of the Society for action. A finding of plagiarism may result in a letter of reprimand and an author can be barred from publishing in any ASM journal for up to five years. An author's correction or retraction is required. The penalties for fabrication or falsification are more severe. Publication of a retraction is mandatory and various publications, leadership roles, privileges and rewards are precluded. The Society may decide to publish the charges and findings in the ASM NEWS. A report of the actions by ASM will be forwarded to the author's employing institution as well as to the appropriate government offices if federal funds are involved.

ASM has taken other initiatives to promote research integrity. Its annual meeting often includes sessions on topics such as conflict of interest policy, the responsibilities of research mentors, and ethical issues for reviewers of scientific manuscripts. A report of a meeting of the American Academy of Microbiology (an arm of the ASM) considered issues such as defining contributions, authorship, intellectual property, and accountability, as well as the responsibilities

of the individual researcher in collaborative relationships. The Society has published a book titled, "Scientific Integrity: An Introductory Text with Cases."

American Sociological Association

The American Sociological Association recently engaged in a process to revise its code of ethics over a three-year period. While the new code is longer and more detailed, it is no more regulative than the earlier code. The Ethics Committee's most difficult decision was whether the ASA should continue to act as a grievance body to enforce the code, a decision that was affirmed. The Association is committed to educational and support efforts to implement the code and promote ethical conduct. Examples include the availability of an ethics liaison officer to respond to ethical queries, the development of a casebook of illustrative issues, and the presentation of workshops and forums at conferences.

American College of Epidemiology

The American College of Epidemiology has established an Ethics and Standards of Practice Committee charged with the task of developing guidelines for epidemiologists. The guidelines were developed through a process that included a survey of members and fellows of the College to determine which subject areas should be covered in the guidelines. They were then drafted by a special subcommittee of the ACE Ethics and Standards of Practice Committee. The elements of the guidelines include identification of core values and statements of the duties, virtues and obligations of practice as well as a means for discussion and clarification of them. They are structured to enhance readability and relevance to practicing epidemiologists. After the guidelines have been in place for a while, another subcommittee will evaluate their effectiveness and the relevance of the topics covered by the guidelines for ACE members.

Society for Neuroscience

The Society for Neuroscience developed guidelines for "Responsible Conduct Regarding Scientific Communication" over a three-year period. The process included the establishment of an ad hoc committee that examined other guidelines, prepared drafts, received input from consultants, and disseminated a draft to the membership for comment. Seven major drafts followed. The issues requiring major discussion were fast-tracking, criteria for authorship, the sharing of reagents, inclusion of special circumstances, criteria for "prior publication," inclusion of industry needs, and enforcement. The responsibility for enforcement was determined to reside with the institution that sponsors the research.

A PUBLIC PRESENCE IN SOCIETY ETHICS INITIATIVES

Growing interest in public participation in the oversight of research and scientific inquiry counters long held traditions of homogeneous group responsibility. The societies and others charged with promoting ethical conduct and reviewing allegations of misconduct have subscribed to the idea that only members of their profession are competent to make judgments about it, that outsiders may have biases or are uninterested, and that it is cumbersome to involve persons without the pertinent expertise. But self-regulation by professional peers too often

means that persons with similar backgrounds, training, and values as well as vested interests can, despite the best of intentions, fail in representing the public interest.

A view expressed at the conference holds that the person trained to perform a particular function is least capable of seeing negative consequences and harms that could be caused by the act. Similarly, the person who is most capable of seeing negative consequences or harms that could be caused by certain actions is the person most likely to be so harmed. Token outsiders, at worst, would have no impact and serve primarily a public relations function. Further, inclusion of laypersons in oversight or review roles might preempt government imposition of such "watchdogs" and, indeed, they would serve as surrogates for the public interest. If protocols and research findings are defensible to reasonable people, the public interest is served; the concept of objectivity known as the "view from nowhere" is advanced.

Many categories of people would likely fit this role of "outsider": junior members of the profession and lower status students and trainees are semi-outsiders; scientists from related or distant fields, technicians, lawyers, historians, and persons from underrepresented groups such as women and ethnic minorities could make valuable contributions to deliberations. The practice is already in place among corporate boards of directors, state licensing boards, institutional review boards, consultants, and trainers. It may be appropriate for society ethics/review committees to adopt such practices as well.

PUBLICATION AND COMMUNICATION ETHICS

Publication plays a critical role in the advancement of science by communicating knowledge from the researcher(s) to the larger scientific community. One might say that science does not truly exist until it is published, at which time the publication becomes a public commodity. The exchange of information through publication is an essential part of doing science, a public good, and, for some, a moral imperative. It is important, then, that scientific societies, as major publishers of science, take initiatives to preserve the integrity of the process that certifies and communicates research.

The AAAS survey found several provisions in the codes of ethics among the survey respondents that prescribed the essential criteria for determining authorship or how the order of the co-authors on a manuscript was to be determined. Also presented at the conference was a report of another survey, this one of 125 medical schools (with a 95% response rate). It was found that 21% of the schools have an authorship policy, 9% were in the process of developing policy, and 65% did not have a policy and were not developing one. (Five percent did not know whether there had been discussions of authorship policy on their campuses.) The most frequent comment of medical schools that did not have authorship policies was that criteria should be established by each discipline. This suggests an extremely important role for the scientific societies in developing authorship policies for their members. The societies must also make sure that their members know of the existence of their policies and how to interpret them. Regular continuing educational efforts are imperative. There is also the possibility that scientific societies could work together to establish a uniform policy that would hold across disciplines. This would be advantageous to those engaged in interdisciplinary research collaborations.

The International Committee of Medical Journal Editors, having identified common and persistent problems with authorship, developed criteria in the "Uniform Requirements for Manuscripts Submitted to Biomedical Journals" in 1985, most recently revised in 1997. Several hundred journals worldwide have adopted the following criteria:

- All persons designated as authors should qualify for authorship.
- Each author should have participated sufficiently in the work to take public responsibility for the content.
- Authorship credit should be based only on substantial contributions to: (1) either the conception and design or the 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. Conditions 1, 2, and 3 must all be met.
- Other contributors should be listed in an appendix or footnote.
- Editors may ask authors to describe their contribution(s).

Publishing may be undergoing redefinition. As electronic publications burgeon so do issues and questions. Should self-publishing on a Website, for instance, preclude publishing in a traditional journal? What are the attributes of a definitive publication? Can traditional paper standards be applied? Must standards of publishing be modified or new ones created? There are both opportunities and pitfalls associated with electronic publishing. The immediacy, impermanence and global reach of electronic publishing mean that new, expanded audiences can be reached. Both previously unknown collaborative partners and the lay public may become informed and involved. The rights of patients, research subjects, and even of researchers themselves must be protected. But how can one implement the informed consent process in an electronic environment? The privacy of readers must also be protected. Is personal information about those who access a document collected, and, if so, how is it used, e.g., for tracking, selling, or some future, unspecified purpose? Digital technology may make it easier to misrepresent data or alter graphic representations. Societies could make a valuable contribution by encouraging cross-disciplinary discussion of these matters among researchers and those involved in publishing.

Discussion over the years has led to a proposed alternative to the current authorship model. It is the contributor-guarantor model. The contributor approach describes what each named individual has done, which means that even minimal contributions are credited. A contributor does not have to make an intellectual contribution, write or revise the paper, or approve the final version; nor is a contributor held accountable for the entire work. The guarantor approach names those who are willing to take responsibility for the content and quality of a publication. There must be at least one guarantor, and may be more. The guarantor assumes responsibility for the integrity of the entirety of the research being reported. In this model, authors are listed alphabetically or based on the quantum of their contributions, in descending order. The specifics and the nature of the respective contributions are footnoted.

There are some downsides to the model, however. Publication indices may only list the first three authors, which could disadvantage the others. Evaluating the importance of each contributor's work could be controversial. For instance, is the design or the conduct of an experiment the most important? Other concerns are that this model will take too much journal

space and that universities' Academic Promotion and Tenure Committees may not consider contributorship as seriously as authorship.

While the government definition of scientific misconduct includes fabrication, falsification, and plagiarism, the scientific community is charged with considering standards for other practices. In publication practices, that encompasses such matters as authorship credit, duplicate publication, accurate representations of the data presented, and peer review. Guidelines for responsible conduct in the communication and publication of scientific research must be developed and implemented, and the societies can play a pivotal role in their promulgation and implementation.

EVALUATING THE EFFECTIVENESS OF SOCIETY ACTIVITIES

As the public increasingly demands greater accountability on the part of the scientific community and as societies seek effective ways to promote research integrity, these activities must be subject to rigorous evaluation. But neither resources nor strategies in support of evaluation appear to be a priority among the societies responding to the AAAS survey. The survey results revealed few means by which societies determine the effectiveness of their activities. Three indicated they conduct surveys and two mentioned informal feedback. Other categories mentioned once included outcomes of research projects, attendance at programs, meeting evaluations, annual reviews, peer review of research articles, disciplinary procedures, compliance with guidelines of society's instructions for authors, and the practice of addressing specific ethical concerns on a case-by-case basis. The societies responded that the following activities appear to be most effective for promoting research integrity: publications on research ethics, programs at annual meetings, columns/articles in professional journals and newsletters, resource material with which mandatory compliance is specified, mentoring, and oversight of journal article reviewers. Ethics committees, resource materials, and posting materials on a Website (unless a focal point of the site) were reported as least effective. But none of these appears to have been evaluated with any rigor. Indeed, it is not even clear what would constitute the criterion of "effectiveness" in order to draw valid conclusions. The reality is that these responses are more reflective of seat-of-the-pants judgments than any empirical evidence.

At a conference panel on "Designing Research and Evaluating Society Activities," speakers stressed that evaluation research, if conducted properly, can be helpful in assessing the effectiveness of an activity in accomplishing its goals, including the efficiency of its implementation. The development of baseline measures will be essential for evaluating initiatives over time. Speakers identified various methods that could be used to assess the impacts of a society's ethics code or supporting activities: conducting qualitative interviews of principal investigators, developing case studies of misconduct, administering attitude surveys among both researchers and the sponsors of the research, developing measurement tools regarding effectiveness of educational and preventive strategies, and – ideally – developing a common protocol that would be useful across the diverse societies. It was also suggested that critical incident analysis could be a useful approach for evaluating "what went wrong" when errors or possible misconduct occur. In examining such incidents, it would be important to assess how the system in which research is conducted, not just the individual, may have contributed to the occurrence of the alleged behavior.

Given limited resources, evaluation makes sense for societies that want to confirm that their efforts are "working." Currently, there are sparse data on the impact of those efforts. Even less is known about what fosters good or bad behavior in the conduct of research. A program of research and evaluation that generated data related to these matters could contribute to a better understanding of how the societies can influence the behavior of their members in a way that fosters research integrity.

FINDINGS AND RECOMMENDATIONS

While no vote of conference participants was taken to determine the extent of any consensus, a number of findings and recommendations clearly emerged that most participants would likely support. There was little argument with the notion that societies can play a key role in developing initiatives to help prevent ethical infractions and promote responsible research conduct. Yet, conference participants did acknowledge that a scientific society may not always be a sufficiently impartial judge of allegations of research misconduct. Like all institutions, societies can overtly or subtly engage in cover-ups to protect their good name or to avoid possible litigation. Nevertheless, participants clearly believed that scientific societies can and should do more to promote research integrity.

Below are key findings and recommendations that flow from conference deliberations.

Ethical Standards

- Codes of ethics should be developed by all scientific disciplines, with the process of development offering ample opportunity for contributions from all sectors of a society's membership.
- Ethics and publication standards are not always effectively transmitted from one generation of scientists to the next, or even to current members of a society. Hence, any effort to develop standards should be linked to a plan for their dissemination and for the education of those to whom they (will) apply. For example, ethics consulting services sponsored by societies may help members assess options for responsible conduct.
- If a society decides to enforce its standards with review and disciplinary procedures, it should be prepared to devote adequate resources to do so effectively.
- Enforcement procedures should accord due process and ways to initiate a grievance should be commonly known.
- When misconduct allegations are reviewed by societies, the results may not be made public, thereby diminishing the potential deterrent effect. Societies should, therefore, consider making public the outcomes of their misconduct review.

Education

- Educational curricula in the discipline should include an ethics component, which should be reflected in accreditation standards.
- Societies should sponsor learning opportunities in responsible research for their members, including activities at society meetings, articles in their publications, and the

development and dissemination of educational materials, especially examples of ethical practices involving complex circumstances.

- Societies should develop initiatives that foster the preparation of ethics curricula and materials that incorporate the values and ethical prescriptions reflected in the society's code of ethics.
- Societies should develop partnerships with the appropriate disciplinary departments in colleges and universities to implement these and other educational initiatives.

Collaboration and Mentoring

- Scientific societies and professional associations should work closely together in developing and implementing codes of ethics as a way to bridge gaps in the understanding of ethical responsibilities across disciplines and professions.
- In planning a research project, a clear delineation of roles, working relationships, credit allocation, and intellectual property policies is desirable. The design of methods of dispute resolution may help to promote responsible research practices and support collegial models for conducting collaborative research. Societies should consider adopting partnering agreements, conflict resolution mechanisms, and mentoring strategies in support of scientists and students.

Research and Evaluation

- Individual scientists do not act in isolation from their professional peers. More research is needed on the importance of the societies (and other forces in the research system) in shaping the ethical climate in which scientists work. Worth explanation is how the exercise of professional discretion by individual scientists is affected by standards prescribed by his or her society.
- At present, there has been very little formal evaluation of the effectiveness of the society initiatives described in this report. More rigorous evaluation is essential if resources are to be efficiently allocated and if scientists and the larger public are to have confidence in the self-regulatory functions of the societies. Such evaluation should be sensitive to the heterogeneity of the population of scientific societies.

Publication

- In their role as publishers, societies have the opportunity to influence research conduct. Societies should review their codes of ethics to determine whether they appropriately cover publication ethics, a critical element in promoting research integrity.
- The society's leadership should work closely with new editors and new generations of researcher-scholars regarding ethical standards and their crucial role in helping to ensure the integrity of research.
- Society journals should develop educational programs regarding publication policies that promote integrity in publishing scholarly work.
- The scientific societies should establish a consortium of journal editors to develop, where appropriate, consistent standards for publishing scientific research.

- Scientific societies should work together to establish a uniform policy regarding authorship in the context of multi-disciplinary research collaborations.
- Criteria for authorship and the responsibilities--including relative contributions--of authors should be clearly stated by society journals.
- Specific standards for online publication should be developed by the societies.

* The presenters and discussants at the conference, while representing various societies and governmental offices, stated that their ideas and remarks were their own, and did not necessarily represent the views of the organizations that employ them.

Report prepared by Elizabeth DuMez, Conference Rapporteur

Endnotes

[1] Chalk, R, Frankel, MS, & Chafer, SB (1980) *Professional Ethics Activities in the Scientific and Engineering Societies*. (Washington, DC: American Association for the Advancement of Science), pp. 101, 102.

[2] Institute of Medicine (1989) *The Responsible Conduct of Research in the Health Sciences*. (Washington, DC: National Academy Press), pp. 36, 37.

[3] Panel on Scientific Responsibility and the Conduct of Research (1992) *Responsible Science: Ensuring the Integrity of the Research Process*, Committee on Science, Engineering, and Public Policy, National Academy of Sciences, National Academy of Engineering, and Institute of Medicine. (Washington, DC: National Academy Press), p. 147.

[4] Teich, AH and Frankel, MS (1992) *Good Science and Responsible Scientists*. (Washington, DC: American Association for the Advancement of Science), p. 19.

[5] *Ibid*.

[6] Commission on Research Integrity (1995) *Integrity and Misconduct in Research*. (Washington, DC: U.S. Department of Health and Human Services, Public Health Service), p. 20.

[7] In late 1999, the U.S. Office of Science and Technology solicited comment on a proposed policy that defines the scope of the federal government's interest in the accuracy and reliability of research. The proposal consists of a definition of research misconduct and basic guidelines for responding to allegations of research misconduct. Research misconduct is defines as "fabrication, i.e., making up results and recording or reporting them, falsification, i.e., manipulation of research materials, equipment, or processes, or changing or omitting data or results such that the research is not accurately represented in the research record, and plagiarism, i.e., the appropriation of another person's ideas, processes results, or words without giving appropriate credit." See Office of Science and Technology Policy, Executive Office of the President (October 14, 1999). "Proposed Federal Policy on Research Misconduct to Protect the Integrity of the Research Record," *Federal Register*, vol. 64, no. 198, pp. 55722-55725.

[8] OPRR Reports (June 18, 1991), Revisions of the Code of Federal Regulations, Title 45--Public Welfare; Part 46--Protection of Human Subjects, Public Health Services Act. (Office for Protection from Research Risks, National Institute of Health, U.S. Department of Health and Human Services).