Research Responsibility
Symposium Notebook
Session Listings & Manuscripts

9th NATIONAL CONFERENCE

COUNCIL ON UNDERGRADUATE RESEARCH

June 19 - 22, 2002
Connecticut College
New London, CT

Plenary Session
Research Responsibility

Thursday, June 20, 2002
1:15-2:00 pm

Ethics Training Programs at Colleges and Universities: Federal Expectations
Panel discussion of federal concerns and status of regulations and guidelines.

BIOGRAPHIES

Kay Fields
Public Health Service Fellow
Office of Research Integrity
U.S. Department of Health and Human Services

Kay Fields is Senior Scientist and PHS Fellow in the Office of Research Integrity, U.S. Department of Health and Human Services. Her academic background includes an A.B. from Radcliffe College/Harvard University, Ph.D. from MIT, Postdoctoral research experience in Switzerland, research and teaching at University College, London, and twelve years as a professor of Neurology at Albert Einstein College of Medicine. She moved to Bethesda as a Branch Chief in the Extramural program of the National Institute of Mental Health in 1990, and had some experience in the intramural program. She has been a Senior Scientist in the Division of Research Investigations, ORI, from 1992 to 2002. It is now the Division of Investigative Oversight. She maintains research interests in molecular neurobiology and genetics of neurologic disease. She started in research as an NSF Undergraduate Research Participant at Cold Spring Harbor Labs and recently attended a 40th year reunion of the URPs.

James Kroll
Office of the Inspector General
National Science Foundation

Dr. Kroll is Head of Administrative Investigations for the National Science Foundation's Office of the Inspector General. He is responsible for the management and resolution of all administrative allegations of wrongdoing (including research misconduct) involving NSF activities. In that position, he works closely with NSF grantees and other government agencies to resolve allegations.

Prior to working for the OIG, Jim served 21 years as a meteorological officer with the U.S. Air Force. During his Air Force tenure, Jim served in a number of positions including Staff Weather Officer, Chief of Meteorological Modeling and Simulation at the Air Force's Environmental Technical Applications Center, Commander of Detachment 8, 26th Weather Squadron, Atmospheric Sciences Program Officer at the Air Force Office of Scientific Research, Chief of Total Force Policy, Directorate of Weather, Headquarters U. S. Air Force, and finally as an Air Force Liaison to National Weather Service.

Jim completed his undergraduate studies at Rutgers University where he received his B.S. in Meteorology in 1980. Jim later attended North Carolina State University where he received his M.S. in atmospheric sciences in 1985 and his Ph.D. in 1988.

Kay Fields

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ABSTRACT

The Public Health Service believes that education in the responsible conduct of research is part of the core mission of academic institutions that do research. All research institutions highly value quality research, and recent advances in science accompanied by increasing ethical dilemmas have made research integrity a key component of research quality. For example, public confidence in biomedical research is a key underpinning for increased public support and the willingness of providers and consumers to utilize new research findings and improved drug therapies, medical devices, and treatment regimens which are based on those findings.

Education is a demonstrated mechanism for knowledge transfer, and the Office of Research Integrity believes that education in responsible research practices is a vital element of a research program. It provides information about regulatory requirements, institutional policies, scientific standards, and best practices. It demonstrates the commitment of the institution and individual researcher to research quality and responsible research. If done well, it can improve the quality of research and decrease disruption in the lab. If professional standards and practices are well known and accepted in the institution or lab, the chances for authorship disputes and other disagreements should diminish. When standards for discarding or omitting data are clear and understood, there is less opportunity to question someone's scientific judgment or integrity. The development and practice of appropriate scientific norms can give confidence to all stakeholders-scientists, institutions, government sponsors, and the public-that research is being done well and with high integrity.
PHS has identified the following topics as core areas in responsible research: data collection, management, and reporting; mentor/trainee responsibilities; publication practices and responsible authorship; peer review; collaborative science; human subject protections; animal welfare in research; research misconduct; and conflict of interest and commitment. Institutions may add to this list as they find appropriate to meet the needs of their staff and research programs.

Learning how to develop a hypothesis, test it, utilize the necessary lab techniques, collect the data, perform the statistical analysis, and write up the results are well accepted as pre-conditions to conducting quality research. ORI believes that knowing how to obtain informed consent, reduce risk to human subjects and experimental animals, avoid or resolve conflicts of interest, maintain data integrity, publish research responsibly, and maintain confidentiality of peer reviewed manuscripts are equally important to the responsible researcher. You will learn about these and other important issues in the next several days. ORI hopes you will find these issues and discussions helpful and stimulating in your research careers and those of your students.

James Kroll

Office of the Inspector General
National Science Foundation

ABSTRACT

Each federal agency has an independent Office of Inspector General (OIG) charged with conducting independent and objective audits, investigations and inspections and evaluations, and preventing and detecting fraud, waste and abuse. Within National Science Foundation's (NSF) OIG, the Office of Investigations investigates allegations of wrongdoing involving organizations or individuals that receive awards from conduct business with, or work for NSF.

OIG investigators examine allegations in which NSF is the potential victim of fraud by employees, grantees, contractors, or others. We receive allegations from many sources, including proposal reviewers, agency employees, the OIG hotline, other OIG offices and the public. NSF regulations also stipulate that we handle all allegations of research misconduct, in addition to allegations of fraud, waste and abuse. These allegations may lead to civil or criminal investigations.

NSF/OIG believes that awardee institutions bear primary responsibility for the prevention and detection of research misconduct. The key to prevention is education. Education is particularly critical at the undergraduate level where the next generation of researchers begins formulating their modes and methods of conducting research. On-going education for faculty is also important as they are the role models for undergraduate students and because certain issues like conflicts of interest are more likely to affect faculty members than undergraduate students.

OIG believes that a good education about research responsibility comes from understanding what actions violate ethical norms or established rules governing federally funded research, and being aware of the potential consequences of committing such violations. Issues critical to NSF include, but are not limited to, research misconduct, conflicts of interest, human subject protections and animal welfare concerns, peer review violations, duplicative research, retaliation against another researcher, and student/mentor relationships. We encourage institutions to develop educational programs to address these issues for their faculty and students and OIG is always ready to provide on-site presentations at institutions to address these issues. We hope that the discussions during this conference bring a higher awareness of the important issues relating to the ethical conduct of research. Feel free to call us anytime if you have questions regarding these issues.

Listing of Sessions

- **The complete manuscript is contained in this notebook.**

Thursday, June 20th

9:45-10:30 am

- **Dealing with Federal Compliance Issues at a PUI**
  Frances Vinal Farnsworth, Middlebury College, Linda Freed, University of Wisconsin - Oshkosh, and Chris Craney, Occidental College

Recommendation Letters: Ethical Issues, Pragmatics, and Best Practices
Tara Kuther, Western Connecticut State University

10:45-11:30 am

Data Handling and Integrity: Teaching Students about Data Management and Record-Keeping
Julia Frugoli, Clemson University

Is Research Objective?
Naomi Amos, Randolph-Macon Woman's College, Jill Reich, Bates College, and Paula F. Dehn, Canisius College

Research Learning Contracts
Patricia Ann Mabrouk, Northeastern University

- **Teaching Research Ethics to Undergraduates**
  David Elmes, Gregory Cooper, and Jeanine Stewart, Washington and Lee University

The Ethics of Peer Review
Joyce Iutcovich, Keystone University Research Corporation and American Sociological Association

1:15-2:00 pm

Ethics Training Programs at Colleges and Universities: Federal Expectations
Panel discussion of federal concerns and status of regulations or guidelines. Chris Pascal, Office of Research Integrity HHS, and James Kroll, National Science Foundation

2:15-3:00 pm

Administrative Support of Research Responsibilities: Ethical, Legal, Regulatory Aspects
Barbara Byrne, VP, University of the Sciences in Philadelphia, Sally Mateja, Murray State University, and Maria Moyer, Richard Stockton College of New Jersey

Diversity as an Ethics Issue
Thomas Van Valey, Western Michigan University

The Social Impact of Scientific Research
David Koetje, Calvin College, and Anne Kleinschmidt, Allegheny College

3:15 - 4:00 pm

- ### Data Manipulation in Undergraduate Lab Courses
  Julio Turrens, University South Alabama, and Elizabeth Davidson, Arizona State University

Government Views of Scientific Misconduct: Fabrication, Falsification, and Plagiarism
Jim Kroll, National Science Foundation, and Chris Pascal, Office of Research Integrity HHS

Publishing with Undergraduates in Peer-reviewed Journals
Jeff Osborn, Truman State University, Elizabeth Paul, College of New Jersey, and Wayne Glowka, Georgia College & State University

Student Research on Prejudice and Social Inequality
Thomas E. Ford, Western Michigan University, and Ida Mukenge, Morehouse College

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Friday, June 21st

9:45-10:30 am

Community-based Research Collaborations: Students and Faculty as Civic Scientists
Jill Chopyak, Independent Consultant, and Elizabeth Paul, The College of New Jersey

Ethical Dilemmas and Solutions in Review of Non-medical Research
Nona Smith, Leslie Alexander, Kenneth Richman, and Celeste Johnson, Bryn Mawr College

What is Plagiarism in the World of Collaborative Research and the Internet? How to teach students responsible data-gathering on the web
Gloria Edwards and Carolyn Gutierrez, Richard Stockton College of New Jersey

10:45 - 11:30 pm

Community-based Research as Pedagogy
Elizabeth Paul, The College of New Jersey, Jill Chopyak, Independent Consultant, and William (Reed) Benedict, Eastern Illinois University

Conflicts of Interest in Research
John Ahearne, Sigma Xi, S. Robert Jelley, Wiggin and Dana, and Garry Brewer, Yale University

Managing Chemicals: Streamlining, Storage, Disposal, and Compliance
Linda Grimm, University of Michigan – Dearborn, Neal Abraham and David Roberts, DePauw University

2:00 - 2:45 pm

- ### Starting an Institutional Review Board at a Primarily Undergraduate Institution
  Beth Cunningham and Andrea Halpern, Bucknell University, Gary Gaffield, Wittenberg University

International Undergraduate Research Experiences: Opportunities & Challenges
Daniel Wubah, James Madison University, John Stevens and Sally O'Connor, National Science Foundation

- ### Mentor-trainee Relationships
  Jeffrey Schultz, Rollins College

Responsible Research with Animals
Nancy Dess, Occidental College, Nelson Garnett, National Institutes of Health, and Suzanne Baker, James Madison University

3:15 - 4:00 pm

Integrating Ethics in Science into a Summer Undergraduate Research Program
Amy Shachter and Margaret McLean, Santa Clara University

MEALTIME DISCUSSIONS

Thursday, June 20th (Lunch)
11:30 am – 1:00 pm

Conflicting Values in the Lab or Classroom
Elaine Hoagland, National Executive Officer, Council on Undergraduate Research

Saturday, June 22nd (Breakfast)
7:00 - 8:00 am

Institutional Review Boards (IRBs) at Primarily Undergraduate Institutions
Andrea Halpern and Beth Cunningham, Bucknell University, Gary Gaffield, Wittenberg University

MANUSCRIPTS

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Dealing with Federal Compliance Issues at a Predominantly Undergraduate Institution

*(Reprinted from the CUR Quarterly **22:** 61)*

Linda Freed
Director of Sponsored Programs and Faculty Development
University of Wisconsin – Oshkosh

Frances Vinal Farnsworth
Coordinator of Sponsored Research
Middlebury College

For many months now, issues relating to research ethics, and the federal regulations that govern them, have featured prominently in news coverage. Big headlines about subject deaths in government sponsored research and government shutdowns of major biomedical research institutions have heightened public awareness of research ethics issues. Debates surrounding genetics research, stem cells, and animal rights/animal welfare, also break into headlines with what seems to be increasing frequency.

In the wake of these events, the Public Health Service (PHS) has reorganized its management of human subjects protections and tightened training requirements for researchers and Institutional Review Boards (IRBs). The PHS Office of Human Research Protections (OHRP) manages the new Federal-Wide Assurance process, which requires that institutions receiving research funding from the National Institutes of Health (NIH) or other federal agencies file an assurance that covers all of the institution's federally-supported human subject research. PHS no longer accepts assurances that are limited to individual research projects or limited to PHS supported research. More proposals are on the table, ranging from even more stringent training requirements, to extending compliance certification requirements to all research regardless of funding, to abolishing institutional self-regulation and monitoring in favor of a more centralized system of compliance/ethics control. Greater public scrutiny of the moral, ethical, and legal conundrums with which scientists and social scientists wrestle on a daily basis has generated new demands for increased regulation and control of research.

So what does this changing regulatory climate mean for us -- faculty and administrators at predominantly undergraduate institutions (PUIs)?

While major biomedical research institutions have been the subject of the controversies and regulatory scrutiny, the resulting regulatory changes and the prospect of even more regulation in the future impact all organizations that support research – including the smaller institutions represented by most of CUR's membership.

Large research institutions have a long history of addressing these issues and the costs of compliance efforts are among the costs funded by the facilities and administration (F&A, formerly "indirect") cost reimbursement collected from their grants. These institutions have research administration or sponsored programs offices that have the responsibility for ensuring that the institution is in compliance and often they coordinate and staff all the compliance processes.

But small institutions without these resources have the same responsibilities as their larger counterparts if they accept any federal funding. Every institution that receives federal funding must certify compliance with over 25 federal regulations and Congressionally imposed requirements. Some of these requirements are standard for all large employers (e.g., civil rights, employee protection) but others are unique to the research world (e.g., human subjects and animal protection) and mandate committees and processes even when an institution has only a few grants. As the regulatory

environment continues to tighten, compliance requirements will impose even greater burdens on PUIs. In effect, these have become "unfunded federal mandates" - in order to accept the federal funding, our institutions must expend the time and resources to establish and implement the necessary policies and processes.

While most PUIs, because they accept federal student financial aid and a variety of grant funds, probably already have systems in place to comply with the non-research mandates, a surprising number either lack or have incomplete systems for compliance with the regulations governing research. At least for the present, the research-related mandates apply only if the institution accepts federal research dollars for the type of research in question. If your campus has no current federal grants for human subjects research, for example, the compliance requirement is not triggered until and unless the institution accepts federal support for a human research study.

So why be concerned about compliance?

There are a variety of reasons why PUIs must begin now to build an administrative and faculty culture supportive of compliance with these mandates, and to commit the resources needed for full compliance.

1. Taking the “high road”: No research, no matter how noble the aim, is important enough to justify violations of basic humanitarian principles. Our current systems of peer evaluation and monitoring and institutional self-regulation exist to help researchers negotiate the gray area between risk and benefit. Ethical guidelines for professional organizations, American Psychological Association (APA) for example, often make reference to federal regulations and require researchers to apply practices “consistent” with such regulations. Using the criterion of who pays for the research to apply different standards to various research activities is an ethically untenable position. Individuals who agree to participate in a research project do not have fewer rights when the project is not federally funded. Likewise, the small size of an institution does not make a lesser ethical standard acceptable. In light of the current controversies and regulatory overhauls, it is easy to focus on the bureaucracy and lose sight of the positive reasons for adherence to the ethical principals behind human and animal research. Compliance becomes less onerous and easier to “sell” – to administrators, faculty and students – when seen from an ethical rather than a strictly legalistic perspective.

2. Institutional climate: To preserve a lively intellectual environment on the campus, PUIs need to send a clear message that faculty research is valued. This message ought not be selective – an institution cannot expect to sustain a vital faculty if it values some areas of research while negating others. Selectivity can also have significant curricular implications. The tenor of course offerings in biology or psychology, for example, will be different in an institution that supports animal research than in one that refuses to be “inconvenienced” by animal welfare laws and regulations. Because human subjects research involves data from or about living human beings, any discipline may involve human subject research. Sociological, anthropological, and psychological studies usually involve human subjects; biological and historical studies often involve human subjects. To attract and retain the faculty needed to support the curriculum in these disciplines, an institution must be willing to provide compliance support in order to allow all faculty members to remain professionally active.

3. Preparedness to accept grants: Institutions need to be prepared when grant funds are awarded for regulated research. With acceptance of such grants, institutions must submit an assurance of compliance with the regulations that govern the newly funded project. As noted above, the assurance will bring all regulated research under its umbrella. Consequently, a single grant for human subjects research requires that the review, approval and monitoring of all human subjects research supported by the institution be fully compliant. It is not unusual for a PUI to scramble at the last minute to create compliance committees and procedures so that a grant can be accepted. Rushed implementation can result in sloppy implementation, creating a weak system that causes as many problems as it solves. In particular, rushed implementation can generate resentment

against compliance, pitting seasoned investigators against administrators. While faculty discover that new bureaucratic burdens have been imposed on their research, administrators view the “new” compliance obligations as a government imposition resulting from the idiosyncrasies of the work of a single faculty member, rather than as a basic institutional responsibility.

4. Curriculum: Research regulations apply to all situations, "teaching" and "research". Failure to comply with animal welfare regulations, for example, will impact the curriculum as well as the ability to seeking external funding. Furthermore, all disciplines in regulated fields have an obligation to train their students in both the ethics and the mechanics of the discipline’s research. Students who are graduate-school bound benefit from early, practical training and experience in negotiating with compliance committees. Colleges and universities benefit from articulate alumni who are well trained in ethics and compliance; they are the research community’s first line of defense in a climate of increasing scrutiny and criticism of regulated research.

5. The regulatory climate will become even more restrictive: Change in the direction of greater regulation is inevitable. Congress has already entertained proposals for regulation of all human research regardless of how it is funded. Animal rights organizations continue to push for greater regulation of animal research. Unless an institution is willing to shut down all human research, and all use of animals in research and teaching, compliance will not remain an option indefinitely. Institutions that have not yet done so probably need to start now to bring their compliance systems in line with current federal regulations and to prepare for additional change to come.

Questions to think about

Because dealing with federal compliance at PUIs presents many challenges, CUR will devote a number of workshops at the 2002 Conference on Undergraduate Research to compliance issues. Conference participants might consider the following questions and come prepared to grapple with the challenge of building campus cultures supportive of compliance in the PUI environment. The list of questions that follows, while not exhaustive, is a starting point for these conversations:

* How do we convince administrators that supporting appropriate compliance systems is both necessary and desirable? How do we win the necessary resources and support to sustain effective and efficient compliance systems?

* How can we gain faculty support for compliance? Given that all faculty are more focused on getting research done than dealing with bureaucracy, and PUI faculty have less time and fewer resources than colleagues at research institutions, are there ways to limit the bureaucracy while still meeting the federal requirements? Can we build user-friendly systems that support rather than impede research, that assist faculty to achieve compliance without fretting over it? How can our systems help faculty train students in the mechanics of compliance?

* How can institutions monitor the myriad requirements and ensure themselves (as well as sponsors) that they are in compliance? How do we engage senior officials in ways that assure the desired levels of administrative participation, cooperation and support?

* What resources are available to help administrators and faculty establish effective and appropriate human subjects and/or animal care review processes? Which of these resources speak specifically to issues of concern to PUIs? Can resources targeted primarily at biomedical research institutions be adapted to meet the needs of PUIs?

* What is the proper role for CUR in providing training or other support to help our members and member institutions deal with compliance issues?

Issues in Teaching Ethics to Undergraduates

*(Reprinted from the CUR Quarterly **22:** 55-56)*

Gregory J. Cooper
Associate Professor and
Director of the Program in Society and the Professions

David G. Elmes
Professor of Biology

Jeanine S. Stewart
Associate Professor of Psychology and Associate Dean of the College

Washington and Lee University

For those of us trained to think and work as scientists, our comfort in handling objective, quantitative data makes it especially difficult to imagine ourselves willingly and competently entering into debate about matters of moral reasoning. The task of educating young scientists about research ethics may seem daunting, but consider the disservice done to them by tacitly fostering the belief that scientific research really is managed and executed as cleanly as we would like it to be.

Ethical concerns impinge on the practice of science in a number of different ways. Attempts to incorporate ethics into an undergraduate science curriculum should be clear on the differences. In part this is because the distinctions are important to grasp in themselves. In part it is because these different dimensions of ethical influence pose distinct challenges for curricular design and pedagogical strategy.

How can various ethical concerns be best tackled in the undergraduate curriculum? At Washington and Lee University, some science courses include basic coverage of ethical practice, many mentors consider ethical research principles an integral part of training, and an interdepartmental course focuses on bio-medical ethics. Each approach has strengths and weaknesses.

Some ethical norms are associated with the practice of science in a very generic sense. These include: ownership of intellectual property, fraudulent data manipulation, plagiarism, exploitation of assistants, and so on. Because these issues concern all scientific disciplines, they can, and probably should, be incorporated into science classes involving the practice of the discipline. Furthermore, mentors should consider modeling and discussing ethical practice in the same ways that they model and discuss scientific practice. In psychological science, most textbooks on methodology include material on ethical norms. At Washington and Lee such material is included in laboratory sections and evaluated on tests. Students read the web site of the major arbiter of ethics in psychology, the American Psychological Association. If a group project requires institutional approval for its conduct, the students as a group prepare a protocol for the University's *Institutional Human Subjects Research Committee.* Mentors and professors also have available web-based information on the teaching of ethics in other sciences.

Some ethical concerns arise as a consequence of the entities involved in scientific research. We recoil at the inhumanity of the Tuskegee syphilis studies, but not at the mutilation of some sub-atomic particles. Many objects of scientific research have a kind of normative standing that has implications for the ways in which they may be treated in the course of that research.

The curricular implications are (at least) two-fold. First, these kinds of concerns impact the various scientific disciplines differentially. Psychology is more deeply involved with issues of human and animal welfare than, say, physiology, physiology more so than biochemistry, and so forth. Second, the line

drawing between ethical and unethical behavior is more difficult in this domain. In part this traces back to controversies regarding the moral standing of non-human animals - can they be treated in ways that humans cannot? Does status on the phylogenetic tree make a difference? In part the difficulty revolves around issues of informed consent in human research. Think of the desperate AIDS patients willing to try an experimental drug before the test protocol has been completed.

Such complex issues produce conflicting opinions and have lead to conflicting moral intuitions. The consequence, for curricular design, is that these issues are much more likely to lead in the direction of open-ended and unresolved ethical discussions than the examination of the internal constraints on general scientific practice. Of course the discussion can be brought back down to earth by invoking the explicit standards that have been developed for research subjects. Students take lab courses and join faculty mentors in the conduct of real research, not only to gain expertise in data collection and analysis, but also to learn about the scientific enterprise. Certainly it is worthwhile to help students understand that the design of any study employing, say, human subjects must take certain standard ethical principles into account. Nevertheless, there is no avoiding the fact that these standards embody particular stances with regard to the controversies just mentioned and likely will not satisfy everyone.

The weaknesses of approaching ethics via scientific practice and mentoring alone may best be seen in the final set of ethical controversies. The issues discussed so far involve the ethics of doing science, but some of the ethical concerns relate to the nature of scientific knowledge itself. These problems arise in at least two ways. One is the obligation to put one's knowledge to work to do good when one is (relatively) uniquely positioned to do so. The global warming debate, for example, is fraught with political controversy, charged emotions, impassioned rhetoric, deep misunderstandings of science as a process, irrationality, and so forth. Whether we overestimate or underestimate global warning, there are significant well-being and economic consequences. A person working in this area might be tempted to steer clear of public debate. Would it be irresponsible, under these circumstances, to simply disengage and make no effort to get the truth out with regard to the global warming threat?

A second question of social responsibility concerns the very generation of certain kinds of scientific knowledge. Many scientists who worked on the Manhattan Project had serious crises of conscience upon witnessing the detonation of the first atomic bomb. Clearly, there is the argument on the other side – if we don't develop it, Hitler will. Would the situation have been different with no Hitler in the equation? Are there things we are better off not knowing? Are there areas of scientific understanding that it is simply unethical to pursue?

Incorporating social responsibility questions into a standard science course might be difficult. Exploring these broader normative concerns typically takes a special curricular vehicle - a special topics course, perhaps best team taught by scientists and others with a background suitable for reflecting on these larger questions of value.

Note. Order of authorship was determined alphabetically.

Data Manipulation by Undergraduates and the Risk of Future Academic Misconduct

*(Reprinted from the CUR Quarterly **22:** 64-65)*

Julio F. Turrens
University of South Alabama

Elizabeth Davidson
Arizona State University

Academic misconduct among undergraduates takes many forms, and sometimes may not even be intentional. For example, it is not uncommon for undergraduates to manipulate data obtained in the laboratory so that the final graphs look as students **perceive** they ought to look. This is in part because students are aware of the expected outcome of the experiment, may suspect that they have done something wrong if their results differ from what was expected and think that they will receive a lower grade if they show their real results.

It is the responsibility of the instructors to make students understand that, due to a variety of experimental errors, outliers are expected as part of the data. Furthermore, students need to learn that data manipulation constitutes a form of misconduct. Complacency towards data manipulation sends the wrong message: students do not realize that altering data is ethically wrong and as a result they move down the slippery slope, adopting unacceptable new standards.

Recent studies have shown that the proportion of students involved in academic misconduct (knowingly or not) has increased over the past 20 years to alarming values (between 75 and 98%, depending on the articles). [1,2] Intentional cheating has also increased in recent years. For example, the internet has provided a fantastic tool for students to become involved in plagiarism. Cutting and pasting paragraphs from Internet articles on a term paper is a problem that, unfortunately, many of us have become familiar with. Moreover, Internet companies have flourished both instigating cheating (www.schoolsucks.com, www.academictermpapers.com, etc.) as well as preventing Internet-related plagiarism (www.plagiarism.org). Once again, we as faculty can do a lot to prevent plagiarism by setting clear rules (for example, requesting copies of the literature used in the study) and taking a little time to investigate those reports that look suspicious. In many cases plagiarism may be detected by simply searching in the internet for a string of words from the suspected paragraph in quotation marks. The result of these searches usually produces the document from which the text was originally taken.

The incidence of misconduct appears to decrease substantially in graduate school. Yet, a study carried out in several medical schools[3] showed that, although relatively few students were involved in misconduct, a majority of those students who acknowledged having participated in misconduct had also cheated as undergraduates. Therefore, one should expect that an increase in the proportion of undergraduates involved in academic misconduct should result in an increased incidence of misconduct during post-graduate training.

More studies are needed to determine whether the extent of academic misconduct among graduate students is the same in all disciplines. For example, although this is a broad generalization, one can say that most pre-medical students tend to be more competitive than pre-scientist students. Could this determine that the proportion (small as it may be) of medical students involved in misconduct is larger than the proportion among graduate students in the sciences? Or could it be, perhaps, that the need for success (for example, post-doctoral opportunities in cutting edge laboratories, appointments at prestigious institutions, etc) makes a small proportion of **all** pre-professionals participate in misconduct?

In any case, faculty should actively work towards reversing this trend by clearly communicating their expectations to undergraduates. Instructors must provide students with the foundation for ethical conduct in the laboratories, lecture courses, and in research in general, openly explaining and

discussing what constitutes plagiarism, data fabrication and manipulation. Otherwise, the lack of communication between faculty and students concerning academic standards leads to a difference in perception of what constitutes misconduct.

References:

[1] Graham, M. A., Monday, J., O'Brien, K. and Steffen, S. (1994) Cheating at small colleges: An examination of student and faculty attitudes and behaviors. *Journal of College Student Development*. **35:** 255-260.

[2] Genereux, R. L. and McLeod, B. A. (1995) Circumstances surrounding cheating: A questionnaire study of college students. *Research in Higher Education*. **36:** 687-704.

[3] Baldwin, D.C. Jr.; Daugherty, S.R.; Rowley, B.D. and Schwarz, M.R. (1996) Cheating in medical school: a survey of second-year students at 31 schools. *Acad. Med*. **71:** 267-273.

Julio F. Turrens is Professor in the department of Biomedical Sciences and Director of the Undergraduate Research Program at the University of South Alabama. In addition to several courses in biochemistry, he teaches a course entitled "Issues in Biomedical Sciences" in which students discuss a variety of bioethical problems and issues concerning research integrity.

Elizabeth W. Davidson is Research Professor in the Department of Biology at Arizona State University, Tempe, where she teaches a course entitled "Professional Values in Science."

Starting an Institutional Review Board at a Primarily Undergraduate Institution

*(Reprinted from the CUR Quarterly **22:** 57-60)*

Beth Cunningham
Associate Dean of Faculty College of Arts and Sciences
Bucknell University

Gary Gaffield
Assistant Provost for Academic Programs
Wittenberg University

Andrea Halpern
Professor of Psychology
Bucknell University

Jerome Rackoff
Director of Institutional Research and Assessment
Bucknell University

In recent years, federal oversight of research involving human subjects has become more extensive and more public than ever. While most Psychology Departments at PUIs have probably had an approval process for human subjects for some time, recent federal regulations are much more stringent about the composition, process, and purview of Institutional Review Boards (IRBs). This new emphasis has the practical effect of formalizing what may have been an informal process at PUIs, and most likely extending involvement of IRBs to research in departments other than Psychology. The first three authors have all been involved recently in the creation of a formal IRB process at Bucknell University: Halpern as a member of the Psychology Department, Rackoff as an administrator and the first Chair of its IRB, and Cunningham as member of the Physics Department and currently an Associate Dean of Faculty serving on the IRB. Gaffield is an administrator at Wittenberg University and has served on its IRB since its creation in 1992. He has chaired it since 1995 and offers a perspective on the long-term operation of an IRB at Wittenberg. In this article, we offer some observations about the context in which we, and presumably other PUIs, have set up IRBs, and identify some specific issues that IRBs typically encounter during that process.

One important context is the set of federal rules governing IRBs, contained in the Code of Federal Regulations, Title 45, Part 46 (45CFR46 for short, found on the web at: http://ohrp.osophs.dhhs.gov/humansubjects/guidance/45cfr46.htm), which are written to apply only to federally funded research. It is very likely that many PUIs will want to broaden that purview. On Bucknell's campus, we discussed early in the process the ethical dilemma of extending different levels of human subjects protection depending on funding sources of the research. Equally troubling from the point of view of university liability was the potential of requiring less (or no) oversight for some research compared to other research. Bucknell decided that all human subject research would come under the jurisdiction of the IRB. It also recognized that because the definition of "research" in 45CFR46 requires the intent to contribute new knowledge, classroom exercises or lab projects designed primarily to learn lab skills might merit a lower level of attention from the IRB.

Wittenberg also did not consider limiting the authority of its IRB to only federally funded research. A Wittenberg faculty member was awarded a research grant by NIH that was contingent upon the college's establishing an IRB and filing an "Assurance of Compliance with HHS Regulations for the Protection of Human Research Subjects." Wittenberg chose simply to adopt a model assurance

agreement provided by NIH, which obligated the college to apply 45CFR46 to all human subject research, regardless of its funding source.

Another relevant context is that 45CFR46 was originally intended to apply to biomedical research in large universities. However, most of us reading this article are in small or primarily undergraduate universities, and our institutions' human subject research will more likely occur in social science disciplines than in invasive medical research. Thus, 45CFR46 is not a perfect match for our needs, and requires some interpretation to fit PUIs better. For instance, because of the nature of some social science research, participants cannot always be fully informed about all the manipulations and hypotheses in the study.

A third important consideration in creating and operating our IRBs was to keep our educational mission in mind at all times. Thus, we viewed our mandate as not only the application of regulations, but to engage in dialogue with faculty and student researchers about the purpose of the system, and how to conduct research that is both ethical and scientifically valid. A further consideration in some of the research we review is that participating in research is considered educationally valuable. Like many Psychology Departments, both Bucknell's and Wittenberg's Introductory Psychology courses have a research participation option as one means of fulfilling some course credit (a "subject pool"). It is important that students neither be required to serve as research participants nor be placed in a position in which they are not completely free to withdraw from participating without penalty or loss of benefits. Secondly, as a practical matter, despite the educational value of participating, schools might consider adopting Bucknell's policy prohibiting students younger than 18 from serving as research subjects, avoiding the need for parental consent.

Finally, we need to recognize the challenges that PUIs face in the practicalities of running an IRB in a small research community. Faculty members in many disciplines may not be familiar with IRBs, and will be hesitant to serve or even submit their research for review. Smaller institutions have a smaller pool to draw on for interested and competent IRB members. PUIs in small communities have a challenge in finding qualified members outside the university (a requirement as stated in 45CFR46) who are not related to university employees!

Composition of the IRB

Federal regulations specify only three of the member categories of an IRB: (1) a member from the community (typically a member of the clergy or a physician); (2) a non-scientist; and (3) members qualified to discuss the research under consideration. Who else should serve on an IRB, especially at a PUI? At both schools, the IRB includes a representative from psychology, representatives from other division "clusters," and the administrator who acts as the college contact person for faculty who submit federal grant proposals (the Associate Dean of Faculty at Bucknell; the Assistant Provost at Wittenberg, who also chairs). Divisional representation satisfactorily assures research expertise among the IRB members without requiring a faculty member from every interested discipline, which would enlarge the IRB to an unmanageable size.

Recruitment of IRB Members

Recruitment of IRB members both willing and able to serve can potentially be difficult. At most small institutions, faculty members are already burdened with administrative work, so faculty may have to be enticed to become an IRB member. On the other hand, many faculty members find ethical issues interesting, and IRB members will often have a vested interest in making the process work smoothly.

In fact, the workload on a typical IRB need not be burdensome at all. Most cases considered by our colleges' IRBs are managed through "expedited review," in which the chair or a designee alone can approve a proposed research project (45CFR46.110). The Department of Health and Human Services periodically produces a list of minimal risk research activities that are eligible for expedited review, which is available at the website of the Office for Human Research Protection http://ohrp.osophs.dhhs.gov/humansubjects/guidance/hsdc99-01.htm. In addition, much of the

research conducted at a PUI is exempt from extensive IRB review. The only caveat to bear in mind is that someone other than the researcher must decide whether a project is exempt. At Wittenberg, the IRB chair decides on exemptions. At Bucknell, each cluster has a faculty member who is not on the IRB serve as the initial reviewer. This reviewer and the IRB chair need to agree on the classification of each project. A list of exempted activities is found at 45CFR46.101(b)(1)-(6). Consequently, our PUIs have had few cases that have required full committee review.

The charter members of an IRB will have more demands on their time than subsequent members. The burden of developing a policies and procedures manual, for example, falls to the first members of a new IRB. Also, since all cases are new ground, there is no "case law" collective experience available to a new IRB to facilitate its discussions. However, in Wittenberg's experience, IRB decisions become fairly routine within a year or two.

A special burden falls on a Chair of a new IRB. In Bucknell's case, the first chair is an administrator conducting institutional research who also has faculty experience. This has worked out well to ensure some continuity for the first few years, and to tap the expertise of someone experienced in interacting with government agencies and many campus constituencies. Wittenberg's first IRB chair was a member of the chemistry department who had never been involved in human subject research. The objective was to assure faculty ownership of the IRB at its founding. For the last half dozen years, the Assistant Provost has chaired. Management of the paper flow, the high volume of rulings on exemptions, the large number of expedited reviews, and the maintenance of IRB records may lead PUIs to choose an administrator as a chair, especially once the legitimacy of the IRB has been established.

Classroom Exercises and Lab Projects

One issue that Bucknell's IRB spent many hours discussing involved handling classroom exercises and lab projects involving human subjects. This IRB concluded that classroom exercises in which students use each other as subjects do not constitute research as defined in the CFR and, consequently, the IRB has no jurisdiction over them.

However, some laboratories, although designed primarily to teach lab skills, do in fact deputize the students into being experimenters for other, naïve students. Thus at Bucknell it was thought some level of IRB oversight is desirable. In order to limit the amount of time members of the IRB would spend on reviews, Bucknell decided that it would permit instructors to submit a general lab protocol that established boundary conditions for student projects (e.g., no use of students under 18). Lab instructors have the responsibility to make sure specific projects meet the general protocol guidelines. Instructors discuss the protocol with their classes, and student researchers fill out a form discussing their procedures, which is signed and kept by the instructor.

Wittenberg's IRB conducts individual reviews of every student research project (but, like Bucknell's IRB, not classroom exercises). It adopted this approach for two reasons: (1) It assures an independent review of all human subject research; and (2) by requiring students to petition the IRB, underscores for them the importance of ethics, the protection of human subjects, and the value of risk reduction.

Interfacing with the Campus

One of the major goals of the IRB is to provide communication to the campus community and individuals concerning policy issues on human subject research. This is particularly important with departments and individuals that only infrequently conduct research involving human subjects. Two of the main methods that Bucknell uses to communicate information about human subjects policy are via campus e-mail and via a thrice-weekly general campus publication that goes to all faculty and staff. So far these methods have been sufficient to spread the word about the IRB and the university's new human subjects policy, even from departments and individuals new to the review process. Bucknell has also begun to include IRB information as part of the new faculty orientation process.

Wittenberg's IRB is now well known to the faculty and a substantial number of those who conduct human subject research have served on the IRB during its ten-year history. Each fall, a reminder is sent to all faculty members, informing them of the IRB and its responsibilities and their obligation to submit human subject research to the IRB for its review.

Accessibility of Documents

Public access of forms makes the review process less tedious for faculty as well as students. At Bucknell, all of the review forms are available on our file server as word-processed documents and the policy document and paperwork will be translated into a web-friendly form once the policy is finalized. At Wittenberg, IRB documents are printed and distributed to all faculty members as part of the Faculty Manual.

Spirit of the IRB and Campus Politics

The IRBs at PUIs cannot see themselves as faceless committees that say "no" to proposals. Instead they need to be as helpful as possible to researchers using human subjects in order to make their projects both scientifically as well as ethically sound. A consequence of giving positive feedback has been that most researchers agree that the review process is a positive experience and that their research project is better as a result. So far all projects that have been reviewed by our IRBs have eventually been approved, although several times they have insisted that procedures be modified as a condition of gaining approval.

Three other points should be kept in mind to make an IRB as user friendly as possible. Writing documents to facilitate the procedure is important. Students as well as faculty will get frustrated if they have to spend much time completing complicated forms or asking questions to clarify the review procedures. Quick turnaround time for the review process is essential especially if the researcher's procedures must be modified. Finally, faculty and students will undoubtedly have questions about the review process and the human subjects policy. We have found that providing researchers samples of informed consent forms, for example, both helps them understand the components of informed consent and saves the time and trouble of creating new ones from scratch.

Other Issues

Several other considerations will be mentioned here only briefly. First, careful documentation of all IRB actions is essential if the institution is to be in compliance with federal guidelines. This includes detailed minutes of full-IRB reviews, a database to monitor the status of each active research project, and records of communications with the researcher when the IRB requires modifications of the research protocol. Both Bucknell and Wittenberg have found e-mail to be an effective way to facilitate such communications. To provide a suitable audit trail for any DHHS site visit, e-mail communication should be printed, dated and signed by the Chair so that there is a complete paper file of each project.

Finally, one cannot discuss IRB issues without noting the significant challenges associated with the explosion of Internet and e-mail-based research. Thorny ethical issues can arise in this arena, and there is often little in the way of precedent to assist the IRBs in arriving at a reasoned judgment. Some research universities have written policies on their Web sites that can be consulted for guidance. Class projects – which some colleges may decide is technically not research and thus not the province of the IRB -- can nonetheless place subjects at significant risk when they employ e-mail or the Internet. Bucknell's IRB was forced to intervene when one class sent an e-mail survey to the whole campus community asking sensitive questions regarding medical conditions and family health history. Such data are transmitted via an insecure medium, and could be made public in the future, with negative consequences. The IRB permitted the students to use their e-mail message to recruit subjects, but required that the actual survey be administered and returned anonymously via campus mail. (At Wittenberg, the survey likely would have been considered research and subject to IRB review.)

In the end, the IRB must thus be prepared to be flexible in its interpretation and implementation of the federal regulations and its own policies so that the research and educational mission of the institution is supported without compromising the safety and autonomy of the human subject of research.

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Gary Gaffield is Assistant Provost for Academic Programs at Wittenberg University. He taught American history at Manhattanville College before becoming Assistant Provost at Wittenberg in 1984.

Andrea Halpern is Professor of Psychology at Bucknell University, where she teaches and conducts research in the area of human cognition. She makes extensive use of human subjects in her research and for many years oversaw the subject pool in Bucknell's Introductory Psychology course.

Jerome Rackoff is Director of Institutional Research and Assessment at Bucknell University. He has been at Bucknell for twenty-five years, first as a member of the biology faculty, then in various administrative capacities in University Relations and Academic Affairs.

Resources
The following resources can help new and continuing IRBs in their work.

A. Print sources

Chastain, Garvin and R. Eric Landrum (1999) *Protecting Human Subjects: Department Subject Pools and Institutional Review Boards.* American Psychological Association, Washington, D.C.

Protecting Human Research Subjects: *Institutional Review Board Guidebook*. (1993) Office for the Protection of Human Subjects of Research Risks, NIH. Available from Superintendent of Documents (017-040-00525-3).

Sales, Bruce D., and Susan Folkman (2000) *Ethics in Research with Human Participants*. American Psychology Association, Washington, D.C.

Shea, Christopher (2000) Don't Talk to Humans: The Crackdown on Social Science Research. *Lingua Franca* 10(6).

B. Videotapes from NIH

Ordering video tapes: http://ohrp.osophs.dhhs.gov/references/resource.htm

Evolving Concern: Protection for Human Subjects

Balancing Society's Mandates: Criteria for Protocol Review

The Belmont Report: Basic Ethical Principles and Their Application

C. Information on the web

Regulations in plain English: http://obssr.od.nih.gov/IRB/protect.htm

IRB news tracked by the American Psychological Society:
www.psychologicalscience.org/newsresearch/irb/

For research involving children: Society for Research in Child Development:
http://www.srcd.org/about.html#standards

The Online Ethics Center for Engineering and Science: http://onlineethics.org
Codes of Ethics of Professional Societies in the Social Sciences

- American Psychological Association: www.apa.org/ethics/code.html
- American Anthropological Association: www.aaanet.org/committees/ethics/ethcode.htm
- American Sociological Association: www.asanet.org/members/ecointro.html

For web-based IRB training: National Association of IRB Managers: www.naim.org

The Transformational Process of Mentoring

*(Reprinted from the CUR Quarterly **22:** 72-73)*

Jeffery R. Schultz
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Rollins College

Multifaceted mentoring activities are integral components in student development. What does it mean to be a good mentor? What does mentoring involve? How effective are you as a mentor? Do research-active faculty have an added responsibility when mentoring research students? How can the mentoring process be enhanced to provide for better student-faculty interactions and make the student research experience more learning-centered? What type of mentoring style do you use and are your students learning as much as they can with this style? These issues will be addressed in a mentoring workshop that is part of the Research Responsibility Symposium planned for the 2002 CUR National Conference at Connecticut College. The process of mentoring can be described and defined in a variety of ways, however good and effective mentoring can be distilled to a transformational process that is personalized, intentional, organized, and assessable.

Mentoring activities should work from the premise that all students are individuals and, as such, the mentoring process needs to be personalized for each student. Some students are very capable in their research abilities and can take a project and go with it, meet every deadline, provide a written summary weekly activities, and make significant progress on the project. Other students need to have more intentional guidance with their projects, clearer and demonstrated methods of how to do the experiments or problem-solve, and these students may not make much progress on the project. As faculty members at primarily undergraduate institutions (PUI), we have just as much responsibility to focus on the teaching-learning process as we do with the process of research and scholarship.

Taking a personalized approach involves being intentional in how mentoring is approached. Not every good teacher or researcher is a good mentor. Being intentional means taking time to work with each student, meet regularly one-on-one to assess progress, be available to demonstrate laboratory techniques and do the experiment, help analyze and interpret data and make reasonable conclusions based on stated results, share and encourage the students with their discoveries, and offer support when the experiments do not go quite as planned. Being a good sounding board, showing genuine interest in each project and in the students as individual people, helping keep the students focused, and if necessary redirecting them back on course will help build mutual respect that is keystone for any effective collaboration. The process of mentoring is also multifunctional and promotes overall development. Multifunctional objectives and activities lead to functional diversity and adaptation. Good mentors help students with experiments as well as offer career and personal guidance when needed, and are good role models. By being faculty members we are role models whether we want to admit it or not, so we have an innate responsibility to be as effective mentors as possible.

Approaching mentoring as a process of student development that is personalized and intentional requires organization. Just as every good experiment or project involves careful planning, inclusion of controls and variables, timely experimental implementation and assessment, so does the process of mentoring. Taking time to accurately define the problem, and working with the students to ensure that they know what question they are asking helps create that type of positive, interactive, and progressing learning environment that we as teachers and facilitators hope to achieve in the classroom. As the saying goes, prior planning prevents poor performance. Lack of an organized plan for what the students will be doing and how the faculty will guide this project leads to frustration for both students and the faculty mentors. Some planned chaos is good to challenge traditional thinking, but too much chaos leads to ineffective, energy-draining, and non-productive cycling.

Assessment

Every experiment and study generates results that require analysis and interpretation, in essence assessment. The same type of questions that we ask students as they assess our classes, we can also ask our students about their research experiences and the mentoring process. How well did the mentoring process work? What worked well? What are areas that could be improved? Did the student, and did we as mentors, learn something from this experience? Every experience has a take-home message, and as mentors we need to keep an open mind and be flexible enough that we can listen to what the students say, assess the validity of their comments, and be willing to address their concerns and make changes to enhance this experience. After all, engaging in research activities involves as much teaching as do our classroom activities. Just as we need to share findings and results from scholarly work and research activities, we also need to share and assess the experiences of mentoring. For example, consider having monthly mentoring round table discussions with faculty in individual departments, divisions, or even college-wide to discuss what works, problems encountered, and trouble shooting strategies. You may even consider performing a more formal assessment of your effectiveness as a mentor; that is, study mentoring activities that take place during a summer research program, evaluate findings and share results with greater community through an article.

Mentoring is a transformational process for both the student and faculty involved. Effective mentoring is a necessary core to faculty-directed student research collaborative projects. Mentoring activities can also help faculty become better teachers, lead to more productive group meetings with student collaborators, and result in a positive, challenging environment that invites student involvement. Ineffective mentoring can also result in the production of a negative, non-student friendly environment that focuses only on the research project and ignores the student development part of the project.

So what type of mentor are you and will you be? How can you improve your current approach to enhance developmental activities that lead to a positive environment? As you consider these thoughts and travel down the mentoring pathway, remember that the research process and student-faculty collaborations for PUI faculty in teaching-focused institutions is not about the end product, whether that be the student capstone, the publication, or grant; but rather the objective in mentoring is about the journey from start to finish. This journey encourages student growth, faculty development, and challenges to current beliefs that lead to a positive experience for all involved. As a car commercial says, “Enjoy the ride.” Keep growing and developing as a mentor – you may be surprised that you learn as much as the students you mentor.

Reading List

Halaby, R. (2001) Promoting undergraduate research in science. *The Scientist* **15:** 35.

Hansen, D.E. (2001) Fostering research for undergraduates. *Chemical and Engineering News* **79:** 59-60.

Malachowski, M. (1996) The mentoring role in undergraduate research projects. *Council on Undergraduate Research Quarterly,* **17:** 91-93; 105-106.

Phillips-Jones (1998) *The Mentee’s guide: how to have a successful relationship with a mentor*. Coalition of Counseling Centers.

Phillips-Jones (1998) *The Mentor’s guide: how to be the kind of mentor you once had-or wish you had*. Coalition of Counseling Centers.

Shellito, C., Shea, K., Weissmann, G., Mueller-Solger, A., and Davis, W. (2001) Successful for creating positive student research experiences. *Journal of College Science Teaching* **30:** 463-464.

Zachary (2000) *The Mentor’s guide: facilitating effective learning relationships*. Jossey-Bass.

Research Responsibility Resources

A. MAJOR NATIONAL ORGANIZATIONS & FEDERAL RESOURCES

American Association for the Advancement of Science (AAAS)

Integrity in Scientific Research Resource Guide. Contains listings of books, periodicals, videos, journal articles, reports, and society and U.S. federal agency policy statements.
http://www.aaas.org/spp/video/resource.htm

Integrity in Scientific Research Videos. http://www.aaas.org/spp/video/
Five videos available from AAAS on these topics:

- Video 1: This video highlights issues related to intellectual property, the disclosure of privileged information, sharing information among scientists, crediting the work of others, and the responsibilities of collaborators who encounter questionable conduct by a colleague.

- Video 2: This video explores the competitive pressures scientists experience to get the data "right" and to publish their findings, mentoring responsibilities, loyalty to and honesty with one's collaborators, and the selection and reporting of data and record keeping.

- Video 3: This case focuses on issues related to the consequences of industrial support for the sharing of data and resources, the role of technology transfer, the effects of commingling public and private funds, and the stresses that scientists encounter in the face of conflicting professional values, legal obligations, and loyalty to colleagues.

- Video 4: This video touches on issues related to authorship practices, the allocation of credit, and the importance of maintaining laboratory notebooks.

- Video 5: Several issues are raised regarding the responsibilities and consequences of reporting suspected research misconduct, institutional responses to misconduct allegations, reporting deviations from research protocol, and the use of animals in research.

Professional Ethics Report. A quarterly newsletter that includes news items and essays on scientific misconduct and research integrity. Available from AAAS, Scientific Freedom, Responsibility, and Law Program, 1200 New York Ave, NW, Washington, DC 20005.

Sigma Xi
www.sigmaxi.org/publications/publications.htm

1993 Sigma Xi Forum Proceedings: Ethics, Values, and the Promise of Science. Together, over 450 participants in this forum developed more than 20 conclusions and recommendations for the scientific community on ethical issues, many of which placed the responsibility for improving the public image of science on scientists themselves. The proceedings volume includes papers by: George Bugliarello, Polytechnic University; Rita R. Colwell, Maryland Biotechnology Institute; J. Michael Bishop, Nobel Laureate; David Goodstein, Caltech; Carl Djerassi, Stanford University; Rosalyn S. Yalow, Bronx Veterans Administration Medical Center, and many others. 255 pages.

Honor in Science. First published in 1984, and now in its sixth printing with more than 50,000 copies in circulation, *Honor in Science* is required reading in many graduate programs as a guide to ethics and values in research. 41 pages. Emphasis is on graduate students and professors but much information may be applied to undergraduates.

Office of Research Integrity, US Department of Health and Human Services
www.ori.hhs.gov/

ORI Newsletter. Published quarterly by the Offi[illegible]esearch Integrity to reinforce and promote a common interest in handling allegations of scient[illegible]onduct and to promote integrity in research. Available from the Office of Research Integrity, 55[illegible]urity Lane, Suite 700, Rockville, MD 20852.

National Science Foundation Office of the Inspector General. Publications concerning ethics issues important to NSF, including briefings, brochures, case studies, and reports of meetings. http://www.oig.nsf.gov/pubs.htm

Dear Colleague Letter on Misconduct in Science
http://www.oig.nsf.gov/dearcolleagueletter.pdf

NSF Misconduct in Science and Engineering Regulation
http://www.access.gpo.gov/nara/cfr/waisidx_99/45cfr689_99.html

The Online Ethics Center for Engineering and Science. The mission of the Online Ethics Center is to provide engineers, scientists, and science and engineering students with resources for understanding and addressing ethically significant problems that arise in their work, and to serve those who are promoting learning and advancing the understanding of responsible research and practice in science and engineering. www.onlineethics.org

Public Responsibility in Medicine and Research. An organization that promotes responsible conduct of research and provides information on policies, challenges, and opportunities. Runs workshops and meetings. www.primr.org

B. ETHICS POLICY STATEMENTS

Poynter Center for the Study of Ethics and American Institutions, Indiana University, links.
http://poynter.indiana.edu/links.html. This list of sources on research ethics includes professional society ethics statements and university office of research policy statements. It was updated regularly, as of April 2002.

C. PUBLICATIONS

Several authors. (1998).Ethical Issues in Undergraduate Research. *CUR Quarterly*, March (1998), **18**:3.

Bebeau, M.J., 1995. *Moral Reasoning in Scientific Research: Cases for Teaching and Assessment.* Bloomington, Ind.: Poynter Center for the Study of Ethics and American Institutions. 618 E. Third St, Bloomington, IN 47405-3602. www.indiana.edu/~poynter/index.html

Davidson, E.W., Cate, H.E., Lewis, C.M. Jr. and Hunter, M. 2001. *Data Manipulation in the Undergraduate Laboratory; What are we teaching?* Proceed Conference, Research on Research Integrity, Office of Research Integrity. http://ori.hhs.gov/html/publications/rcri.html.

Elliott, D. and J. E. Stern, eds. 1997. *Research Ethics: A Reader*. Hanover, NH: University Press of New England. ISBN 0-87451-797-4. Developed in conjunction with a model course on the responsible conduct of research. Includes relationships with colleagues, institutional responsibility, conflict of interest, experimentation with animals and humans, funding of research.
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Erwin, E., S. Gendin, and L. Kleiman, eds. 1994. *Ethical Issues in Scientific Research: An Anthology.* NY: Garland Publishing, Inc. ISBN 0-81530-641-5. Essays on subjects including fraud and deception, research on humans and animals, genetic research, and military research.

Macrina, F. L. 1995. *Scientific Integrity: an Introductory Text with Cases*. Washington, D.C., ASM Press. ISBN: 1-55581-069-1. Orientation to basic issues including mentoring, conflict of interest, record keeping, and authorship. Teachers' supplementary material including writing assignments.

National Academy of Sciences, 1992. *Responsi* -23- *ence: Ensuring the Integrity of the Research Process.* Vol. 1. Washington, D.C., National Ac Press. ISBN: 0-309-04731-5. Report of an NAS panel, with findings and recommendations.

National Academy of Sciences, 1995. *On Being a Scientist: Responsible Conduct in Research*. Washington, D.C., National Academy Press. ISBN: 0-309-05196-7. Primer for beginning scientists. Includes treatment of data, self-deception, peer review, fraud, allocation of credit, responsibility in collaborative research, plagiarism, and upholding the integrity of science.

National Research Council, 1996. *Guide for the Care and Use of Laboratory Animals*. Rev. ed. Washington, D.C., National Academy Press. ISBN: 0-309-05377-3. Includes institutional policy, animal husbandry, veterinary care, physical plant maintenance, hazardous substances, and federal laws relevant to animal use.

Office of Protection from Research Risks, 1993. *Protecting Human Research Subjects: Institutional Review Board Guidebook*. Washington, D.C., U.S. Government Printing Office. ISBN: 0-16-041834-8. Includes information on government regulations.

Public Health Service, 1995. *Integrity and Misconduct in Research: Report of the Commission on Research Integrity.* Washington, D.C., U.S. Government Printing Office. Report of the Commission on Research Integrity (the Ryan Commission).

Stern, J. E. and D. Elliott, 1997. *The Ethics of Scientific Research: A Guidebook for Course Development.* Hanover, N.H., University Press of New England. ISBN: 0-87451-798-2. A guide for instructors by two faculty members at Dartmouth College.

Keith-Spiegel, P., K. Aronson, and M. Bowman, 1994. *Scientific Misconduct: An Annotated Bibliography*. Ball State University. www.lemoyne.edu/OTRP/otrpresources/otrp_sci-misc.html

D. DISCIPLINARY ETHICS ISSUES & TRAINING

Chemistry and Physical Science

Teaching Chemical Ethics: Resources for University Educators. Developed by K. T. Lawson, Duke University Chemistry Library. http://www.lib.duke.edu/chem/ethics/index.html

Virginia Polytechnic Institute and State University (VPISU) Department of Chemistry
www.chem.vt.edu/ethics/ethics.html

Guide to creating a course syllabus, by Dr. Linda Sweeting.
www.chem.vt.edu/ethics/sweeting/sweeting.pdf

Engineering

The *Online Ethics Center for Engineering and Science*. The mission of the Online Ethics Center is to provide engineers, scientists, and science and engineering students with resources for understanding and addressing ethically significant problems that arise in their work, and to serve those who are promoting learning and advancing the understanding of responsible research and practice in science and engineering. The website contains a help line and information on mentoring as well as case studies and information on conferences. www.onlineethics.org

Psychology and Biology

Scientists and Subjects: an Internet-based Seminar on Ethics of Research with Human Subjects. Funded by NIH. http://www.indiana.edu/~poynter/sas/

American Psychological Association: Research Ethics and Animal Research
www.apa.org/science/research.html

Online Brochures and Information:

- APA Ethical Principles of Psychologists and Code of Conduct
  http://www.apa.org/ethics/code.html
- Friendly Advice for Responding to Requests for Information about Animal Research
  http://www.apa.org/science/advice.html
- Guidelines for Ethical Conduct in the Care and Use of Animals
  http://www.apa.org/science/anguide.html
- Research with Animals in Psychology
  http://www.apa.org/science/animal2.html

APA Print Publications and Videos:

- Ethics in Research with Human Participants (APA book)·
  http://www.apa.org/books/4312310.html
- Perception and Action: The Contributions and Importance of Nonhuman Animal Research in Psychology (APA Video). http://www.apa.org/science/contrib-video.html

Social Science

Sieber, J. E. 1992. *Planning Ethically Responsible Research: A Guide for Social Science Students.* Newbury Park, CA, Sage Publications. ISBN: 0-8039-3964-7.

E. ADDITIONAL LISTING OF ELECTRONIC & PRINT RESOURCES ON RESEARCH ETHICS BY DAVID ELMES, WASHINGTON AND LEE UNIVERSITY (PAST PRESIDENT, CUR)

http://psych.wlu.edu/ethics_and_responsible_research.htm

Symposium on Research Ethics at CUR National Conference

Pre-Conference Survey

In May 2002, a survey on research responsibility held of CUR National Conference pre-registrants. Only 12% said that their institutions had an official policy on research responsibility, although nearly 70% were aware of federal definitions of research misconduct and about half knew that the federal government may soon require training in ethics for those who receive federal grants.

On a scale of 1-5, participants rated research responsibility a "moderate" national problem (ave. score 2.8), while rating it at their own schools a problem of "low concern" (ave. score 1.6). Untenured faculty and administrators are more likely to see research integrity issues as serious than are tenured faculty. Fourteen percent of those coming to the meeting reported knowledge of recent faculty incidents of misconduct, while 18% had firsthand knowledge of student academic or research misconduct in the past year. Yet nearly 60% reported witnessing an incident during their careers.

The areas of greatest concern were student plagiarism, cheating on lab reports, and cheating in the classroom. Faculty misappropriation of data was also a concern. Mistreatment of animals was very rarely observed. When asked what the key problems were in dealing with student academic and research misconduct, many faculty members felt that student-controlled honor boards were "too lenient". "Plagiarism is so common, especially when students use Internet sources, that Honor Boards tend to view this as a minor offense. Very discouraging," commented one respondent. A second problem, rare but worth noting, was lack of support by the administration. One faculty member stated, "The Administration is afraid of lawsuits and often does not back up the faculty."

Faculty and administrators from research universities experienced more research misconduct and student cheating than faculty from comprehensive universities (those that grant Masters' and Bachelor's degrees). Baccalaureate colleges (those that offer only BAs) reported the fewest problems. This result may be related to the relative sizes of the institutions and the sheer volume and amount of pressure on faculty and graduate students to do research at research universities. There also is more awareness of research responsibility issues at research universities compared with other institutions. Most of our survey respondents were from comprehensive universities and baccalaureate colleges.

Faculty report opinions that students majoring in a science are less likely to participate in research or classroom misconduct than non-majors, with the exception of pre-professional students (e.g., pre-medical students) who are as likely to cheat as non-majors. No hard data are available to confirm this impression.

There was a consensus among those surveyed that informal mentoring in a research setting is the best way to teach research ethics. Only 7% taught a formal course unit in research ethics; most of those were psychology professors who included it in their research methods courses. However, many professors are beginning to include case studies in research ethics during summer research experiences for undergraduates, including elaboration of the consequences of misbehavior. One person commented that a culture of ethical conduct should be nurtured across the curriculum, not just in science courses. Another said that basic expectations should be spelled out in a written document given to students when they begin undergraduate research, emphasizing that research does not always produce "desired" or "expected" results; results are what they are, neither good nor bad, and must be reported faithfully. Several faculty members and administrators want to see more opportunities for professional development of faculty in the area of teaching research ethics. The CUR symposium will lead to a permanent web page at www.cur.org that will help in this effort.