# The Project for Scholarly Integrity in Graduate Education:
# A Framework for Collaborative Action

## The Council of Graduate Schools

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# I. Introduction: Integrity as a Core Value of Scholarship

In both the public mind and in the minds of individuals who embark on careers in education and research, science represents many of our highest aspirations.[1] Scientists seek to understand how things work; to discover and uphold the truth, even when it challenges conventional beliefs; to benefit society; and to solve the world's most pressing intellectual and practical problems. Science, and research across all disciplines, is also a highly social activity. The social structures that make scientific discovery possible are competitive, and the excitement of competition drives discovery. But these social structures are also collaborative and collective, requiring individual researchers often to work in teams and always to contribute to the larger communal enterprise of scholarship and research. The public benefits of science make headlines every day, and the public's conception of a scientist typically includes the personality traits of honesty, altruism, and objectivity to complement the highest levels of educational achievement. "Scientist" has therefore regularly ranked among the top professions in terms of public confidence and esteem.

This public esteem for scientists bleeds over onto the institutions and the leaders of those institutions. The National Science Board's *Science and Engineering Indicators* (2002) found "Public Confidence of Leadership in Selected Institutions" from 1973-2000 to be highest for medicine and the scientific community, above that of the Supreme Court, education, and the press.[2] In the 2006 indicators, the confidence expressed in the science profession and its institutions remained at near its highest levels.[3] Overall, what is often described as the compact or covenant between science and society has been a successful one. Through this compact, public funds support scientific endeavors that in turn benefit the public through applications and education. The foundation of this compact is integrity.

In the broader academic context, integrity is a concept rich with connotations that encompass understanding the minimal standards of compliance in research, the personal ethical decision-making processes of individuals, and ultimately the ways in which our institutions reflect the highest aspirations and broadest commitment on the part of the academic profession to the principles of truth, scholarship, and the responsible education of future scholars. Whenever integrity by any of these definitions is compromised, the breach of trust that can result has important consequences for the individual researchers, the institutions they represent, and society. Research integrity is not simply an individual value, it is also an institutional value reflected in the culture that is reinforced by the processes in place and the daily decisions of individual researchers, faculty and mentors, campus leaders, and administrative staff.

Recent efforts to place greater emphasis on research integrity are important in the context of three phenomena: (a) an increase in the number of reported cases of misconduct, nationally and internationally; (b) the encroachment of external pressures upon academic research as interaction and interdependence intensifies among academic, commercial, and government sectors; and (c) the expanding scope of researchers' responsibilities as a consequence of the globalization of the scientific community. The growing interaction

among academic, business, and government sectors and the globalization of the scientific community both have the potential to provide enormous public benefits, but they also mean that the next generation of scholars faces new challenges. What is needed now, more than ever, is for university leaders and scholars to work together to ensure that a strong tradition of research integrity evolves to meet these new challenges. The continuing collaboration between the Council of Graduate Schools and member universities on research integrity is designed to provide a framework to support these efforts.

Important progress has already been made on this front through projects supported by the Office of Research Integrity, the National Science Foundation (especially the Ethics and Education in Science and Engineering [EESE] program), including ORI- and NSF-sponsored projects of the Council of Graduate Schools.[4] Many of the educational activities and projects that address the need for greater attention to research integrity as an important element of preparation for a research career fall under the umbrella of "responsible conduct of research" (RCR). However, RCR has sometimes been interpreted to mean narrow "training" in response to an emphasis on compliance and regulatory issues. Curricular content and innovative approaches particular to the graduate education context have developed out of these programs, but many of these have been piecemeal, and materials have ranged from passive to minimally interactive, sometimes with an emphasis on brief workshops or online instruction that can be perceived as add-ons, incidental to the real curricular experience of a graduate degree program. The aims of the CGS project described below are convergent with the advancement of the responsible conduct of research, but are much broader and more inclusive than a "training model" would imply. Although increased compliance with professional standards by individual researchers would be difficult to measure within the time period of this project, we believe that the educational approach here will result in a community of scholars that is on the whole more compliant as a result of aspiring to a more comprehensive model of academic integrity. This document reflects the input of a planning committee composed of six leading graduate deans and national RCR experts. What CGS and the planning committee hope to achieve through this project is nothing less than a set of models for comprehensive curricular and administrative integration of research integrity into the fabric of graduate education.

*a. Misconduct and Compliance Training*
Advocates of enhancing education in research integrity frequently state that the scientific community must be especially vigilant because, among other reasons, highly visible incidents of misconduct threaten to undermine the public confidence in science. Of course this is true, and the research community has had its share of highly visible incidents of research misconduct. Most of these cases fall under the categories of the falsification and fabrication of data and plagiarism. Some of the most well-known cases in the U.S. over the last 25 years involve established researchers at prestigious universities and national labs. While the names associated with these incidents have captured the public attention, the popular press has, for the most part, laid the responsibility for them on the moral lapses of a few individuals. Press accounts of

misconduct typically acknowledge that extreme cases of falsification and fabrication are relatively rare in the research community.

When cases of research misconduct attract attention, institutional leadership and the university name are subject to public scrutiny. Newspaper headlines as often implicate the institution or university as the individual for the offense ['(Brand X) University Professor Commits Act of Fraud']. This may account for the sometimes serious discrepancies between the articulation of university ethics policies and their implementation. Administrators may fear that bringing cases of misconduct out into the open could jeopardize the reputation of their university. But the force of such headlines may reside, rather, in the public's surprise that patterns of misconduct could survive the scrutiny of peers even in our most prestigious institutions. In fact, on first impression, the high profile cases that have shaken the scientific community do not appear to have had much of an effect on public confidence in science.[5] Despite the public confidence, the relative rise in allegations and cases of misconduct suggest that far beyond the mistakes and possible moral lapses of the few, there may also be systemic or cultural forces at work that, if left un-answered, could affect the entire research enterprise.

A natural response of institutions to cases of serious misconduct is to intensify compliance training. In effect, all researchers are subject to intensified training and greater scrutiny on the assumption that such cases could have been prevented through better understanding of the rules and professional standards for research. Availing faculty of opportunities to refresh their knowledge of professional standards is a good cause, but these serious misconduct cases can serve another important purpose. They should be seen as educational opportunities to open lines of discussion and elevate the research climate of the campus. Graduate deans and other senior administrators such as presidents, chancellors, provosts, and vice presidents for research and division deans should see these cases not only as symptoms of institutional vulnerability, and therefore as opportunities for conversation about safeguards and programs for upholding the university's reputation for quality research, but also as occasions for holding more overarching campus-wide conversations about the role of integrity in the mission of the university and the fundamental importance of academic integrity across all sectors of the university.

*b. Impact of External Pressures and Globalization on the New Research Culture*
Systematic improvements are needed not only to uphold professional standards, prevent misconduct, and ensure greater compliance within the scientific community, but more importantly because the evolving complexity of the world of science and the place of the university in society require a comparable evolution in our educational approach to preparing the next generation of scholars. A more systematic approach than has been undertaken in the past, under the guidance of senior leaders, is more necessary now than ever before because of changing dynamics in the broader research culture in the last half-century.

In *Science, The Endless Frontier*, his report to Harry S. Truman in July 1945 (requested a year earlier by President Franklin D. Roosevelt), Vannevar Bush asserted that America's

colleges and universities "are uniquely qualified by tradition and by their special characteristics to carry on basic research." Within these institutions:

> …scientists may work in an atmosphere which is relatively free from the adverse pressure of convention, prejudice, or commercial necessity. At their best they provide the scientific worker with a strong sense of solidarity and security, as well as a substantial degree of personal intellectual freedom. All of these factors are of great importance in the development of new knowledge, since much of new knowledge is certain to arouse opposition because of its tendency to challenge current beliefs or practice. (http://www.nsf.gov/od/lpa/nsf50/vbush1945.htm)

As new technologies make research misbehavior both more possible and more easily discernable, a number of external pressures on scientists are arguably making the incentives to "misbehave" stronger. One of the key responsibilities of all educators is to prepare students to thrive with integrity and professionalism in a research enterprise that is perhaps no as longer as immune to the "adverse pressures" that Vannevar Bush identified a half-century ago. Hence, a number of influential reports have encouraged universities, associations, and agencies to work together to address "the importance of recognizing the role of the 'system' in contributing to incidences of research misconduct" (AAAS & ORI, 2000, p.2; see also ESF & ORI, 2007 and IOM & NRC, 2002).

Among the factors that influence the current system, or research culture, are:[6]
- Diminishing success rates for research grants leading to increased competition for funding;
- Diminishing national investments in education and training that do not keep up with R&D investments.
- Commercial and political pressures that threaten the principles of disinterest and objectivity upon which scientific integrity is based.
- A research community that is quickly globalizing, but in which cultural differences are sometimes pronounced and are not yet fully understood by all parties.
- An increase in national R&D budgets globally that increases international competition in research;
- Global teams that are increasingly called upon to address life or death issues concerning the environment, global public health, security/anti-terrorism, etc., where errors and misconduct have potentially greater consequence and are more publicly visible than before.
- An ever-contracting "half-life" of knowledge, where the pace of discovery is accelerating at the same time that the average age of first tenure appointments and the average time spent in postdoctoral appointments is increasing.

The rapid pace of modern research compounded by the increased competition for grant funds creates additional pressure for conclusive findings, and the prompt publication of those findings diminishes the time and communal incentive for the self-regulatory processes of science to operate, via the replication and verification of experiments.

In addition to the mounting external pressures facing researchers today, there are also unprecedented opportunities for one's research to have broad public benefit on a global scale. But with these opportunities come increased responsibilities and risks. Increasingly, research on a variety of topics with global applications requires scholars who can work effectively in interdisciplinary, interinstitutional, and international teams. Such research also requires researchers who are sensitive to the ethical issues surrounding the sometimes unintended global uses and different cultural contexts that the products of one's research may encounter. Models of education in the responsible conduct of research, still largely focused on traditional ethics which stress the "proximity of ends" in "the immediate setting," may not yet be adequate to address the complexities of working in an intercultural and international context, where the consequences of one's research may lie outside one's immediate proximity, both geographically and temporally. Ensuring the adequacy of our ethical models is especially important where life and death issues are concerned, and where the consequences of responsible and irresponsible conduct are magnified.[7]

In the broader environment or scientific culture, the savvy prospective student may be attracted by a career in research with the prospect of having a positive social or global impact but may also see a number of trends as warning signs: universities are increasingly turning to private sources of investment funds to supplement federal investment; those seeking tenure are increasingly expressing the feeling that quantity is too-often privileged over quality in tenure and promotion systems; the speed of knowledge production threatens to compromise the quality of research findings; and scientists compete (and collaborate) globally, more aggressively than before, for status as innovators and may in some areas of research and in some countries face the unexpected encroachment of political pressures. A comprehensive values-based approach to research integrity will not only help the scholars we are now preparing in our graduate programs face these pressures with confidence, it may also help to attract more interest in science careers among a new generation of students, who by some accounts are more interested than previous generations of students in issues of policy, the social and global impact of their choices, and responsible citizenship when considering career choices.

*c. Moving to a Values-based Approach to Research Integrity*
Among the recommendations that emerged from a recent global conference on research ethics was the need for nations and institutions to strike a balance between "compliance-based" and a "values-based" approaches in their policies and programs.[8] Federal agencies, like the leadership of U.S. graduate schools and universities, are justifiably concerned about the number of reported incidents of misconduct, pervasive patterns of misbehavior, and the financial costs related to such misbehavior. They are also concerned with the additional costs incurred when investigation of misconduct is required as well as the potential long term costs of a breach in public confidence in the integrity of university research funded by public investment. Recent requirements by the National Institutes of Health, and requirements from the National Science Foundation (imminent at the time of preparing this manuscript) that recipients of federal funding involving graduate students and/or postdocs include education and training activities in responsible and ethical conduct of research, send a clear signal that compliance is only one aspect of the federal

approach to this problem. A values-based approach to graduate education in research integrity and professionalism is necessary not only to obtain the essential support of research faculty, but also to render compliance-based efforts more effective.

Recently, researchers have emphasized the need to expand our definitions of ethical research behavior, and this expansion has important implications for the role that institutions can play in providing a policy and educational environment that encourages responsible and ethical conduct of research.[9] A values-based approach to addressing research integrity may require a serious assessment of the campus climate and difficult conversations about the factors within the university and the broader research environment that may contribute to misconduct as well as those that reinforce academic integrity. While most of the public attention has fallen on sanctionable offenses in falsification, fabrication, and plagiarism, and training has largely focused on compliance in these areas, important debates are taking place in the scientific community about the prevalence of a wider range of questionable research practices including laboratory, data, financial, and classroom management. Addressing the full gamut of professional responsibilities of scholars requires a fundamental change in traditional ways of providing research ethics education. Included therein are the responsibilities not only of individual researchers but also of institutions and institutional leaders who have the capacity to influence the overall research environment.

The CGS Project on Scholarly Integrity in Graduate Education will focus on the leadership of graduate schools and graduate deans in fostering responsible and quality scholarship through systematic improvements in graduate education. This project developed in part in response to the need to address the "institutional and systematic structures" and the ways in which these structures shape behavioral patterns and individual decision-making processes. Because a comprehensive educational approach requires persons with the leverage to effect system-wide change, the leadership of graduate deans and the support of other senior leaders are central to this effort. As the CGS 2006 monograph on *Graduate Education in the Responsible Conduct of Research* states, graduate deans are among the most powerful agents of such change in "advancing ethics education as the central factor shaping the ethical climates of their institutions. And graduate deans, as visible campus officers well-positioned to promote ethics education, can themselves influence the ethical climate, by playing leadership roles in promoting awareness of ethical issues and by deliberating them in public forums" (CGS, 2006, p.11).

## II. A Comprehensive Approach to Research Integrity in Graduate Education: Project Overview

The Project for Scholarly Integrity (PSI) is a collaborative project designed to generate models for integrating research ethics and the responsible conduct of research (RCR) into the fabric of graduate education. Five universities, selected through a competitive process of external review, will receive awards to develop models for such an approach. CGS and the five universities will develop educational models for promoting responsible conduct

of research and integrity in professional scholarship, education, and research. The tools and models for conveying understanding, knowledge, and skills developed in a collaborative manner within this project will be publicized throughout the graduate community through CGS's dissemination venues, including meetings and workshops, online resources, and publications.

This project builds on the experiences and momentum of two prior pilot projects. The first ORI-funded RCR initiative focused on program "start up," or the key elements required to launch an effective program. The CGS monograph, *Graduate Education for the Responsible Conduct of Research* (2006), describes six "best practices" in launching an RCR program that emerged out of that project:

1. Establishing an Advisory Board
2. Providing Public Forums
3. Offering Two-Tiered (discipline-based and university-wide) Instruction
4. Teaching Ethical Reasoning Skills
5. Making RCR Training Mandatory
6. Developing Multi-Level Assessment

The current project draws on these recommendations and on lessons learned from an NSF-funded CGS initiative to advance the integration of RCR into the regular practice of graduate education. That NSF-funded project addressed the needs of students in science and engineering for greater understanding of professional standards of their disciplines and for enhanced skills in deliberate ethical reasoning about issues that arise in interdisciplinary research and in public-policy arenas. A monograph discussing the best practices that emerged from that project is scheduled for publication in Summer 2008.

As with the first sets of CGS RCR pilot projects, the leverage point for this initiative will be the graduate school. The initial targets are graduate deans, who will serve as Principal Investigators for each university project. The planning committee met three times in 2007-08 to contribute to this planning document that addresses core issues that institutions need to address in institutionalizing RCR. This document has informed the CGS-developed request for proposals, released in April 2008, as well as assessment and dissemination efforts. Proposals will be due in July 2008 and award announcements made in September.

Further activities supported by the current project will include:

- An enhanced interactive website that will serve as a clearinghouse of relevant resources and provide electronic forums for exchanging information and advice; (as in other CGS best practice initiatives, one electronic discussion group devoted to RCR institutionalization issues will be open to all CGS member universities, while another group will facilitate information to sub-award participants and affiliates);
- Frequent face-to-face and telephone meetings among participants and affiliates; and
- A monograph that will detail the institutionalization efforts of five major research universities with particular emphasis on what is scalable and transferable to other institutional contexts.

Through the project, CGS will also seek to develop a structure to provide long-term support for CGS member universities seeking to build on the pilot projects supported by this project and to develop a comprehensive approach to RCR.

# III. Essential Components of a Comprehensive Approach

The planning committee for this project was charged with identifying the requisite components of a comprehensive approach to institutional efforts to advance research integrity across graduate education. The following is a summary and articulation of those essential components and includes additional recommendations for enhancing an institutional approach to research integrity. For each area described below, a list of recommended activities is provided for institutions seeking to advance a comprehensive approach to research integrity and the responsible conduct of research. This list informed by the planning committee is representative but by no means exhaustive, and the CGS project will encourage innovation in each area.

# A. A Framework for Action

The first item on which there was agreement was that universities seeking to fully embed and ingrain research ethics into graduate curricula and reinforce that commitment through institutional processes and procedures would benefit from a common framework for action. Such a framework should be flexible enough to allow for institutional innovation and differences, but should provide the five universities in this project and affiliates with a shared structure that would facilitate implementation and assessment in the project and an exchange of information among institutions. The model below is premised on the notion that any genuine positive culture change at an institution involves effective leadership in fostering interaction, analysis, and strategizing at every stage:

(1) *Engage* the community in identifying needs.
(2) *Invite* key stakeholders to reflect on a plan for action.
(3) *Act* on those reflections.
(4) *Communicate* to the broader community about activities and their ongoing impact.
(5) *Integrate* activities to ensure greatest impact and sustainability.

These action steps need not be followed in strict sequence, and feedback loops may occur at different points. For example, inviting faculty and campus leaders to brainstorm about issues and potential strategy for action may precede efforts to focus the attention of the broader community on the need for action, and may help to identify particular needs that will help to convince others of the importance of the project. Also, as both curricular and administrative integration are among the chief goals of this project, questions of integration and sustainability will need to be considered in the initial planning stages.

<u>(1) Engage the Community in Identifying the Needs</u>
The planning committee recognized two different approaches to focusing the graduate community's attention on the need for a more systematic approach to research ethics and integrity and for garnering broad campus support, at least in the early phases of the campus projects.

Two approaches will be adopted by CGS, and should be considered by graduate deans as they develop comprehensive strategies to integrate research and scholarly integrity into the fabric of graduate education at their universities. These two approaches could be adopted simultaneously, or they could provide alternatives for securing buy-in among different potential collaborators and constituencies. Different leadership styles and different institutional cultures may encourage senior administrators to place differing emphases on each approach in their overall strategies, but no approach should overemphasize compliance to the exclusion of values-based discussions and activities. Regardless of the emphasis, true inroads into the culture of scholarship and research behavior will require a recognition on the part of graduate education leaders of the essential role that integrity plays in the definition of scholarship.

*a) Recognizing vulnerabilities*
The first approach is to create a sense of "vulnerability" linked to opportunity, to send a message of our vulnerability, as institutions, as individuals within those institutions, and as members of a larger research enterprise with a public face. This does not simply mean inducing anxiety or fear about the possible consequences of error, misconduct, or misbehavior. It also means: getting others to recognize that, as members in a community of researchers and as institutions, we are not doing enough to: develop students as responsible members of their profession and to keep students and faculty up to date; to empower students as ethical agents; to encourage reflection in the disciplines and across the university about what concepts such as integrity and responsible conduct entail; and to incite innovative ideas about what education resources would best reinforce those concepts.

Activities that build on this approach include:
- Establish the local context(s). There are various levels to the institutional context for scholarship: e.g., the course, the study group, the lab, the institution, and the discipline. These should be defined and understood as potential fields for activity. An important instrument for such understanding is a climate survey (see section on 'Assessment' below):
    - Conduct surveys of perceptions of students, faculty, and administration and compare their perceived scope of instruction, efficacy of instruction, and overall level of research integrity in the campus climate.
    - Analyze the data for gaps and use any gap data to build recognition of disparities, e.g. between graduate teaching goals and graduate learning.
    - Share findings with the community through publication and focused discussion.

- Create greater transparency and "public forums" about the issues (recommended in CGS's *Graduate Education and the Responsible Conduct of Research*, 2006), capitalizing where possible on incidents that may arise.
- Evaluate and review policies and their implementation.
- Promote "difficult discussions" in curricula, in workshops, and in public forums. (Both students and faculty should be involved in these discussions.) Examples include: the obligations and risks of whistleblowing, the ownership of dissertation data, and the ethics of risk management and innovation vs. risk-avoidance in ethical deliberation.
- Emphasize the importance of ongoing professional development for faculty as well as students.

*b) Recognizing excellence in research and education*
The second approach is to reward excellence in fostering research integrity and the responsible conduct of research as a way to emphasize that the university values these qualities in researchers, faculty, and students. A rewards and values approach may be as effective as an approach that emphasizes vulnerabilities in gaining buy-in from research faculty, especially where there may be skepticism about the need for greater attention to the issues or if there is a feeling that addressing them implies an initiative focused only on compliance. An emphasis on the highest ideals and standards of the profession, including educational and mentoring standards, should be re-enforced where appropriate through a model that emphasizes rewards and recognition rather than simply the potential consequences of misconduct. This approach could be especially influential if it emphasized the positive importance of senior researchers as examples.

Activities that build on this approach include:
- Awards celebrating individual mentors, recognized for outstanding contributions to advancing the ethical and responsible conduct of research.
- Block grants to programs to recognize innovative approaches.
- Face-to-face "Socratic" dialogues, or issues-based case studies and vignettes.
- Building mentoring into tenure and promotion processes.
- Recognition of professional ethics as a critical element in the tenure and promotion process.
- Integration with existing programs that have both credibility and scope, such as "Preparing Future Faculty" or "Preparing Future Professionals" programs.

(2) Invite key stakeholders to reflect on a plan for action
The second action step is to convene and to invite and incite reflection of key faculty members (especially those thought leaders who have the potential to serve as future change agents), staff, and students on how best to address the university's needs and vulnerabilities.

Recommended actions include:
- Solicit a clear, public endorsement of this project's goals by the university president or provost.

- Appoint a planning or steering committee (see CGS, 2006).
- Appoint a project director, where appropriate.
- Create a forum that can be perceived as a neutral place where everyone's positions can be valued.

(3) Act on those reflections
Under the leadership of the graduate dean or institutional equivalent, design and follow through on a plan for action will require making determinations and taking action in the areas of:
  a) Content
  b) Sequencing of Content and Pedagogy
  c) Collaboration
  d) Assessment
  e) Dissemination

*a) Content*
Universities participating in this project will need to determine whether and to what extent they will be creating new curricular content or adapting existing curricular materials to meet the needs of the local contexts. Where creating new materials, key stakeholders should have input into identifying the shortcomings of existing materials, and suggest concrete areas for improvement. If new materials will be developed, a clear plan with potential collaborators identified and resources available should be established in advance. If projects require adopting and/or adapting existing resources, a clear rationale for choices of curricular content should be stated and discussed.

One of the core features of this project is to encourage approaches that embed, in a rich curriculum, education in the professional standards pertaining to, and bedrock principles and values behind, the nine core areas of responsible conduct of research as identified below:
  1) Data Acquisition, Management, Sharing, and Ownership;
  2) Conflicts of Interest and Commitment;
  3) Human Subjects;
  4) Animal Welfare;
  5) Research Misconduct;
  6) Publication Practices and Responsible Authorship;
  7) Mentor and Trainee Responsibilities;
  8) Peer Review; and
  9) Collaborative Research.

Other areas that should be considered in a comprehensive approach include:
  Lab management
  Classroom management and practice
  Financial stewardship
  Ethical decision-making and deliberation processes
  Ethical principals

Under "classroom management and practice," for example, the "term paper" is often less clearly defined than published papers in campus RCR programs, but issues of integrity and the ethics of authorship are equally germane here. The classroom can also provide an optimal space for learning about issues such as data management and authorship in a non-threatening environment, i.e. where the criteria for "sanctionable" offenses and consequences may be less severe and less public.

*b) Sequencing of Content and Pedagogy*
Institutions planning an integrative, comprehensive approach to research integrity should consider how content will be sequenced: i.e. how content, activities, and resources will address developmental needs of students at appropriate stages in their graduate path.

CGS will direct attention to available online resources and resources on best practices in content and delivery, but will also encourage innovation where appropriate in the development of curricular content.[10] Whether institutions propose to develop original curricular content or to innovate in the area of pedagogy and learning, they should articulate how proposed activities are grounded in theories of learning. Projects should take advantage of pedagogical context of graduate education to go beyond minimal training in proper conduct and professional standards. For example, universities could explore the pedagogical opportunities in hosting "difficult discussions" in workshops or other settings, and/or prepare students and faculty for professional situations that do not have easy right and wrong solutions but may instead require them to consider multiple, competing interests and hierarchies of value.

The inclusion of face to face and interactive learning opportunities will be required as an essential characteristic of instruction in this project. Additional elements may include:
   i) An active writing journal, integrated into courses, that might include reflection on incidents that occur where issues of research ethics and responsible conduct arise, and mentoring on the more self-reflective aspects of research practice.
   ii) Online interactive, or other technology that engages interaction,
   iii) Passive web or published printed materials

Possible activities include:
- Adaptation of existing online passive or interactive curricular materials to a face to face workshop or classroom context.
- Development of courses or content that escalate in complexity, e.g. via decision trees.
- Development of a "teachable moments" model across the curriculum, with workshops for faculty that focus on how to recognize teachable moments.
- Workshops that provide an open forum for students and faculty to tackle "difficult discussions" (see p.12 above, "Recognizing vulnerabilities").
- The inclusion of research ethics and integrity discussions in orientation.
- Re-evaluation of the role of education for research integrity in existing course offerings or degree requirements.

*c) Collaboration*

This project will require collaboration among key stakeholders from across the institution.  Universities planning such an approach to research integrity must ask themselves: Who must be involved in order to fully scale up graduate education for research integrity? Who should or could be involved as potential collaborators? Suggestions include:

- President or provost, from whom support is essential
- Senior research officer, where appropriate, e.g. Senior VP for Research, from whom support is also essential
- Academic deans
- Graduate Council
- Center for instructional development and research
- Faculty council and subcommittee that works on instructional quality and subcommittee on professional standards. (The comment was made that faculty leading in these efforts are not necessarily graduate faculty but may be "mapped onto other structures.")
- Faculty
- Office of educational assessment
- Student organizations
- Postdoctoral fellows and/or students
- Student Affairs
- Ombudsperson

*d) Assessment*

A multi-tiered assessment approach is important for ensuring comprehensive and effective implementation. Any institution that seeks to take a comprehensive approach to integrating research ethics and research integrity into graduate education should consider at least three types of assessment:

i. *Program implementation*—CGS has developed a set of instruments that universities participating in the Project or Scholarly Integrity will be asked to use to assess the development of activities. The assessment instrument (consisting of pre- and post-implementation surveys) will seek to gain understanding of the scope, impact, integration, visibility, and potential sustainability of funded projects.

ii. *The culture or climate for scholarly integrity*—CGS will develop (in consultation with subject and assessment experts and participating project PI's) assessment instrument(s) to measure the extent to which perceptions reflect improvements in the campus culture or climate of research integrity.[11]

iii. *Student learning*—Universities participating in the Project for Scholarly Integrity will develop or adapt instruments for assessing student learning and will be encouraged to share these instruments with each other and with the CGS community. [To inform this activity, CGS will provide on the project website information about student learning assessment tools developed as a result of prior CGS RCR initiatives and other, e.g. ORI-funded, initiatives.]

In assessment areas §i and ii, CGS will ask universities participating in the Project for Scholarly Integrity to engage in pre-implementation and post-implementation assessment. Ongoing assessment activities will be encouraged: (1) to ensure that proposed activities reflect an understanding of the campus climate and existing programmatic resources, and (2) to measure change over time fostered by the project funding. Universities engaged in these three areas of assessment should plan opportunities to reflect on the relationship (and any potential discrepancies) between the findings of these respective assessment instruments.

*e) Dissemination*
*Dissemination* to the broader community, including communication about activities and their ongoing impact, is an important activity for ensuring the success of efforts led by the graduate school. The graduate school should encourage stakeholders to take advantage of appropriate venues, and should create new ones where appropriate, for sharing information about administrative and process innovations as well as resources and instruments with each other and with the broader community. CGS will encourage senior administrators and project directors to help each other improve existing resources in conjunction with partnering universities. Participants in the project will be asked to address how any instruments created or processes developed that prove to be effective or promising will be shared with other universities. As part of the Project for Scholarly Integrity, CGS will develop an electronic and communication infrastructure for regular exchange of ideas, and universities will be encouraged to share their results with the broader community through meetings and publications.

(4) Integrate activities to ensure greatest impact and sustainability
One of the key assumptions of the CGS Project for Scholarly Integrity is that a sustainable comprehensive approach to research integrity requires the thoughtful integration and alignment of various components that can only be undertaken under the direction of senior leadership. This requires activities focused on two sets of considerations:

*a) Aligning Curricular Activities, Administrative Structures, and Policies and Procedures*
*Curricular integration*—Universities should include a plan for integrating existing curricular resources (whether these are "homegrown" or include other, publicly available resources)[12] into the fabric of graduate education on campus (e.g. via workshops, face to face seminars, assessment, etc.). This may entail both curricular integration and administrative integration. For example, the graduate school may leverage resources to encourage that a successful course or workshop offered in one discipline is adapted to meet the needs of another discipline, or that a course that effectively but sporadically addresses research ethics issues championed by one professor in one program may be offered on a more permanent basis, possibly taught by alternate faculty. The development of curricular materials can focus the energies of faculty and students and staff who may contribute to the development of content, even from across disciplines (as happens in the development of video vignettes depicting case studies, for example). Alternative activities may include: adapting resources developed elsewhere to one's own institutional needs; the scaling up of curricular content from a small population to a larger one; and

the transferability of content from one discipline to another are important routes to developing a comprehensive approach.

*Administrative structures*—Existing administrative and educational structures can serve as important resources and conduits for the project's activities. Such resources may include: IRB offices, research administration staff, professional development programs, etc. Universities should consider which resources are the most likely partners in the short term, where there may be immediate buy-in, and which may be good partners in the longer term, where relationships may need to be cultivated.

*Policies and Procedures*—Universities and degree programs should ask how university-wide and program policies and procedures interact with individual decisions and behaviors in of the content areas identified above. In planning to develop a comprehensive approach to research ethics, universities should identify areas where improvements upon current interactions are needed and possible mechanisms for improvement.

Possible activities:
- Review rules for funding research.
- Require investigators, as part of the process of submitting to an institutional review board, "a sixth chapter" that analyzes ethical issues raised by the research and/or its application, and specifies what alternatives were considered?
- Review application of procedures for response to misconduct allegations.

*b) Sustainability, Transferability, and Scalability*
Universities participating in the CGS Project for Scholarly Integrity will be asked to provide evidence that the activities supported by this project are sustainable beyond the expiration of external project funds, that they are replicable or transferable to other universities and that thought has been given to what elements may and may not be readily adapted by other universities, and that, more generally, the activities are scalable, or can be adapted to institutions with larger or smaller populations, as appropriate.

Questions that universities should consider include:
> How will one resource, instrument, or set of resources and instruments be integrated with other existing resources and tools to obtain maximal leverage and impact? How will activities be sustained over time? How will curricular activities undertaken be made known and content made accessible to other universities?

# B. Novel Approaches to Pressing Issues

The planning committee whose ideas informed this document agreed that any project that aspired to take a comprehensive approach to research integrity and to have a significant impact on the broader community of future scholars should have three other characteristics. Such a project would need to be: interdisciplinary, intercultural, and interactive.

*Interdisciplinary*
Interdisciplinary activities were discussed in different ways. Such activities could involve research areas that bring together multiple disciplines, which may have their own perspectives and professional standards. They could bring together faculty from different disciplines to have discussions about core areas, but being careful in so doing to be sensitive to the perception that some issues may not be seen as relevant to all disciplines. And they could bring together teams from different disciplines to create resources and content, or innovative ways to deliver and/or scale-up existing content.

In order to ensure systemic change in the behavioral and biomedical disciplines chiefly targeted by this initiative, universities may find it important or even necessary to include a forum within the project to involve other fields, such as the humanities and social sciences.[13] The planning committee saw this outreach as a potentially important strategy for securing the biggest impact because of the advantage that interdisciplinary perspectives bring to ethical discussions, the lack of experience in addressing research ethics in some of these fields, and because the project will offer senior leaders a rare opportunity for expressing visible, public commitment to this topic to a national audience.

*Intercultural*
Almost any attempt to integrate research integrity in graduate education will involve intercultural activity, which may be an implicit or an explicit feature. Broad fields of study and specific disciplines may have different operating definitions of research integrity and may have different professional standards. Just as disciplines may in effect have different "research cultures" that influence their definitions of professional responsibility, so students may come from different educational backgrounds and cultures of scholarship and pedagogy that may influence their ideas about what is expected to conduct research with integrity in a graduate setting.  Some differences will be surmountable through common orientation and acculturation to graduate education in the field, while other differences may require some aforementioned "difficult discussions" to take place. Such cultural differences may surface as matters of national background, as ethnic background, even as differences between undergraduate and graduate students' research practice; and other group differences may become evident.

Recognizing that intercultural opportunities for graduate education in research integrity are a backdrop against which any important campus-wide effort takes place, universities can be most effective by making intercultural dimension an explicit feature of the proposed curricular and administrative integration. In so doing, universities should resist any temptation to essentialize such differences in background by assuming, for example, the necessity of any kind of remedial ethics training or ethical acculturation inferred from a student's background.[14] At the same time, universities should respond to perceived educational needs in as targeted and helpful a way as possible.

*Interactive*
Finally, this project will require universities to address the relationship of individuals to working groups, because—while all research contributes to a broader social enterprise—

collective and collaborative (teamwork) research in particular involves different dynamics than solitary research, and individual responsibility should be considered in this context. The profession of science, whether in academic or non-academic settings, involves horizontal and vertical relationships that carry their own sets of ethical dynamics and implicit as well as explicit expectations. Graduate students work together as peers, they may also serve as mentors and be served by mentors, and there are relationships of employment for students or postdoctorates funded on a grant that make a faculty member not only a senior advisor and authority in the field but also an employer. There are structural vulnerabilities that may involve unique sets of ethical dynamics.

Questions that universities should consider when planning a (more) comprehensive approach to research integrity include:

> To what extent are the ethical dynamics involved in these multi-layered interactions known and knowable, measured and measurable, monitored, and/or assessed? Should they be? What resources address these interactions?
> How do professors and postdocs interact with graduate students (and visa versa)?
> How do students interact with each other?
> How do administrative staff interact with graduate students and postdocs?
> How do university leaders interact with faculty and graduate students?
> How do students and researchers interact with the public?[15]
> What are the potential roles of professional societies as partners with universities in the area of research integrity?

## IV. Conclusion

This document is intended to provide a framework for graduate deans and other senior administrators seeking to begin efforts or enhance current steps to take a more comprehensive approach to integrating research integrity and the responsible conduct of research into the fabric of graduate education. Some of the activities identified above will be more appropriate to some institutional contexts than to others, and universities will be starting at different places in their efforts to advance research integrity. Understanding what is likely to be most effective and most needed in the local context is key to the success of any institution's efforts. Beyond the local successes of any given institution is the impact on scholarship as whole that is made possible through the sharing and exchange of information that results. As the CGS project develops, CGS and participating institutions will share the ongoing results of their efforts and will look forward to collaborating with all those faculty, staff, experts and students who hold integrity to be a core aspect of scholarship and who are committed to developing innovative approaches to promoting that value in graduate education.

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# NOTES

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[2] http://www.nsf.gov/statistics/seind02/mmslides/mm07-14/mm07-14.htm

[3] http://www.nsf.gov/statistics/seind06/c7/c7s3.htm

[4] See the web resources of ORI (http://ori.dhhs.gov/education/rcr_resources.shtml), NSF (http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=13338), and CGS (www.cgsnet.org). See also CGS 2006 and Office of Research Integrity 2007.

[5] A 2006 Harris Poll found that the integrity of scientists is regarded by the public as highly as confidence in the leadership of their institutions cited earlier in this document. Scientists rank among the top three professions regarded as "most honest" (at 77%), behind only doctors (85%) and teachers (83%) (Harris Interactive, 2006).

[6] This list modifies and expands upon factors identified in the Lisbon report (ESF & ORI, 2007, p. 24).

[7] Hans Jonas, in *The Imperative of Responsibility* (1984), distinguishes between a traditional ethics appropriate to conduct in the immediate setting of proximate ends and a modern ethics, appropriate to a modern ecological and technological age. A modern ethics, Jonas argues, must take into account the temporal and cumulative dimensions of our actions. A similar argument could be made for the intercultural and international dimensions of our actions where the global applications of research often result in consequences unintended by researchers.

[8] http://www.icsu.org/5_abouticsu/PDF/WC_final_report.pdf

[9] In "Scientists Behaving Badly," Brian C. Martinson, Melissa S. Anderson and Raymond de Vries draw from recent survey findings to argue: "To protect the integrity of science, we must look beyond falsification, fabrication and plagiarism, to a wider range of questionable research practices… Historically, professionals and the public have focused on headline-grabbing cases of scientific misconduct, but we believe that researchers can no longer afford to ignore a wider range of questionable behavior that threatens the integrity of science." They surveyed early- and mid-career researchers about 16 behaviors on a list ranging from sanctionable (10), to possibly sanctionable (4), and non-sanctionable/careless (2). Their overall finding was that one third of early- and mid-career researchers, combined, admitted to having "engaged in at least one of the top ten behaviours (sic) during the previous three years" (Martinson, et. al., 2005). Nick Steneck echoed this concern about a wider range of ethical misbehaviors: "Though outright scientific fraud—like the cloning scandal involving Hwang Woo-suk of Seoul National University—grabs headlines, questionable practices that seem much more benign are pervasive, and may have a more damaging long-term effect on the future of research" (Epstein, 2006; see also AAAS & ORI, 2000; ESF & ORI, 2007, p.7, Recommendation 3 ff.).

[10] Some of the existing resources are now available through the ORI website (http://ori.dhhs.gov/education/rcr_resources.shtml). Starting in May 2008, CGS will be developing a public website that serves as a national clearinghouse for resources deemed most applicable and useful to the graduate community. This website will be accessible through the CGS national website: www.cgsnet.org.

[11] The CGS 2006 monograph, *Graduate Education for the Responsible Conduct of Research*, states: "Though the term 'ethical climate' may lack precision, graduate deans can contribute to the usefulness of the notion by insisting on the development of assessment instruments to define and measure it" (p. 11).

[12] See note 4.

[13] Often, universities provide little or no preparation in research integrity for scholars in the social sciences or humanities working on the topic of human subjects research. One problem is that IRB offices may need a dedicated staff person who understands issues specific to these disciplines and who is qualified to review applications from them.

[14] The CGS 2006 publication cautions, for example, that "deans should be very skeptical" of "students who claim in self-defense that they were never taught what plagiarism is or that plagiarism is tolerated in other

countries," and advises that designating special classes for international students would imply that such students are ethically deficient (p. 16). The answer to needs expressed in this manner, either by faculty or by students, the publication suggests, is the teaching of ethics in multicultural contexts.

[15] While public confidence in the benefits of science high in Europe, 'about three-fifths of Europeans agreed with the following statements: "Because of their knowledge, scientists have a power that makes them dangerous" and "Scientists put too little effort into informing the public about their work"' (European Commission 2005a, cited in http://www.nsf.gov/statistics/seind06/c7/c7s3.htm).