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# Science and Engineering Ethics Education: Recipes for Success

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# NSF and Ethics Education in Science and Engineering

Professional Development Workshop—  
Feb. 19, 2010

## Science and Engineering Ethics Education: Recipes for Success

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"Ethical Problems in Academic Research" Swazey JC, Anderson M, Lewis S, *American Scientist*, 31:543-553, 1993.



Survey of 2,000 doctoral candidates and 2,000 of their faculty in chemistry, microbiology, civil engineering and sociology

- Approx. 50% of faculty and 44% of students had “exposure” to misconduct or misbehaviors
- Nearly 43% of the faculty knew of peers making inappropriate assignment of authors
- Almost 50% of students and faculty either observed or had direct knowledge of faculty exploiting others
- Marked disciplinary differences were observed among the misbehaviors and misconduct as well as the ways in which these problems were dealt with.

“Scientists Behaving Badly” Martinson, B.C., Anderson, M.S. and de Vries, R., *Nature*, 435:737-738, 2005

Surveyed: 3,409 mid-career scientists-1,768 responded (52% response rate) and 3,475 early career scientists-1,479 responded (43% response rate).

- 15.5% admitted to changing design, methodology or results of study in response to pressure from a funding source.
- 15.3% had dropped observations or data points from analyses based on a gut feeling they were inaccurate.
- 27.5% had inadequate record keeping related to research projects.
- Overall, 33% of respondents said they had engaged in at least one of ten top “mis-behaviors” in the past three years.

# AMERICA Competes Act, signed into law in 2007

## **SEC. 7009. RESPONSIBLE CONDUCT OF RESEARCH.**

- The Director shall require that each institution that applies for financial assistance from the Foundation for science and engineering research or education describe in its grant proposal a plan to provide appropriate training and oversight in the responsible and ethical conduct of research to undergraduate students, graduate students, and postdoctoral researchers participating in the proposed research project.

# New NSF Requirements

- **Effective January 4, 2010** all *new* proposal submissions must certify that the institution has in place an RCR training & oversight plan for undergraduates, graduate students and postdoctoral researchers supported by NSF.
- Training plans need not be submitted with the proposal, however, they must be provided for review upon request.

# New NSF Requirements

- Institutions are responsible for verifying that their undergraduate students, graduate students and postdoctoral scholars receive training.
- Institutions are provided maximum flexibility in creating and implementing RCR programs to meet this new requirement.
- These requirements do not apply to existing NSF awards.



# New NIH Requirements\*

**Effective Jan. 25, 2010** all trainees, fellows, participants, and scholars receiving support through any NIH *training, career development award (individual or institutional), research education grant, and dissertation research grant* must receive instruction in responsible conduct of research.

- Substantial face-to-face discussions - faculty training & participation - substantive contact hours between the trainees/fellows/scholars/participants and the participating faculty/mentors/



# New NIH Requirements

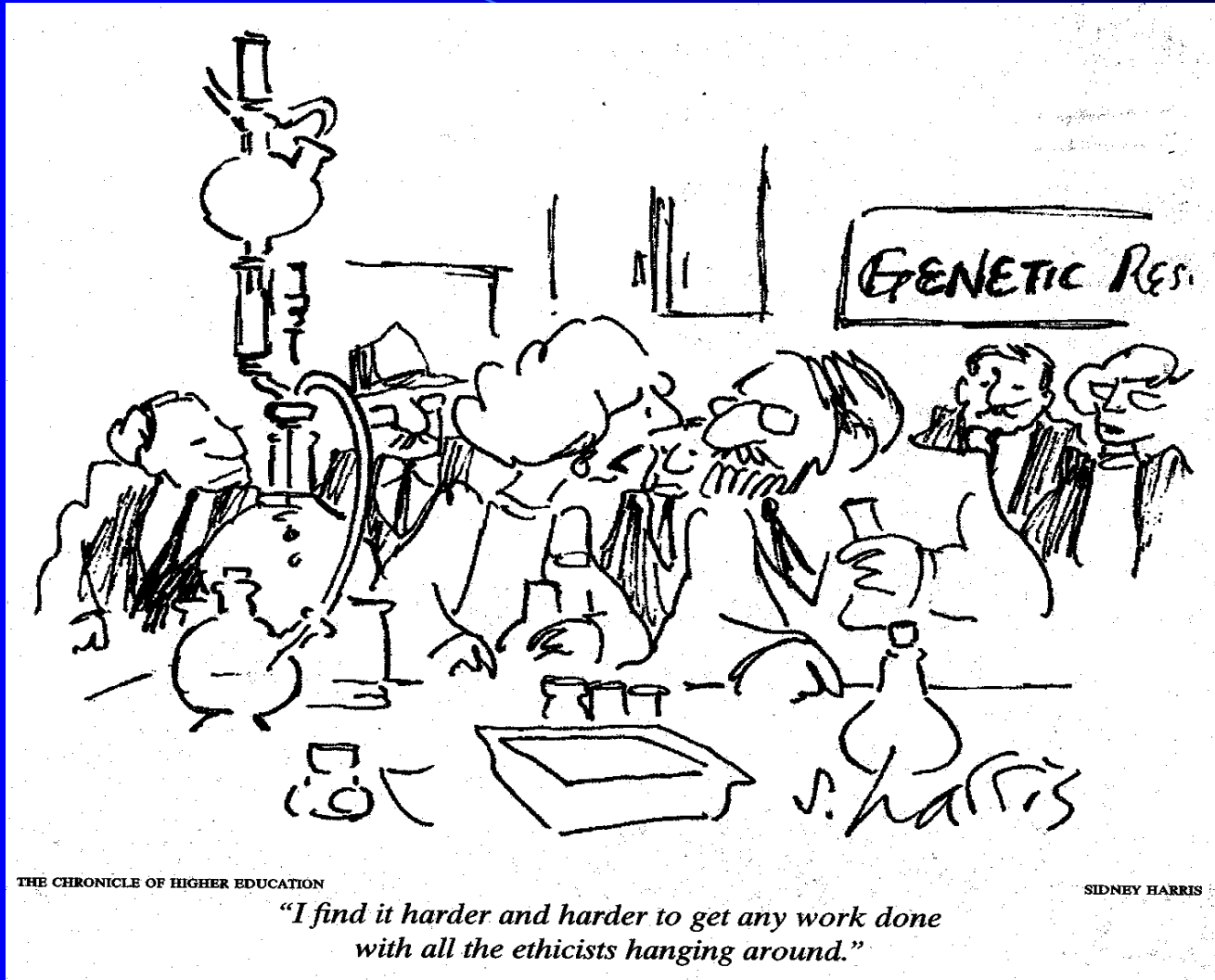
## Subject Matter:

- conflict of interest – personal, professional, and financial
- policies regarding human & animal subjects, and safe laboratory practices
- mentor/mentee responsibilities and relationships
- collaborative research including collaborations with industry
- peer review
- data acquisition and laboratory tools; management, sharing and ownership
- research misconduct and policies for handling misconduct
- responsible authorship and publication
- the scientist as a responsible member of society, contemporary ethical issues in biomedical research, and the environmental and societal impacts of scientific research

# Factors Affecting Establishment of Effective RCR Training Programs

- Faculty Workloads
- Institutional Priorities & Reputation
- Promotion & Tenure criteria
- Competition for funding
- Pressure to publish frequently
- Cultural and Disciplinary Diversity
- Resources





THE CHRONICLE OF HIGHER EDUCATION

SIDNEY HARRIS

*"I find it harder and harder to get any work done  
with all the ethicists hanging around."*

# Keys to Success

- Commitment of faculty and upper administration
- Fair and consistent application of rewards and punishments
- An RCR Committee of faculty, students and staff that develops and implements a comprehensive institutional program that:
  - Guides RCR training at both university and departmental levels
  - Covers a wide range of regulatory, professional, financial and ethical topics
  - Promotes widespread sharing of effective tools and resources
    - Formal courses, Seminars & Workshops
    - Web-based tutorials, Lecture series
  - Provides training programs for RCR instructors and for faculty mentors (PFF, PFP)

# RCR "Best Practices"

- University RCR Education Committee – Supported by the Provost and Chief Research Officer
- Two-tiered instructional program:
  - University (Grad School, Research VP, Grants & Contracts)
  - Department/School/College
- Establish formal university-wide programs that:
  - Assess & discuss current RCR practices and attitudes
  - Cover a wide range of regulatory, professional, financial and ethical topics
  - Involve faculty and students from different disciplines
  - Promote widespread sharing of effective tools and resources
  - Use a variety of delivery methods (one size does not fit all)
    - Formal courses, Seminars & Workshops
    - Web-based tutorials, Lecture series

# RCR "Best Practices"

- Strong emphasis on Mentoring, the Research Environment and Culture:
  - Establish a clear set of expectations of what mentors are to accomplish
  - Establish clear set of policies and procedures for dealing with FFP, QRPs, and “whistleblowers”
  - Expose students and post-docs to more than one mentor
  - Shared responsibility among instructors, mentors and administrators
  - Provide training programs for RCR instructors and for faculty mentors (PFF, PFP)

# Specific Approaches

Establish an RCR Committee/Task Force that is supported by Academic Affairs and Research Office and composed of respected faculty researchers/scholars/investigators, students and administrators from across the institution.

Charge the RCR Committee with the following:

- Assessing institutional and departmental attitudes, perceptions and practices in RCR training – use findings to inform and guide development of an institutional training program.
- Guiding RCR training at both university and departmental levels
- Promoting widespread sharing of effective tools and resources
  - Formal courses, Seminars & Workshops
  - Web-based tutorials, Lecture series

Provide training programs for RCR instructors and for faculty mentors



# Specific Approaches

:

- Make RCR Training a University requirement
  - Students, postdocs and faculty supported by NSF or PHS grants
  - All students conducting theses or dissertations
  - All graduate students and honors students
- Establish an introductory level of instruction delivered via Web-based tutorials, e.g., CITI modules or a course or series of seminars and workshops delivered by RCR committee
- Incorporate ethics and RCR topics into:
  - Theses/dissertation – chapter, prospectus and defense
  - Research methods and design courses
  - Agreement between student and thesis/dissertation chair
  - Certificates and Preparing Future Faculty/Professional Programs
- Promote discussions of topics within departments/colleges using case-studies, vignettes, etc. and led by trained faculty

# Specific Approaches

- Incorporate RCR and professional standards guidelines into department policies and student handbook
- Establish a clear set of university policies and procedures for dealing with FFP, QRPs, and “whistleblowers”
- Include RCR training in new faculty orientation and faculty development programs
- Establish rewards for faculty /investigator participation in RCR training and fostering academic and research integrity
  - Mentoring Awards
  - Workload credit
  - Considered in making promotion and tenure decisions by department, college and university