



Online Ethics Center  
FOR ENGINEERING AND SCIENCE

# Topics: Research Misconduct

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## Description

A guide that provides information and resources on teaching responsible conduct of research that focuses on the topic of research misconduct. Part of the Resources for Research Ethics Education collection.

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## **Summary**

### **Definition**

Research misconduct is defined as (Code of Federal Regulations: 42 CFR Part 93):

*Fabrication, falsification, or plagiarism in proposing, performing, or reviewing research, or in reporting research results.*

### **Complexity of Research Misconduct**

Research misconduct is complex (DuBois et al., 2013):

1. ***Specifics of misconduct as well as perceptions*** can vary greatly from case to case. The heterogeneous nature of research misconduct makes it difficult to capture the full essence of the act with a simple explanation.
2. ***Motivation*** for improper conduct also varies greatly, for example:

*Personality traits*

*Stress*

*Feelings of unfairness*

*... and any of many other reasons*

## Research Misconduct Prevention

### *Self-policing with Quality Research Practices*

**Good science practices** minimize the risk of misconduct. For example:

- Strict adherence to the **scientific method**
- Clear, detailed **recordkeeping**
- Meaningful and clear delineation of **collaboration**
- Shared understanding of **authorship** roles and responsibilities
- Attentive **mentoring** for newer members of the research environment
- Encouragement and support for **asking questions and open discussion**

## Responding to Research Misconduct

### *Obligations to Act*

- Scientists do not all agree on if, when, and how to report misconduct. This disagreement is even greater between scientists and administrators (Wenger et al., 1999).
- Yet, as a 1995 publication of the National Academy of Sciences advises

*Someone who has witnessed misconduct has an unmistakable obligation to act.*

- **Documentation:**
  - *An allegation of research misconduct is one of the most serious charges that can be made against a scientist. Therefore, it is **essential that a charge be sustained only if justified by documentation** and other*

*relevant evidence.*

- *Whether one is making the allegation or being accused of misconduct, **clear documentation provides the best chance for a fair and timely resolution.***

### **Questionable Research Misconduct**

- Some aspects of conduct are too new or poorly defined to allow for a simple answer about what is appropriate. Other behaviors may stem simply from bad manners, honest errors, or differences of opinion, which may be questionable without being research misconduct.
- Impressions should be validated before making serious charges, and many apparent problems can be resolved by other means.

### **Dispute resolution**

Many concerns are best addressed by means other than alleging research misconduct. Some institutions have formal mechanisms in place for conflict resolution, mediation, or arbitration; absent such mechanisms, finding a solution to a dispute may require some creativity.

- **Conflict resolution:** Often, good conflict resolution skills may be helpful or even sufficient. Deal with the problem as early as possible. Begin by defining points of agreement and then work on areas of disagreement. Emphasize the problem rather than the person. Give and ask for clear communication about what is most important to each of the interested parties.
- **Mediation:** A respected third party can sometimes help with mediating a dispute. The goal is to clarify issues in a way that permits the best possible agreement or compromise.
- **Arbitration:** When other avenues of communication have failed, then parties to a dispute might be convinced to put their cases before a mutually agreeable arbitrator for review and a binding decision.

### **Public Allegations**

- The pace of the process for dealing with alleged misconduct can be frustrating. In such circumstances, it can be tempting to discuss the case publicly. However, placing a complex, unresolved issue into the public arena can be harmful to those directly involved and the scientific community as a whole.
- Publicity may also compromise the integrity of an ongoing inquiry and the privacy of parties to the investigation. Moreover, an attempt to circumvent the institutional process may prejudice those charged with reviewing the allegation.

## Background

### Science is predicated on trust

Without confidence in the integrity of their peers, scientists would lack a foundation on which to build new work.

### Self-regulation

Self-regulation and self-policing operate to ensure the **legitimacy of research**, and necessitate that scientists foster an environment in which **responsible research is explicitly discussed and encouraged**. In part, this means that scientists should be familiar with **definitions of research misconduct** and **procedures for dealing with it**, regardless of whether they will ever be party to allegations.

### How frequently does research misconduct occur?

There are some indications that research misconduct occurs only rarely, although questionable research practices may be common (e.g., Kalichman and Friedman, 1992; Martinson et al., 2006). However, there are many barriers to accurately quantifying the extent of research misconduct; for example, cases may go unreported and institutions may be biased against finding misconduct. The actual rate of research misconduct could be as low as 1 in 100,000 or as high as 1 in 100 (Steneck, 2000; Steneck, 2006). Yet, in the past 25 years, many serious allegations of misconduct have been widely publicized, and some of those were borne out by subsequent investigation.

## Examples of Research Misconduct

### ***Hwang Woo-suk's Stem Cell Research (Sang-Hun, 2009)***

In 2006, Korean researcher Hwang Woo-suk was found to have fabricated a series of experiments in stem cell research. He reported creating embryonic stem cells through cloning in two Science journal articles. In addition to research misconduct, Hwang was charged with embezzlement and bioethics violations.

### ***Bengü Sezen's Research Misconduct (Marcus, 2010)***

Bengü Sezen, a chemistry researcher at Columbia University, is notorious for being one of the worst cases of research misconduct in the chemistry community. Sezen perpetrated a massive, sustained effort to manipulate and falsify research data. Even going to the extent of creating fictitious people and organizations to back up her data. The Office of Research Integrity found Sezen guilty of 21 counts of research misconduct.

## Regulations and Guidelines

### **Federal Definition of Research Misconduct**

A **government-wide definition** of Research Misconduct was proposed by the Office of Science and Technology Policy (OSTP, 2000) and is now covered in the Code of Federal Regulations for the Public Health Service (PHS, 2006), the National Science Foundation (NSF, 2006), and other agencies as well.

In all cases, research misconduct is essentially defined as: "fabrication, falsification, or plagiarism in proposing, performing, or reviewing research, or in reporting research results."

- **Fabrication** is making up data or results and recording or reporting them.
- **Falsification** is manipulating research material, equipment, or processes, or changing or omitting data or results such that the research is not accurately represented in the research record.
- **Plagiarism** is the appropriation of another person's ideas, processes, results, or words without giving appropriate credit.

Minimally, for something to count as research misconduct, it must be committed ***intentionally, knowingly, or recklessly***, and there must be a significant departure from accepted practices of the relevant research community.

Not all instances of misbehavior or questionable conduct are covered under these policies, but for those practices that are covered, there are explicit steps that must be taken in the event of an allegation of misconduct.

## Responsibilities

### ***Shared responsibilities for addressing research misconduct***

- ***Federal agencies*** have ultimate oversight authority for Federally-funded research
- ***Research institutions*** bear primary responsibility for the prevention and detection of research misconduct and for the phases required once research misconduct has been reported.

### ***Phases of Response to Allegation of Research Misconduct***

1. ***Inquiry***: assessment of whether the allegation has substance and if an investigation is warranted
2. ***Investigation***: formal development of a factual record, and examination of that record leading to the dismissal of the case or to a recommendation for a finding of research misconduct or other appropriate remedies
3. ***Adjudication***: recommendations are reviewed and appropriate corrective actions determined

## Discussion

### Discussion Questions

1. Define fabrication, falsification, and plagiarism.
2. Give at least three examples of misconduct by researchers that would not meet the existing definitions of research misconduct. In your institution, what can be done about these types of misconduct?



3. In your institution, what formal procedures or mechanisms (e.g., ombudsman, conflict resolution, arbitration, mediation) are available to help resolve disputes or questions about the responsible practice of science?
4. Outline the basic steps to be followed in your institution for responding to an allegation of research misconduct.
5. If you have direct evidence that someone in your institution has committed research misconduct, then to whom and how should such an allegation be made?
6. If you were accused of having fabricated data that you had produced, how could you demonstrate that you really did obtain the results you reported?

### **Case Study 1**

A graduate student, working on a project that involves extensive DNA sequencing, provides his mentor with a computer-generated sequence of a gene. The student tells his mentor that the sequence determination has involved complete analysis of both strands of the DNA molecule. Over the next several months, it is determined that not all of the sequence data reflects analysis of both DNA strands. Indeed, follow-up work by a postdoctoral in the laboratory reveals several mistakes in the sequence. The student in question admits to misleading his mentor and, following appropriate investigation, is convicted of scientific misconduct and dismissed from the graduate program. The mentor realizes that the student presented some of the erroneous data at a regional scientific meeting. Proceedings of the meeting were not published but abstracts of all of the works presented were distributed to approximately 100 meeting participants. In addition, the student, with the mentor's permission, sent the sequence by electronic mail to three other laboratories. What, if any, responsibility does the faculty mentor have with regard to disclosing the above developments? What, if anything should the mentor do about the prematurely released data? Under these circumstances, what is the potential for harm coming from this incident of scientific fraud? Who might be harmed?

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### **Case Study 2**

You are an editor for the *Journal of Novel Diagnostics*. You recently handled a manuscript that compared two new diagnostic tests for the detection of a genetic defect. Test 1 is marketed by Genetix, Inc., and test 2 is marketed by Probes Unlimited. The manuscript concludes that test 1 is superior in terms of reliability and

accuracy. Following peer review and minor revision, you accept the paper and it appears in print. Shortly after publication, you receive a letter from the Vice President for Research at Probes Unlimited. She claims that examination of the methods section of the paper reveals that the authors used test 2 in a manner that significantly deviates from the instructions provided by Probes Unlimited. Moreover, she claims that the senior author on the paper has previously received research grants from Genetix, Inc. Is this "sloppy science" or scientific fraud. What course of action do you take?

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### **Case Study 3**

Dr. Hickory submits a grant application to a federal funding agency. When he receives the summary statement review of the grant application, he finds that it has been criticized on several grounds and that it has received a score that will prevent the application from being funded. He decides to do more experiments to generate preliminary information and indefinitely postpones resubmitting the grant application. Approximately 18 months later, Dr. Hickory is asked to serve as an ad hoc reviewer for a research grant submitted to a private foundation. The topical area of the grant is closely aligned with Dr. Hickory's area of expertise. It turns out that the principal investigator of this application, Dr. Poplar, was a member of the panel that previously reviewed Hickory's above-referenced grant. In reading the introductory section of the grant application, Dr. Hickory realizes that the structure and content of this section is strikingly similar to his previously submitted unfunded grant application. In fact there are several areas of the introduction where wording is virtually identical to his initial grant application. Moreover, several of the experiments proposed in the application to the private foundation are quite similar (but not identical) to the ones he had previously proposed. Dr. Hickory wonders what he can and should do about this situation. He comes to you for advice. What advice do you give him?

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### **Resources**

- [OEC Falsification, Fabrication, Plagiarism & Cheating Bibliography](#)  
A bibliography of websites, articles, guidelines, and books looking at different aspects of research misconduct.

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## **Notes**

The Resources for Research Ethics Education site was originally developed and maintained by Dr. Michael Kalichman, Director of the Research Ethics Program at the University of California San Diego. The site was transferred to the Online Ethics Center in 2021 with the permission of the author.

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Instructor Materials

## **Parent Collection**

Resources for Research Ethics Education

## **Topics**

Research Misconduct

## **Discipline(s)**

Research Ethics

Teaching Ethics in STEM