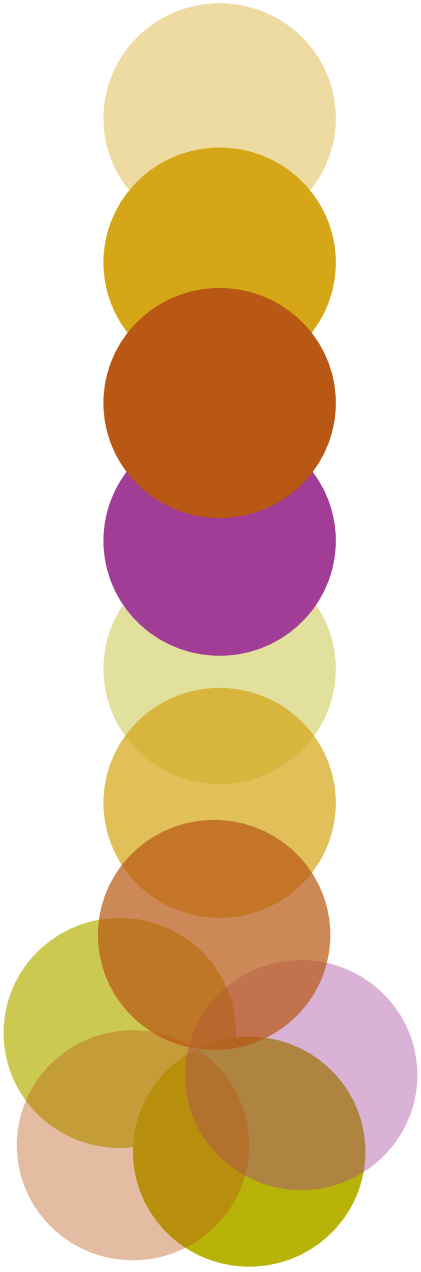

Responsible Conduct of Research

A Shared Responsibility

- 5 Qualities of Good Research Mentors
- 5 Ways Supervisors Can Promote Research Integrity
- The Research Community Safeguards Scientific Integrity
- Write Ethically from Start to Finish
- Tips for Avoiding Plagarism
- Authorship Practices to Avoid Conflicts
- Tips for Presenting Scientific Images with Integrity
- Everyone Plays a Role in Research Integrity
  A "Publish or Perish" Case Study

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Download RCR posters from: www.purdue.edu/research/regulatory-affairs/researcher-training/
or contact RCRTraining@purdue.edu to request copies

5 QUALITIES OF GOOD RESEARCH MENTORS

"A mentor is a person who has achieved career success and counsels and guides another for the purpose of helping him or her achieve like success."[1]

RESPECTFUL

Demonstrates respect for all laboratory members, which reduces fear and unhealthy competitiveness.

SUPPORTIVE

Supports mentees by acknowledging accomplishments and challenging mentees to develop skills that advance their careers.

AVAILABLE

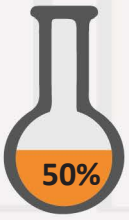
Establishes open and responsive communication with mentees, which promotes research integrity and discourages questionable research practices.

PREPARED

Anticipates the needs of mentees and is prepared to provide assistance and guidance.

HONEST

Sets high standards for honest reporting of data, regardless of whether the data supports the desired outcome.



Respondents in **over 50% of ORI's findings of research misconduct** are **postdocs, students, technicians, and research assistants.**[2]

Why is mentorship important?

Good mentorship improves the quality and integrity of scientific research.

Citations:

[1] https://oir.nih.gov/sourcebook/mentoring-training/guide-training-mentoring

[2] From 2006 to 2015. See Page 8: https://ori.hhs.gov/images/ddblock/march_vol24_no1.pdf

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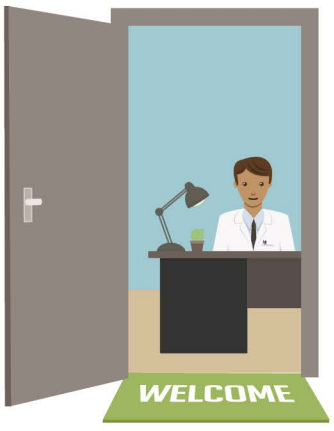
5 WAYS SUPERVISORS CAN PROMOTE RESEARCH INTEGRITY

Are you a principal investigator, research coordinator, academic advisor, or mentor? Roles such as these place you in a unique position to cultivate exceptional research practices among the next generation of researchers.

1 BE AVAILABLE & APPROACHABLE



Your team wants to learn from YOU!

REVIEW RAW DATA

2

You are responsible for the integrity of your team's data.

3 COMMUNICATE EXPECTATIONS

Prevent misunderstandings by making sure everyone is on the same page.

PROVIDE TRAINING and GUIDANCE 4

Avoid making assumptions about anyone's skills or knowledge.

KNOW YOUR RESEARCH INTEGRITY OFFICER 5

Be prepared in case you ever suspect research misconduct.

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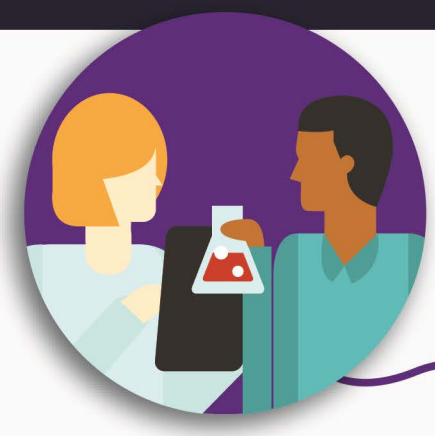
THE RESEARCH COMMUNITY SAFEGUARDS
SCIENTIFIC INTEGRITY



RESEARCHERS

Reproduce, expand on, and openly debate research results

FUNDING AGENCIES

Ensure funding of quality research through rigorous grant review

INSTITUTIONS

Foster a culture of research integrity through mentoring, education, and policies

WHAT'S YOUR ROLE?

WHISTLEBLOWERS

Draw attention to questionable research

JOURNALS & PEER REVIEWERS

Scrutinize submissions to disseminate accurate research

GOVERNMENT REGULATORY AGENCIES

Protect humans, animals, and tax dollars in research and handle research misconduct allegations

Learn more about responsible research with our educational materials:
ori.hhs.gov/resources

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WRITE ETHICALLY

FROM START TO FINISH

PREPARE

Secondary sources might have misinterpreted the work

HAVE A **THOROUGH UNDERSTANDING** OF YOUR SOURCES

Accurately communicate their ideas and terminology

WRITE

SELECTIVE REPORTING

Present unbiased information by acknowledging conflicting evidence and alternative interpretations

CITE YOUR SOURCES

DO NOT PLAGIARIZE

USE YOUR OWN WORDS AND SENTENCE STRUCTURE

&

MAINTAIN THE INTENDED MEANING OF THE SOURCE

OR

QUOTE VERBATIM TEXT

PUBLISH

Only include those who have made substantial contributions to a project

Give proper authorship or acknowledgment to those who have contributed to a paper

AVOID GHOST AUTHORSHIP

Learn more about ethical writing: ori.hhs.gov/ethical_writing

Roig, M. (n.d.). Avoiding plagiarism, self-plagiarism, and other questionable writing practices: A guide to ethical writing. Retrieved September 01, 2016, from https://ori.hhs.gov/ethical_writing

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TIPS FOR AVOIDING PLAGIARISM

WHAT IS PLAGIARISM?

The appropriation of another person's ideas, processes, results, or words without giving appropriate credit.

1. Always acknowledge the contributions of others in your work
2. Identify the citation source when paraphrasing or summarizing
3. Provide a citation when in doubt about facts or common knowledge
4. Always enclose verbatim text in quotation marks with an accompanying citation
5. Cite primary sources of information not secondary or tertiary

"Don't plagiarize. Express your own thoughts in your own words.... Note, too, that simply changing a few words here and there, or changing the order of a few words in a sentence or paragraph, is still plagiarism. Plagiarism is one of the most serious crimes in academia."[1]

"You paraphrase appropriately when you represent an idea in your own words more clearly and pointedly than the source does. But readers will think that you plagiarize if they can match your words and phrasing with those of your source."[2]

Adapted from *Avoiding Plagiarism, Self-Plagiarism, and Other Questionable Writing Practices: A Guide to Ethical Writing* by Miguel Roig.

View 28 Guidelines to Avoid Plagiarism: https://ori.hhs.gov/plagiarism-0

Citations:
[1] Pechnick, J. A. (2013). A short guide to writing about biology, 8th Edition. Boston: Pearson. Page 5.
[2] Booth, W. C., Colomb, G. G., & Williams, J. M. (2008). The craft of research. Chicago: The University of Chicago Press. Bright Tunes Music Corp. v. Harrisongs Music, Ltd. (1976). 420 F.Supp. 177 (S.D.N.Y). march_vol24_no1.pdf. Page 194.

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AUTHORSHIP PRACTICES TO AVOID CONFLICTS

Every field of study experiences conflicts with determining authorship on published papers

Implementing the following suggestions may help avoid potential authorship disputes:

BE PREPARED
Establish written authorship agreements with all members of the lab and other collaborators before preparing a manuscript or before starting a project.

DOCUMENT CONTRIBUTIONS
Authors should list their substantial contributions to the design of the study; the acquisition, analysis, or interpretation of data; and the contribution to the writing of the final paper.

BE CONSISTENT
Have clearly written expectations for authorship on publications and follow them.

COMMUNICATE OFTEN
As the project progresses, the authorship agreement may need to be revisited.

APPROVE THE MANUSCRIPT
All authors should review manuscripts and approve the final version.

[1]This may include people who provide support such as: editorial assistance (e.g., proofreading), limited data collection, supervision of research tasks without contribution to the collection, analysis, or interpretation of data, or the writing of the publication, and technical support

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TIPS FOR PRESENTING SCIENTIFIC IMAGES with INTEGRITY

Images should clearly and correctly represent research results. Minor image processing may be acceptable but, as depicted below there's a fine line between enhancing an image and distorting it.

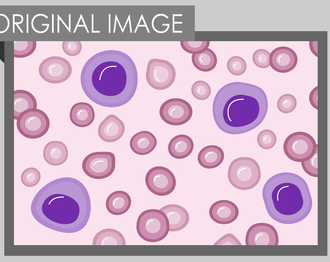
BE AWARE:

Undocumented image manipulations can lead to accusations of research misconduct.

67% of ORI's closed research misconduct cases involved image manipulation.*

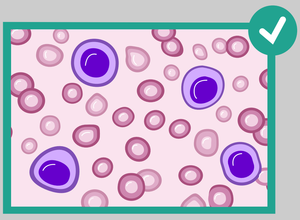
*between 2011 and 2015

ORIGINAL IMAGE

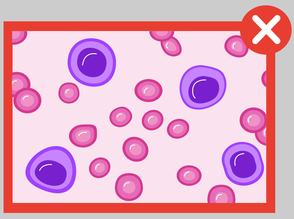


COLOR ENHANCEMENTS

Changing the contrast, color, or brightness



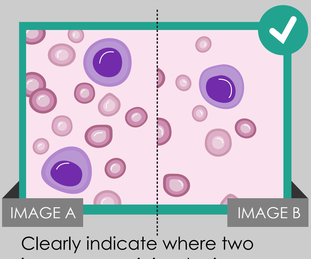
Ensure that the meaning of the image stays the same and fine details are not removed.



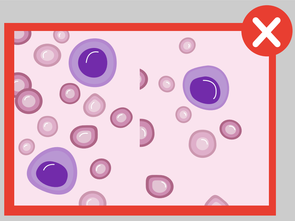
Contrast and saturation were increased causing the background cells to disappear.

SPLICE & PASTE

Combining multiple images into one image



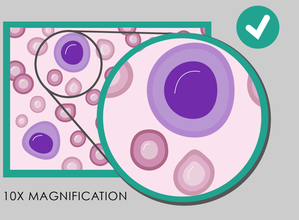
Clearly indicate where two images were joined using a dividing line and labels.



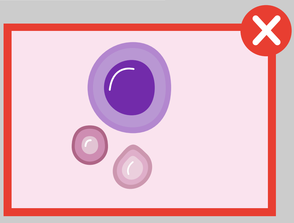
Two images were combined causing them to look like new data.

CROP

Cutting out components and resizing



Use a magnification panel to highlight desired visual data.



Reference information was selectively removed from the image causing loss of data.

WHAT ELSE MUST YOU DO?

- Clearly document all changes made to an image.
- Retain the unprocessed image for your records.
- Follow journal guidelines for premissible processing.

LEARN MORE ABOUT IMAGE PROCESSING:
http://ori.hhs.gov/ImageProcessing

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EVERYONE PLAYS A ROLE IN RESEARCH INTEGRITY

A "PUBLISH OR PERISH" CASE STUDY

There are many reasons someone might engage in research misconduct — such as inadequate training and oversight, personal and professional stress, and fear of failure.

One potential driver of research misconduct is the pressure to "publish or perish." Let's look at how this is affecting Bob, a young scientist, and how his environment may be a contributing factor.

The U.S. Department of Health and Human Services (HHS) defines research misconduct as:

FABRICATION, FALSIFICATION, or PLAGIARISM

in proposing, performing, or reviewing research, or in reporting research results.[1]

PERSONAL LEVEL

Bob is falsifying data

Bob is working hard to publish his research. He is facing a tight deadline and his experiments are not yielding desirable results. He feels that the only way to meet his deadline is to falsify his data.

What leads him to commit research misconduct?

13 HHS makes about 13 findings of research misconduct a year.

INTERPERSONAL LEVEL

Bob's lab is under pressure to publish

Dr. C, Bob's boss, places unreasonable demands on the lab team to produce publishable results. Dr. C is busy and rarely reviews the raw data. Without any oversight, Bob easily falsifies his data.

What can his lab supervisor do to reduce this pressure?

72% In 45 cases of research misconduct committed by trainees, 72% of supervisors had not reviewed the source data.[2]

INSTITUTIONAL LEVEL

The university rewards academic publications and grants

Dr. C needs more publications to earn tenure. Her department chair requires Dr. C to secure grant funding to maintain her lab. These pressures distract Dr. C from her mentoring responsibilities in the lab.

What can the university do to reward responsible research?

RESEARCH COMMUNITY LEVEL

8% *Nature* only publishes about 8% of papers submitted.[3]

The research community reinforces the pressure to "publish or perish"

Bob, Dr. C, and their institution are part of a broader research community. They all face the competitive pressures generated by their peers, funding sources, journals, and academic societies.

What can the research community do to change this norm?

The pressures scientists face are perpetuated at every level.

What can you do to promote integrity from your place in this system?

Citations:

[1] For the full definition of research misconduct, see 42 C.F.R. § 93.103.

[2] Wright, D. E., Titus, S. L., Cornelison, J. B.. (2008). Mentoring and Research Misconduct: An Analysis of Research Mentoring i n Closed ORI Cases. Science and Engineering Ethics, 14, 323-336.

[3] Getting Published In Nature: The Editorial Process. (2016). Retrieved March 17, 2016 http://www.nature.com/nature/authors/get_published/

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