

RESEARCH INTEGRITY




Ethics in Scientific Research

An Examination of Ethical Principles
and Emerging Topics

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The goal
today is to
help scientists
and engineers



Learn about best research practices across the scientific community



Find out about laboratory resources and policies



Acquire the knowledge to make sound judgements, and practice high ethical standards that prevent mistakes



We hope to foster a culture where high ethical standards persist, ongoing professional development is encouraged, and staff have an understanding of, and commitment to, integrity in research.



Outline of Research Integrity class

 Lawrence Livermore
National Laboratory



OVERVIEW OF BEST
PRACTICES WITHIN OUR
SCIENTIFIC COMMUNITY




SUMMARY OF LLNL
RESPONSIBILITIES AND
RESOURCES



EXAMPLES OF RESEARCH
MISCONDUCT



OPEN DISCUSSION: EXAMPLES
OF INTEGRITY IN RESEARCH
PRACTICES



Research is
based on
everyday,
ethical values

Honesty

Fairness


Objectivity

Openness

Trustworthiness

Respect for others

- The application of these values in the context of research is called the *Scientific Standard*



The relationship of science in society

The public will support science only if it can trust the scientists and institutions that conduct research.


—National Research Council and Institute of Medicine (2002)

We do science to advance knowledge, help society, improve lives, help governments & communities set policy, and make new products

Scientific Standard is founded on trust

- Society expects honest and accurate discovery
- Researchers expect data to be carefully collected and accurately reported
- This endeavor is largely a self-regulating community
 - Beginner researchers
 - Established researchers

You ARE or WILL become role models



Responsible conduct requires obligations on the part of scientists and engineers

- Honor the obligation of trust
- Act to serve the public
- Obligation to serve oneself—
personal integrity, and the scientific
community

Don't forget, your conduct is your brand



Definition of Research Misconduct

Research misconduct* is defined as *fabrication, falsification, or plagiarism* in proposing, performing, or reviewing research, or in reporting research results. It includes retaliation against a person who reports alleged misconduct.

1992 NAS report, 2017 NAS-fostering RI

Fabrication—making up and reporting data

Falsification—manipulating data or equipment such that the research is not accurately represented

Plagiarism— appropriating another person's ideas, results, words without giving credit

* <http://www.aps.org/policy/statements/federalpolicy.cfm>




Federal Government Policy

Scientific misconduct must be significant, intentional and proved by a preponderance of evidence.

- Abuse of confidentiality in peer review
- Failure to allocate credit in publications
- Not adhering to government regulations
- Failure to report misconduct
- Retaliation

We are not talking about honest mistakes,
or sloppy work




Defining the role of authors and contributors

*Also includes
proposals, patents,
and presentations*

Authorship confers credit and has important academic, social, and financial implications.

Authorship also implies responsibility and accountability for published work.

- Determinations of authorship roles are often complex, delicate and potentially controversial
- When a large multi-author group has conducted the work, the group ideally should decide who will be an author **before the work has begun** and confirm who is an author before submitting the manuscript for publication



Defining the role of authors and contributors

*Also includes
proposals, patents,
and presentations*

Authorship* is based on the following 4 claims:

- **Substantial contributions** to the conception or design of the work; or the acquisition, analysis, or interpretation of data for the work; AND
- **Drafting the work or revising it** critically for important intellectual content; AND
- **Final approval** of the version to be published; AND
- **Agreement to be accountable** for all aspects of the work in ensuring *that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.*

Contributors who meet fewer than all 4 of the above criteria for authorship should not be listed as authors, but they should be acknowledged

* ICMJE: Medical journal, but most other organizations have followed or modified this (e.g. Science Magazine, NAS (PNAS))¹⁰




Responsibilities as a researcher at LLNL



All members of the Laboratory community who are engaged in research are expected to:

- Conduct research with integrity and intellectual honesty. Exercise intellectual honesty, discipline, adherence to professional ethics, and good judgment
- Be aware of LLNS' policies relating to research
- When appropriate, be aware of the policies and procedures of the agencies funding research
- Conduct research with appropriate regard for human and animal subjects
 - Institutional Animal Care and Use Committee



Defining the role of authors and contributors At LLNL

The Lab's current policy (POL-7007) on Authorship is slightly different from external agencies

- An author is an individual who has made substantial intellectual contributions leading to a scientific publication. Only individuals who have made significant contributions to the research should be listed as authors.
- All authors should meet at least one of the following two criteria, and all those who meet one of the criteria should be authors:
 - Scholarship: An individual who has contributed significantly to the conception, design, execution, analysis, and/or interpretation of the research.
 - Authorship: An individual who has written substantial sections of a paper or participated substantively in revising the manuscript for intellectual content.



A Comparison with community policies

Lab's current policy

All authors should meet at least **one** of the following two criteria:

- **Scholarship:** An individual who has contributed significantly to the conception, design, execution, analysis, and/or interpretation of the research.
- **Authorship:** An individual who has written substantial sections of a paper or participated substantively in revising the manuscript for intellectual content.

Scientific community

Authorship is based on the following 4 claims:

- **Substantial contributions** to the conception or design of the work; or the acquisition, analysis, or interpretation of data for the work; AND
- **Drafting the work or revising it** critically for important intellectual content; AND
- **Final approval** of the version to be published; AND
- **Agreement to be accountable** for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.




LLNL is a
Federally Funded
Research and
Development
Center (FFRDC)

FFRDCs are federally constituted research and development (R&D) organizations that meet special, long-term needs that cannot be met by existing government or contractor resources

FFRDCs work in the public interest and operate as strategic partners with their sponsoring agencies (DOE) to ensure the highest levels of objectivity and technical excellence

We are obligated to provide the best scientific advice to our sponsors regardless to impact



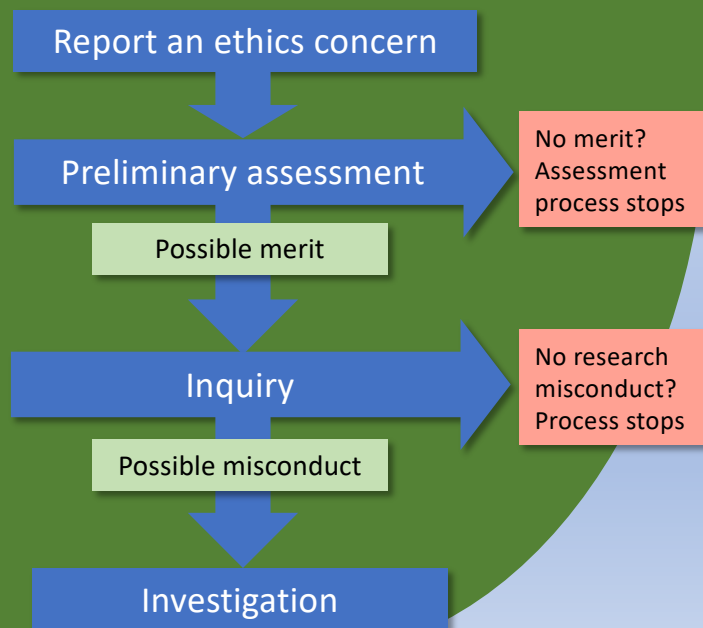
Research
misconduct is
written up in
both Contract 44
and LLNL policy

Contract 44, Section I-78, DEAR 952.235-71, Research Misconduct

- The Lab is responsible for maintaining the integrity of research performed and to prevent, detect, and remediate any research misconduct from occurring
- LLNL Misconduct Policy

Our Lab policy states that we will inquire into, and if necessary, investigate and resolve all instances of alleged misconduct in scientific research

LLNL Policy and Resources



LLNL has policies and procedures in place to investigate and report research misconduct

- To report an ethics concern at LLNL, go to <https://ethics-audit.llnl.gov/report-a-concern/>
- Ethics Office: **William Stern**, Deputy Director, Independent Audit & Ethics Department, Stern12@llnl.gov
- LLNL Research Integrity Officer (within DDST): **Eric Schwegler**, Schwegler1@llnl.gov


Research Integrity Matters

Example I: The Wakefield MMR vaccine

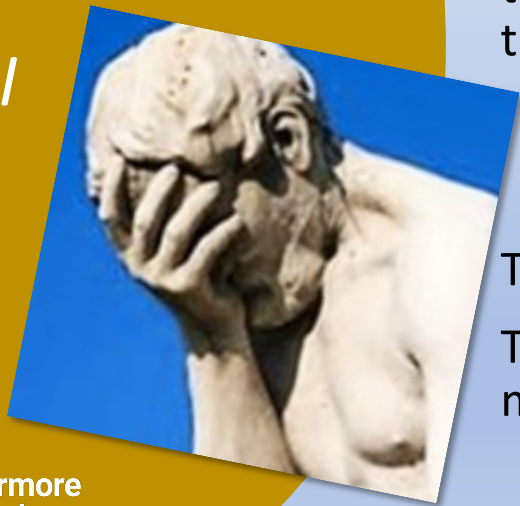


In 1998, Andrew Wakefield published a case study in the Lancet, which suggested that the measles, mumps, and rubella (MMR) vaccine may predispose to behavioral regression and pervasive developmental disorder in children.

- MMR vaccination rates began to drop
- A short retraction of the interpretation of the original data by 10 of the 12 co-authors of the paper, “No causal link was established between MMR vaccine and autism as the data were insufficient.”
- 2010, *Lancet* retracted the Wakefield *et al.* paper
- Wakefield *et al.* were ultimately found guilty of deliberate fraud



Impact of the Wakefield Study *Example 1*



Scientists and organizations across the world spent a great deal of time and money refuting the results and exposing scientific fraud

Parents did not vaccinate their children out of fear of the risk of autism, thereby exposing their children to the risks of disease

- Measles outbreaks in the UK in 2008 and 2009 as well as pockets of measles in the USA and Canada were attributed to the non-vaccination of children

The impact of this fraud continues today

The Wakefield fraud is likely to go down as one of the most serious frauds in medical history



Research Integrity Matters

Example II: Failure to disclose research funding from a foreign government



 Lawrence Livermore
National Laboratory

January 28, 2020

Dr. Charles Lieber, the chair of Harvard University's Department of Chemistry and Chemical Biology, was arrested and criminally charged with making "false, fictitious and fraudulent statements" to the U.S. Defense Department about his ties to a Chinese government program to recruit foreign scientists and researchers. –NPR, Reuters, Nature 2/3/2020

- Between 2012 and 2017, Lieber agreed to be paid a salary of \$50,000 per month, & \$150,000 a year in personal and living expenses by Wuhan Univ. Tech.
- Lieber was to work at or for WUT for at least 9 months a year. Lieber also agreed to host visiting scientists for two-month stints at his US lab
- Lieber, a nanotechnology pioneer, also received at least \$15 million in federal grants from the Department of Defense (DOD) and the NIH since 2008.



Research Integrity Matters

Example II: Failure to disclose research funding from a foreign government

- NIH policies require that researchers applying for federal funds disclose any funding they receive from other governments or universities outside the United States.
- He was indicted for false statements and for hiding his relationship with WUH from his U.S. funding sources
- He was found guilty on both counts (12/21), and recently lost an appeal (9/22). He is out on bail, sentencing scheduled for 1/2023.

Lesson for all LLNL staff: full disclosure

- *grants, etc –be 100% transparent and list everything*



In Summary

Research Misconduct is Serious!

Scientists who publish their research have an ethical responsibility to ensure the highest standards of research design, data collection, data analysis, data reporting, and interpretation of findings



Examples for Discussion

1. Authorship on manuscripts, proposals, patents, awards
2. You think research misconduct is happening, but are not sure what to do
3. Conflict of interest, reviewing grants, writing LOR, serving on committees
4. Plagiarism



Defining the role of authors and contributors

Also includes grants

Postdoc does the work but leaves the Lab for a new position. After 1 year, he/she has still not written up the work, despite repeated requests. The mentor/staff member writes it up. Who is first author?

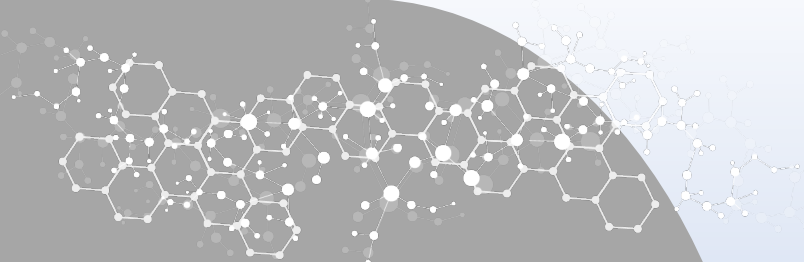
– What are your options?

A junior staff member shoulders the ideas and writing of a proposal but the division leader wants to put a more senior staff member on the proposal as the PI, thinking it will have a better chance of funding (this is not a requirement). The senior staff member was not responsible for developing the proposal and will not be responsible for doing the work, if funded.

– What are your options?

You write a report for a sponsor that isn't exactly what the sponsor wants to hear and they ask you to soften some of the findings. This makes you uncomfortable.

- What are your options?

A decorative graphic of a molecular structure, consisting of interconnected hexagonal and pentagonal rings with small white spheres representing atoms, positioned at the top left of the slide.

You think
research
misconduct is
happening, but
aren't sure
what to do

You work with a group external to the Lab to put together a proposal. At the last minute they take your name off the proposal.

– What are your options?

Your boss writes a proposal and lists relevant publications. You point out that some publications state “accepted” when they are only at the “submitted” stage. Your boss says not to worry, everyone does this

– What are your options?



Conflicts of Interest

Conflicts of interest represent circumstances in which professional judgments or actions regarding a primary interest may be influenced by a secondary interest, such as financial gain or career advancement.

- You are reviewing a manuscript and you collaborated previously with one of the co-authors on an entirely different project
 - Conflict? Resolution?
- You are on a review committee and you are also a contributor on a proposal being reviewed by that committee
 - Conflict? Resolution?



Plagiarism

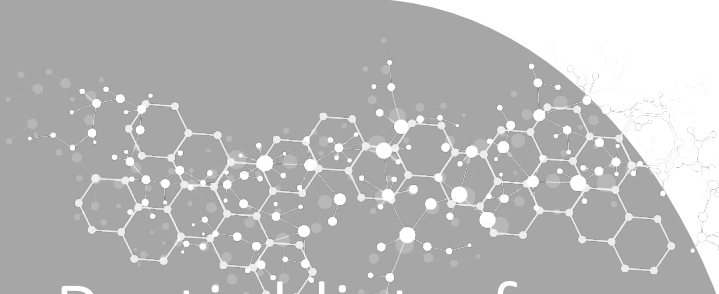
Plagiarism: The appropriation of another person's ideas, processes, results, or words without giving appropriate credit
--2018 NIH

- Software is used by most journals to identify repeated sentences, paragraphs, etc.
- Self plagiarism is an issue too. You cannot submit the same work for publication more than once
 - You cannot submit the same work for publication more than once
 - Re-using text you wrote in multi-publications is also plagiarism.

In Summary:

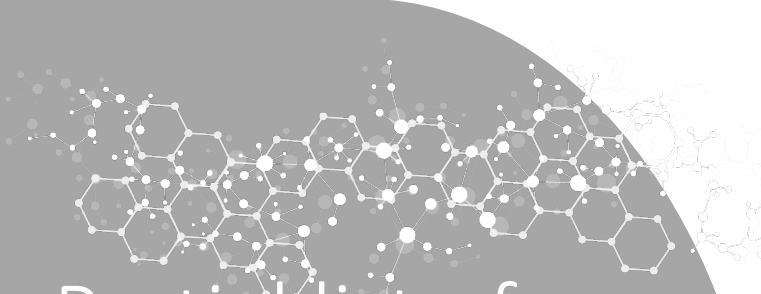
Research Integrity Helps Secure the
Underpinnings of both Science
and Scholarship

<https://st-int.llnl.gov/research-integrity>



Partial list of references & reading material for this class

- National Academies of Sciences, Engineering, and Medicine, [Fostering Integrity in Research](#), The National Academies Press (2017).
- *On Being a Scientist*, NAS 2009, 3rd ed.
- *Ethics in Scientific Research*, RAND, 2019
UC study-still waiting for draft
- *International committee of medical journal editor*
<http://www.icmje.org/recommendations/browse/roles-and-responsibilities/defining-the-role-of-authors-and-contributors.html>
- Conflicts of interest and standards of ethical conduct, NSF Manual 15, 2019
- <https://www.sciencemag.org/careers/2001/03/ethics-authorship-policies-authorship-articles-submitted-scientific-journals>
- National Academy Sciences, Transparency in Authorship:
http://www.nasonline.org/publications/Transparency_Author_Contributions.html
- <http://www.icmje.org/recommendations/>
- <https://www.aaas.org/resources/scientific-integrity>
- U. S. Federal Policy on Research Misconduct
(<http://www.aps.org/policy/statements/federalpolicy.cfm>)
- <https://www.nap.edu/catalog/21896/fostering-integrity-in-research>
- National Academy of Sciences, National Academy of Engineering, and Institute of Medicine, [On Being a Scientist: A Guide to Responsible Conduct in Research: Third Edition](#), The National Academies Press (2009).



Partial list of references & reading material for this class

- American Physical Society, [Ethics Case Studies](#): A series of case studies on ethical issues that can arise in the course of doing physics research, many with accompanying discussion questions, to be used as an educational resource for researchers, mentors, and students.
- M. Thomsen, [An Instructor's Guide for Ethical Issues in Physics](#) (2019): Materials for a course on ethics.
- M. Roig, [Avoiding plagiarism, self-plagiarism, and other questionable writing practices: A guide to ethical writing](#) (2015).
- [Online Ethics Center for Engineering and Science](#): Provides resources and support for engineers, scientists, faculty, and students for understanding and addressing ethically significant issues that arise in scientific and engineering practice and from the developments of science and engineering.
- *Completed in 1992, Responsible Science: Ensuring the Integrity of the Research Process recommended steps for reinforcing responsible research practices (NASNAE-IOM, 1992)*
- American Physical Society, [Guidelines on Ethics](#) (2019).

