Academic Research Ethics

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IMB

Researcher fraud has bad impacts

Harvard and the Brigham call for more than 30 retractions of cardiac stem cell research

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OCTOBER 14, 2018

Piero Anversa

Impacts

- People in the same field
- Collaborators (coauthors)
- Clinical trials (potential lawsuits)
- Biotech investments
- Harvard reputation (donations)
- Fine for 10M UDS

Importance of Research Ethics

學術倫理為學術社群對學術研究行為之自律規範，其基本原則為誠信、負責、公正。只有在此基礎上，學術研究才能合宜有效進行，並獲得社會的信賴與支持。（**國科會對學術倫理的七點說明 102.02.08**）

Research ethics are the **self disciplines** set by academic community to the conducts of academic research. Its basic principles are honesty, responsibility and fairness. Only on this basis, academic research can be properly and efficiently conducted, and be trusted and supported by the society. **So we can get funding to do research.**

One misconduct can destroy your career, and seriously affect the trust and support by the society.

Singapore Statement on Research Integrity

PRINCIPLES

Honesty in all aspects of research

Accountability in the conduct of research

Professional courtesy and fairness in working with others

Good stewardship of research on behalf of others

Singapore Statement on Research Integrity

1. Integrity: Researchers should take responsibility for the trustworthiness of their research.

2. Adherence to Regulations: Researchers should be aware of and adhere to regulations and policies related to research.

3. Research Methods: Researchers should employ appropriate research methods, base conclusions on critical analysis of the evidence and report findings and interpretations fully and objectively.

4. Research Records: Researchers should keep clear, accurate records of all research in ways that will allow verification and replication of their work by others.

5. Research Findings: Researchers should share data and findings openly and promptly, as soon as they have had an opportunity to establish priority and ownership claims.

Singapore Statement on Research Integrity

6. Authorship: Researchers should take responsibility for their contributions to all publications, funding applications, reports and other representations of their research. Lists of authors should include all those and only those who meet applicable authorship criteria.

7. Publication Acknowledgement: Researchers should acknowledge in publications the names and roles of those who made significant contributions to the research, including writers, funders, sponsors, and others, but do not meet authorship criteria.

8. Peer Review: Researchers should provide fair, prompt and rigorous evaluations and respect confidentiality when reviewing others' work.

9. Conflict of Interest: Researchers should disclose financial and other conflicts of interest that could compromise the trustworthiness of their work in research proposals, publications and public

Singapore Statement on Research Integrity

10. Public Communication: Researchers should limit professional comments to their recognized expertise when engaged in public discussions about the application and importance of research findings and clearly distinguish professional comments from opinions based on personal views.

11. Reporting Irresponsible Research Practices: Researchers should report to the appropriate authorities any suspected research misconduct, including fabrication, falsification or plagiarism, and other irresponsible research practices that undermine the trustworthiness of research, such as carelessness, improperly listing authors, failing to report conflicting data, or the use of misleading analytical methods.

12. Responding to Irresponsible Research Practices: Research institutions, as well as journals, professional organizations and agencies that have commitments to research, should have procedures for responding to allegations of misconduct and other irresponsible research practices and for protecting those who report such behavior in good faith. When misconduct or other irresponsible research practice is confirmed, appropriate actions should be taken promptly, including correcting the research record.

Singapore Statement on Research Integrity

13. Research Environments: Research institutions should create and sustain environments that encourage integrity through education, clear policies, and reasonable standards for advancement, while fostering work environments that support research integrity.

14. Societal Considerations: Researchers and research institutions should recognize that they have an ethical obligation to weigh societal benefits against risks inherent in their work.

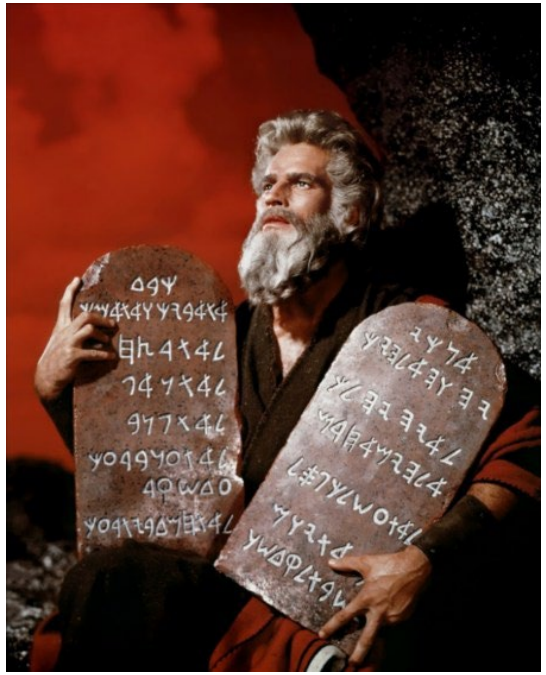
Do’s and Don’ts in Research Ethics

You should …
Many ! (Singapore Statement on Research Integrity)

You should NOT

- **Cheat**
- **Steal**

The Two Commandments



https://sabbaththoughts.com/the-ten-commandments-gods-guide-to-relationships/

OK to be flawed, but cannot cheat

Bad papers are abundant

- Bad logic, bad writing.
- Not rigorous (no proper controls, statistically wrong or insignificant)
- Conclusion not supported by findings
- Still published (many levels of journals, including predatory journals)

No one reads. No one cares. Why?

- Bad/flawed papers can be examined and judged.
- Not research ethics problem.

But cheating cannot be easily detected, therefore, causes more harm.

So, cheating is what we care in research ethics.

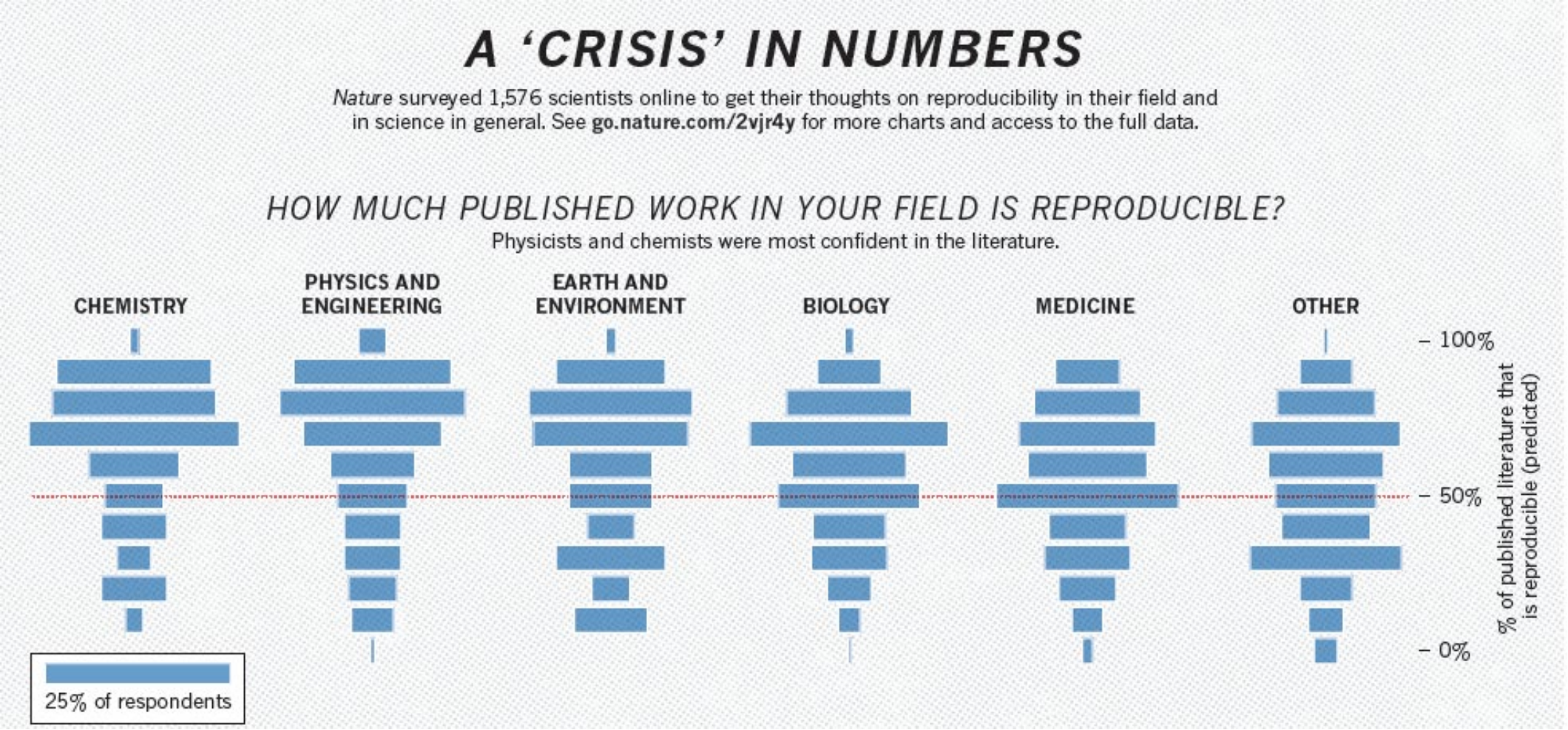
High standards for good research practices

Netherlands Code of Conduct for Research Integrity

- 27. Keep your own level of expertise up to date.
- 28. Take on only those tasks that fall within your area of expertise.
- 38. Be explicit about uncertainties and contraindications, and do not draw unsubstantiated conclusions.
- 39. Be explicit about serious alternative insights that could be relevant to the interpretation of the data and the research results.

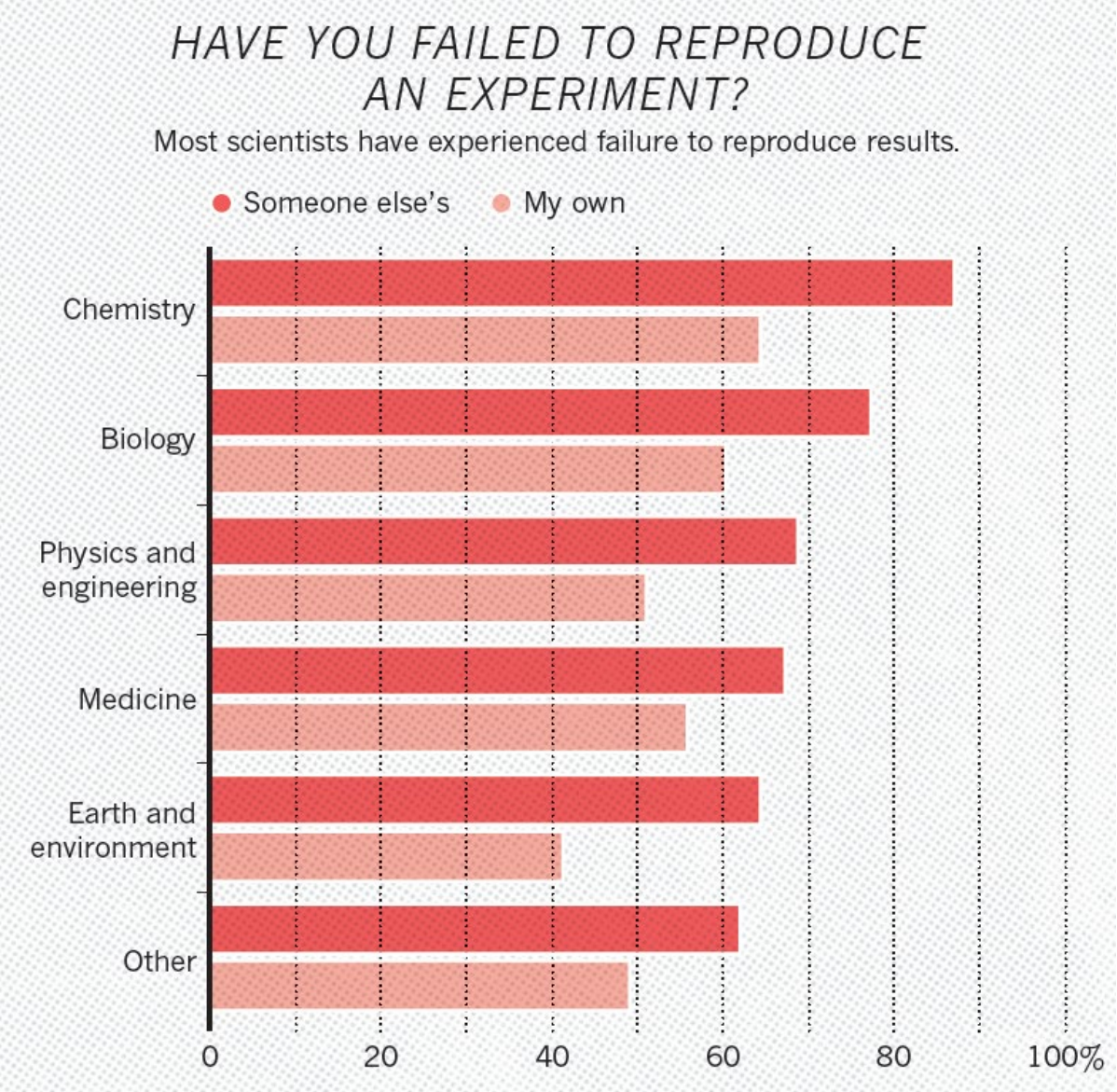
- High standard
- Not meeting standard => rejection (journals, funding)
- Not regarded as research misconduct
- Difference between expectation and punishment

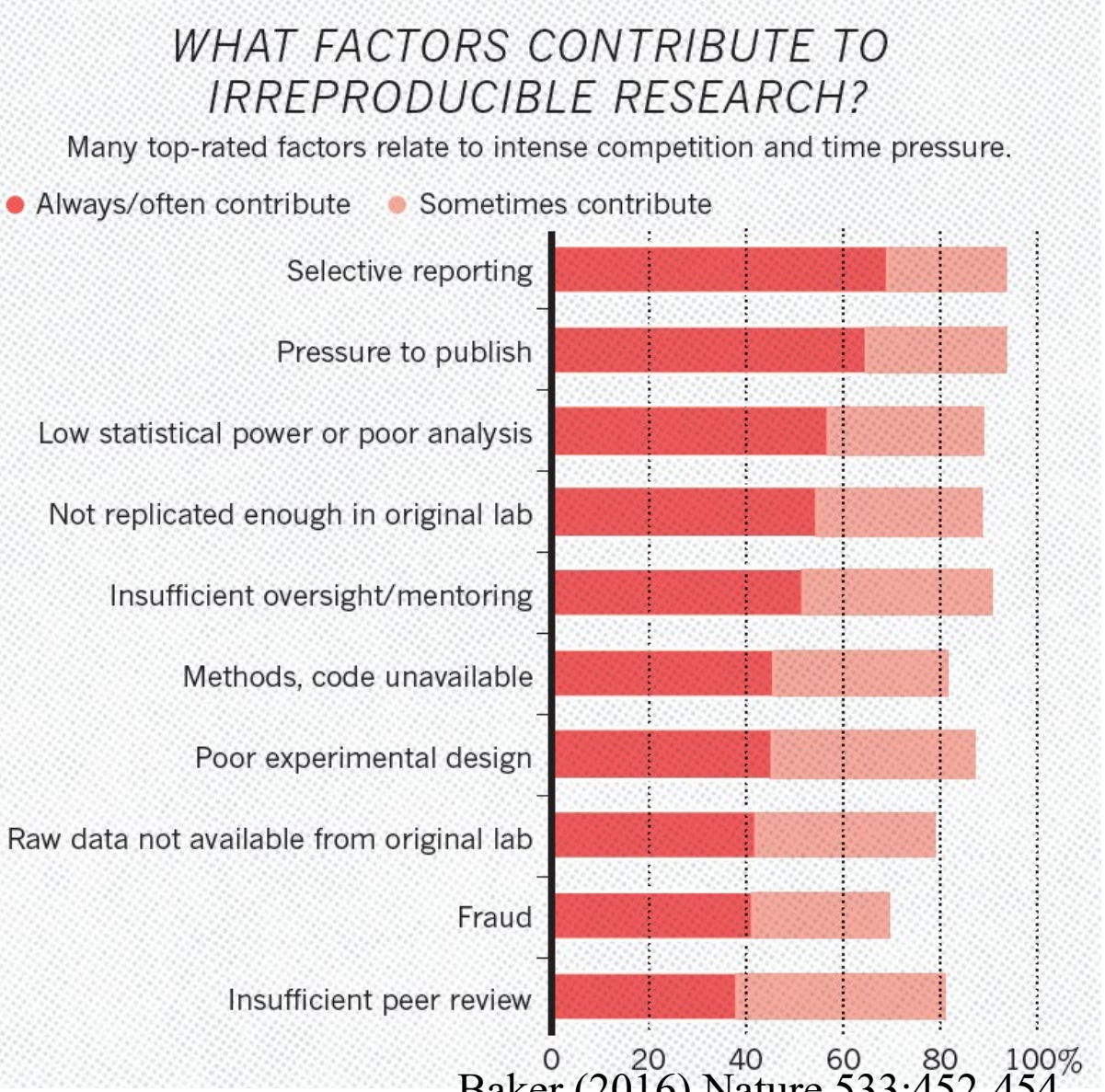
Replication crisis



Baker (2016) Nature 533:452-454

Replication crisis





Baker (2016) Nature 533:452-454

Many reasons for replication failure

- Poor experimental design; variable execution; no proper controls
- Poor or wrong statistics
- Unconscious bias
- Different experimental conditions
- Evolution of experimental methods

Not necessarily research ethics problem.

Science should be rigorous to a degree

Training: journal clubs and lab meetings (avoiding unconscious bias; proper controls)

Who guards rigor?

- Before publication: peer review (current standard)
  - Not meet the standard => rejection
  - Different journals have different standards
  - News worthy, big impact => sacrifice rigor (*Nature* error rate)
- After publication: judgement by the community

Rigor is a subjective judgement

- Not rigorous enough: errors or unreliable information will spread.
- Too rigorous: delays publication and delay societal benefits.
- Block competitor or non-main stream studies, in the name of rigor

Definition of research misconducts

"Research Misconduct" means fabrication, falsification, plagiarism, or other practices that seriously deviate from those that are commonly accepted within the scholarly community for proposing, conducting, publishing or otherwise reporting research. It does not include honest error or honest differences in interpretations or judgments of data.

http://www.ncsu.edu/sparcs/policy/references/interim.html

違反學術倫理的認定： 蓄意且明顯違反學術社群共同接受的行為準則，並嚴重誤導本會評審對其研究成果之判斷，有影響資源分配公正與效率之虞者。（國科會對學術倫理的七點說明 102.02.08）

Those behaviors that intentionally and clearly violating the standard practices commonly accepted within the academic community, and seriously misrepresenting the research accomplishments of the person.

Prevention of research misconducts

Intentional

- No way to prevent intentional crimes.
- Very easy to get caught! Records remain in internet forever.
- Destroys your career!

Non-intentional

- Very easy to deceive yourself.
- Data acquisition, manipulation/analysis, presentation.
- Control experiments.
- Describe all procedures/criteria.
- Education (lab meeting, journal clubs, ethic courses)
- Lab culture

Why do they commit fraud?

- Fame; pressure after fame
- Profit (e.g. drug development)
- I know I am right.
- Survival

Pressure from

- Thesis advisor
- Graduation deadline
- Journal (revision)

Major types of research misconducts

F/F/P (ORI, DHHS, USA)

- **Fabrication 造假**
- **Falsification 變造**

Wrong research results, may mislead others

- **Plagiarism 抄襲**

Take unjust credit

Different degree of influence or damage on others.

Save all primary data

Keep good laboratory record

- purpose of the experiment, detailed procedures, important parameters, results, interpretations

Save all primary data

- Keep multiple copies of primary data (PI, student, cloud); never modify; copy every few years
- Needed for paper submission; when involved in misconduct allegations
- One folder for each experiment. File name should include date, experiment, experimenter, to avoid mix-up.
- Copy to another folder for data processing. Never return to the RAW data folder.

Keep all versions of manuscripts.

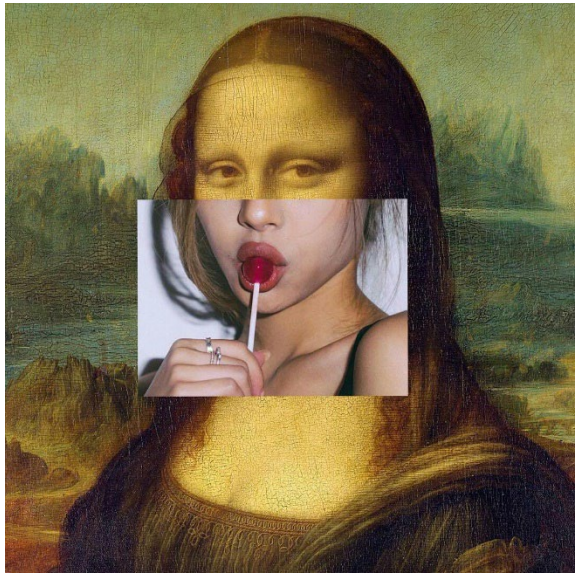
Plagiarism (Stealing)

Plagiarism is the "wrongful appropriation" and "stealing and publication" of another author's "language, thoughts, ideas, or expressions" and the representation of them as one's own original work. (Wikipedia)

Plagiarize: to steal and pass off (the ideas or words of another) as one's own **:** use (another's production) without crediting the source (Merriam-Webster Dictionary)

Exceptions: the source is obvious or common knowledge, so there is no mistake that you are taking credit for it.

- To be, or not to be.
- $E=mc^2$



https://image.posterlounge.ie/images/l/1888787.jpg

https://i.pinimg.com/originals/65/73/f2/6573f2c6c387aad57a577e27fc471a85.jpg

ORI provides working definition of plagiarism

"As a general working definition, ORI considers plagiarism to include both the theft or misappropriation of intellectual property and the substantial unattributed textual copying of another's work."

"Substantial unattributed textual copying of another's work means the unattributed verbatim or nearly verbatim copying of sentences and paragraphs which materially mislead the ordinary reader regarding the contributions of the author.

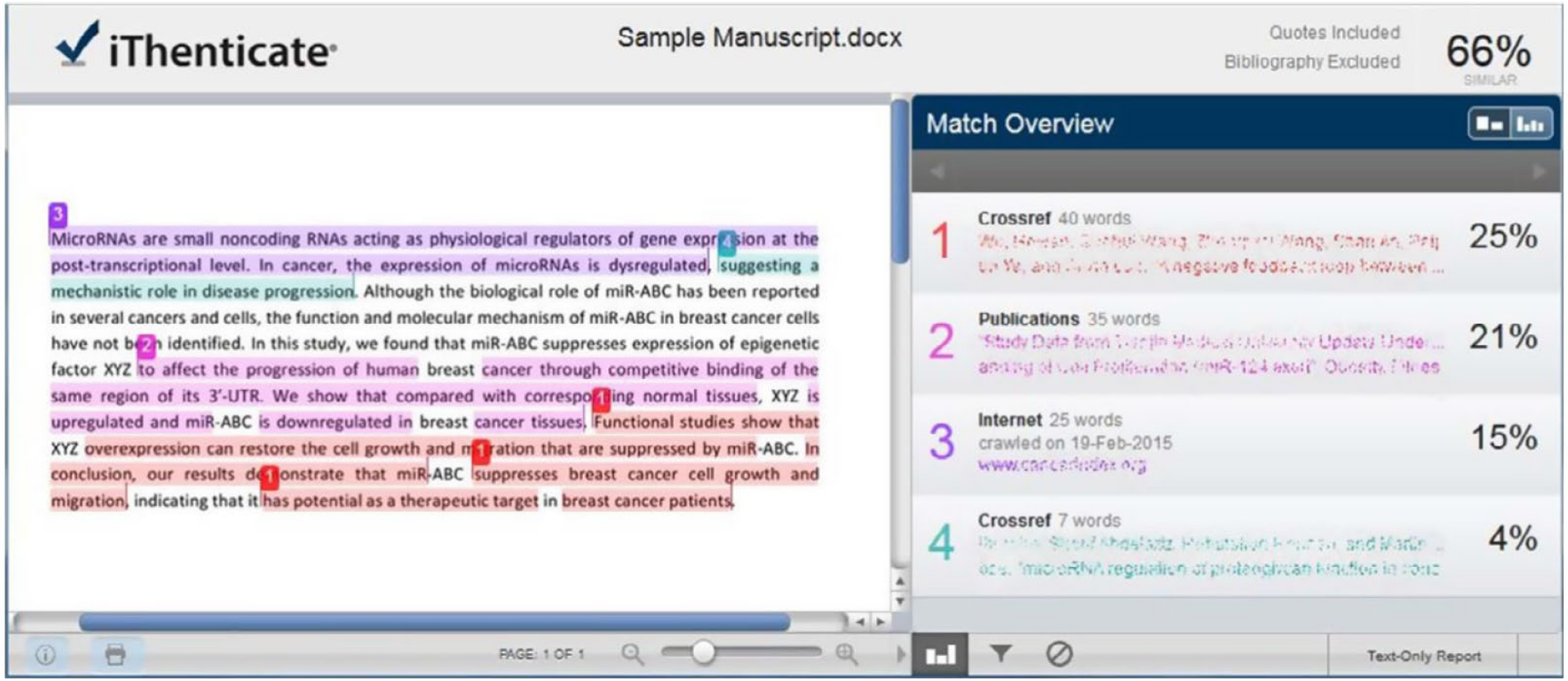
ORI generally does not pursue the limited use of identical or nearly-identical phrases which describe a commonly-used methodology or previous research because ORI does not consider such use as substantially misleading to the reader or of great significance."

ORI Newsletter Volume 3, No. 1, Office of Research Integrity, U.S. Public Health Service, December 1994

Sample of an iThenticate report

- **Detects text similarity, not plagiarism**
- **% similarity is only a reference point**

Bibliography excluded.



Collins et al (2017) The FEBS Journal 284:262–1266

Among teacher/student/collaborators

- Joint work (co-authors, co-PIs, teacher and student). Fair use is fine.
- Indicate specific contribution and cite source.
- No intention of stealing
- Indicate at beginning of grant proposal, or in Acknowledgment (paper, thesis).
  - This proposal is derived/modified from the Ph.D. thesis of XXX and my collaborative work with XXX (2020 PNAS).

Troubles

- The grant/paper uses content from a student's thesis, but the student was not mentioned.
  - The student should be coauthor or acknowledged. The thesis should be indicated.
- Participate in research group discussion => claiming joint work (no documentation).
  - Difficult to refute, unless the cited party raises objection.

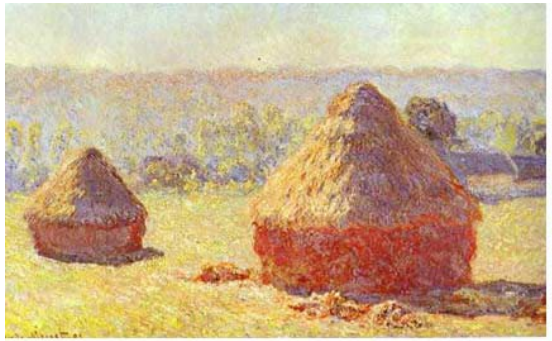
Plagiarism ?

I gave a pop-science talk at a high school, and used a figure from a paper without citing the source.

- Not academic publication. Not research ethics issue.

(copyright infringement is the concern of the publisher)

Self plagiarism?



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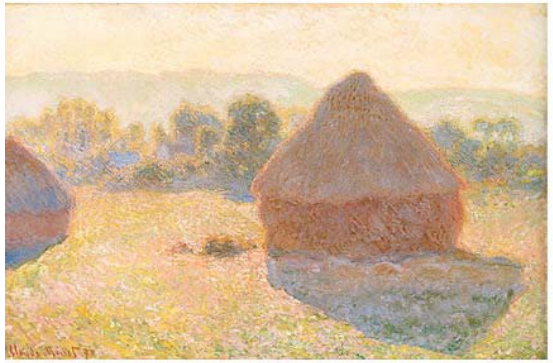

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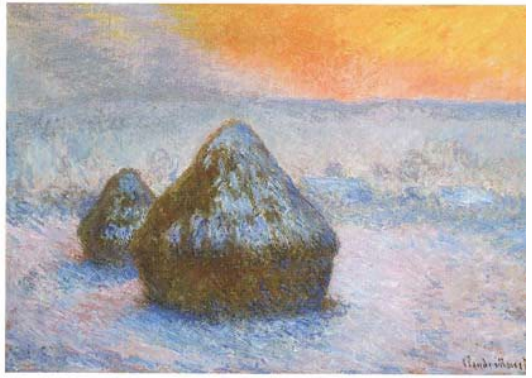

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https://artsology.com/monet-painting-light-with-haystacks.php

Text recycling within the same paper

Sentences in the **Summary**, **Results**, **Figure Legends** and **Discussion** sections in the same paper are highly similar.

Not an issue.

We don’t really care about text recycling.

Duplicate publication is the real issue.

- Plagiarism is stealing from others.
- Self plagiarism? How can you steal from yourself?
- Infringe on the copyright of the publisher. (not the real issue)

- Mis-representation of one's contribution.
  - presenting one's own previously published work as though it were new (American Psychological Association, 2010)

- **Duplicate publication** is the real issue.
  - Of core content of innovation or results
  - Duplicate credit.
  - Affect distribution of research resources.

Case 1

Paper A reports a clinical study of 60 patients, but 40 of these have already been reported in a previous paper B by the same author.

Proper: clearly disclose.

- Results for 40 of the 60 patients have been reported in our previous study (xxx, 2012).

Did not disclose: self plagiarism; intention to cheat the reviewers.

Case 2

Drug testing

- Same analytical methods, same way of presentation of results
- Different drugs, different results
- Not duplicate publication of same result

The key is not in repetition of content (text, figures), but in whether the same results are published again, causing duplicate credit.

孫以瀚. 論自我抄襲－重複發表、文字再使用，有無學術倫理上的處罰必要？2020.11.15 科技報導

Case 3

Copy and paste of Introduction and Material and Methods sections from one paper to another paper/grant by the same author.

Proper way:

- Introduction: try using different ways to present the material, even for the same content.
- Material and Methods: cite previous publications.

Duplicate publication: core content of innovation or results

Two papers by the same author

- Introduction/Background （usually not the core）
- Material and Methods （usually not the core）
- Results （core）
- Discussion （core）
- References （not core）

- If not involving core content, does not count as duplication publication.
- Always cite original source.

- Differences among disciplines：
  - Experimental sciences: easy to define core contents (Results, Discussions)
  - Humanity and Social Science: more emphasis on presentation (of the same ideas)
- Follow the guidelines of journals and funding agency

Text recycling: for the convenience of readers

Tradition way of citing Methods
The … is as previously described (xxx), with the following modifications.

"it may be preferable to provide only a brief summary or paraphrase of that material and refer readers to the source document for details ."

However,
"Many editors, however, prefer that articles published in their journal be self-contained—especially if the source document is behind a paywall."

For the convenience of the readers

UNDERSTANDING TEXT RECYCLING: A Guide for Editors
By Susanne Hall, Cary Moskovitz and Michael Pemberton for the Text Recycling Research Project; V.1, June 2021

Text recycling: for precision and efficiency

"results from a survey of over 300 journal editors and editorial board members from 86 top English-language journals in 16 different academic fields regarding text recycling in scholarly articles. Responses indicate that a large majority of academic gatekeepers believe text recycling is allowable in some circumstances; however, there is a lack of clear consensus about when text recycling is or is not appropriate."

83.6%

I've spent so much effort to craft the best way to precisely describe a method, observation or concept. There is no need to rewrite it in subsequent publications. Rewriting may create confusion. Text recycling is for the sake of precision and efficiency.

Online publication has less constraints in journal space.

S. Hall, C. Moskovitz, and M. Pemberton, Attitudes toward text recycling in academic writing across disciplines, Accountability in Research, 2018.

孫以瀚. 論自我抄襲－重複發表、文字再使用，有無學術倫理上的處罰必要？2020.11.15 科技報導

Case 4

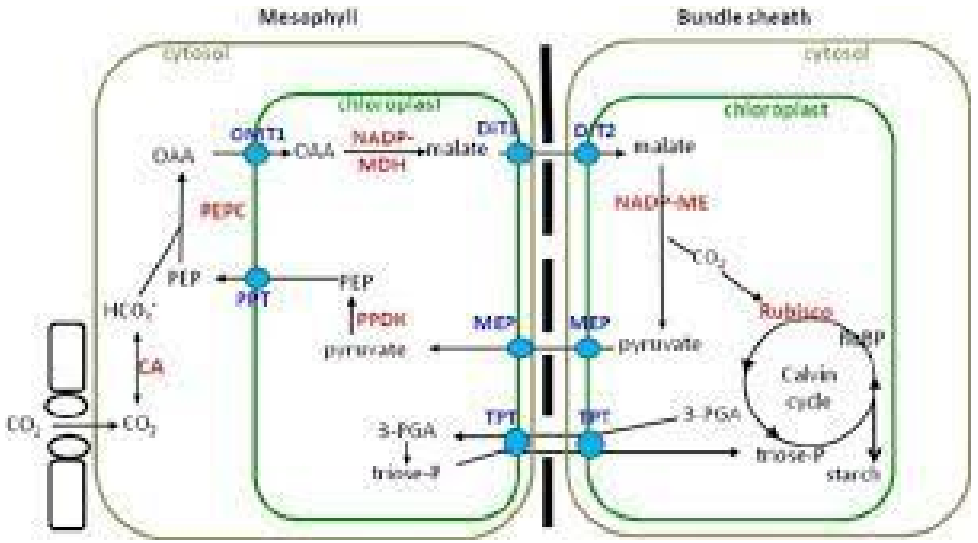
Publishing a Chinese translation of a previous English paper by the same author.

Should:

- Clearly disclose (in Acknowledgement, and inform Editor) it is a translation of a previous publication. (maybe acceptable by the journal, e.g. for a different reader population)
- In CV, clearly indicate one is the translation of another paper.

Case 5

Fig. 1. The C4 pathway for carbon fixation



(Taken/modified from Kakri et al. 2013; with permission from the publisher)

Every study is based on existing foundation contributed by others and oneself.

Introductory figures or text provides the background and foundation for reading the paper.

- Readers would not think these are all your contributions.
- Not the core innovative part of a paper.
- Still need to cite the source.

Karki et al. (2013) *Rice* **6,** 28
https://doi.org/10.1186/1939-8433-6-28

Text recycling: always cite original source

Text recycling (of background, material and method is ok, for the sake of

- Precision and efficiency in description
- Convenience of readers

But should always cite original source.

- The Background/Introduction and Material and Methods sections are partly derived/modified from my 2020 NSTC proposal (xxx) and 2022 my Nature paper (xxx).
- This work is (partly) derived from XXX's Ph.D. thesis of XX University, 2022.

- In Acknowledgment of thesis or paper.
- At the beginning of grant proposal (to make sure read by reviewers)

Low value/significance is not ethics problem

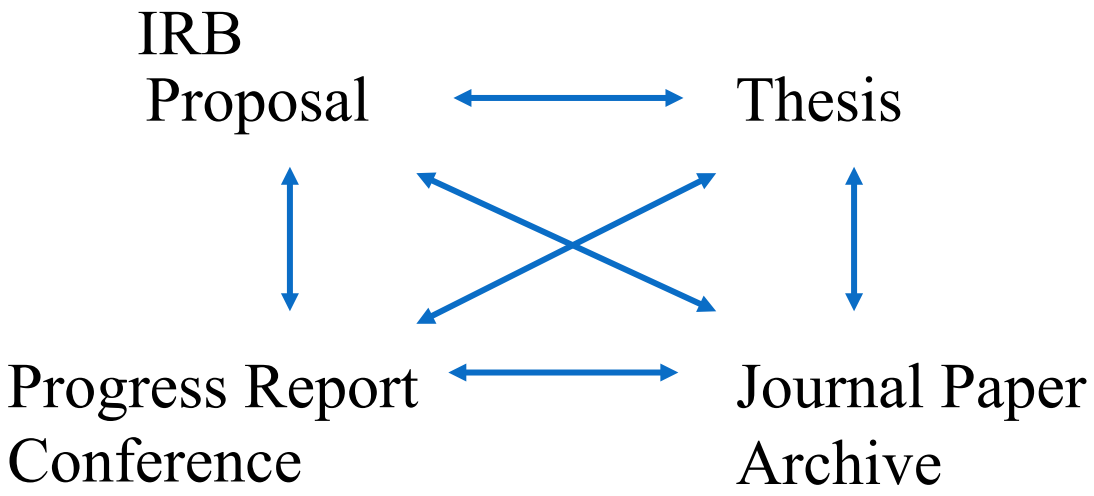
Same logic, analytical methods => Change of variables

- Same gene: regulation at different level (protein stability, transport, phosphorylation)
- X-ray: different proteins
- National Health Insurance Research Database: Correlation between X_i and Y_j

Every paper is based on real study, not duplication publication of the same core results.

Value/significance? **Not ethics problem.**

The series of documents in a study



The series of documents in a study should not be viewed as self-plagiarism, as they are not duplicate publications.

Clearly indicate original source

- List only one in CV, or clearly indicated one is derived from the other.
- If thesis was later published,
  - This work is based/modified from Chapter 2 of my Ph.D. thesis in XX Univ, 2020.
- If paper published before thesis,
  - The Chapter 2 of this thesis has been published in XXX.

The series of documents in a study

Case 6: A journal paper has many sections duplicated from a grant or conference abstract or presentation.

Depends on the tradition of the field. In life sciences, the conference presentation is usually not considered real publication (not listed in your publication list). A grant or a progress report of a grant is not considered publication, hence no need to be cited.

Case 7: A grant or paper has large portions taken from a student's thesis.

Depends on the tradition of the field. In experimental sciences, often the student's thesis can be considered joint publication with the advisor.

OK: if the student is a coauthor on the paper, or included in the grant.
Trouble: if the student is not included in the paper (coauthor or acknowledged) or grant.

Some international viewpoints

U.S. Office of Research Integrity (ORI）does not consider self plagiarism as research misconduct.

COPE (Committee on Publication Ethics) does not consider unpublished work (research proposal, progress report, award application, conference poster and abstract, internet archives) in self plagiarism.

孫以瀚. 論自我抄襲－重複發表、文字再使用，有無學術倫理上的處罰必要？2020.11.15 科技報導

Different journals have different policy

***Anesthesia & Analgesia* Instructions for Authors:**

"Provided the authors are not engaged in duplicate publication, the Journal does **not** view "self-plagiarism" as misconduct. Authors are permitted to reuse their own words, and are encouraged to do so when describing identical research methods in multiple papers."

Many journals do not allow self plagiarism or text recycling.

In humanities and literature: "novelty and the essence of the work are in the eloquence and the wording,"

Habibzadeh and Marcovitch (2011) Plagiarism: the emperor's new clothes. *European Sci Editing* 37:67-70.

Follow the current rules of journal and funding agency.

Don’t be controlled by our tools

Tools change our behavior.

Homology-detecting software (e.g. iThenticate) => catch plagiarism!

=> self-plagiarism (not because we care, but because we can detect it.)

Drunkard looking for lost key under the street lamp. The key is not lost here, but it is brighter here.

Beware of conflict of interests in opinions

Turnitin to Be Acquired by Advance Publications for $1.75B

By Sydney Johnson Mar 6, 2019

https://www.edsurge.com/news/2019-03-06-turnitin-to-be-acquired-by-advance-publications-for-1-75b

"While iThenticate's paper may be perceived as an authoritative guide, it is also the product of a for-profit plagiarism-detection business with a virtual monopoly across academe, scholarly publishing and government."

"a misrepresentation of the realities and ethics of academic research - and a guide that leads to worse, not better, writing."

Cary Moskovitz and Aaron Colton (2021) Resources on avoiding self-plagiarism are scarce and problematic (opinion). *Inside Higher Ed.* https://www.insidehighered.com/print/views/2021/03/05/resources-avoiding-self-plagiarism-are-scarce-and-problematic-opinion

Duplicate submission?

Not duplicate publication

Same proposal, got partial support from university; apply to NSTC.

- Content can overlap; but not double dipping ("what to do" should not overlap)
- Explain only partially funded, not sufficient for full execution.
- Explain clearly at the beginning of proposal.

Three-year grant (3M per year), funded for one year (1M). Apply again.

- Explain insufficiently funded, so requires more funding.
- Point-by-point reply to reviewers' comments, with progress of this year.

Same proposal, rejected last year. Apply again.

- Point-by-point reply to reviewers' comments, with progress of this year.

Coauthorship

A coauthor should have substantial academic contribution (e.g. conceptual design, data collection and processing, data analysis and interpretation, writing manuscript). Simply providing research funding, research environment and facilities, administrative support, or published material, should not be listed as coauthor. The corresponding author should provide the manuscript to all coauthors to read and list them as coauthors only after their agreement. Because the coauthors share the credit and blame, they should be responsible for the content of the manuscript within reasonable extent.

共同作者應為對論文有相當程度的實質學術貢獻（如構思設計、數據收集及處理、數據分析及解釋、論文撰寫）者。單純提供研究經費、研究環境及設備、行政支援、已發表之研究材料，不應列為共同作者。論文的通訊作者應將論文稿給共同作者審閱，並取得其同意後，始得將其列為共同作者。基於榮辱與共的原則，共同作者在合理範圍內應對論文內容負責。（國科會研究人員學術倫理規範 102.02.08）

Coauthorship

- Who should be a coauthor? (or acknowledged?)
- Order of coauthors?
- Co-first authors, co-corresponding authors
- Should I be a coauthor on a paper?
  - Responsibility for your contribution.
  - Risk.

Coauthorship?

Case 1

You need an un-published reagent (antibody, cell line) from Prof. A.

Should A be a coauthor on your paper?

Dear Prof. A:

I am XXX and working on XXX. I heard your exciting talk at the XX conference and was so excited. The XX you described is just the reagent I am looking for. Would you be so kind as to send me a small aliquot to test on XXX. I understand that XX has not been published, so if some positive results can be generated from such reagent in our study, we will be happy to include you as a coauthor.

Case 2

You need a published reagent (antibody, cell line) from Prof. A.

Should A be a coauthor on your paper?

Dear Prof. A:

I am XXX working on XXX. I have read your recent paper describing XX (ref). XX would be useful in our study on XX. Would you be so kind as to send me a small aliquot? I am very grateful for you help.

Collaborator and Competitor?

In a conference, I talked about my unpublished results, and he/she took unfair advantage.

- Stepping on your toe?
- Same project? Overlapping?
- Something you are doing? plan to do next? plan to do in the future?
- Collaborate or compete?

A game of information exchange. You provide some information to get some information.

Win-Win

- Turn a competitor into collaborator.
- Coordinate submission/publication (back-to-back publication)

Generative AI

A generative artificial intelligence or generative AI is a type of AI system capable of **generating text, images, or other media** in response to prompts. Generative AI systems use generative models such as large language models to **statistically sample** new data based on the **training data set** that was used to create them. (Wikipedia)

- Pre-trained: based on large language database: misinformation and bias
- Keep learning: leak secret
- Generative: not copying; makes errors

Cannot distinguish human and AI production

- Many tools are being developed, but none can be certain.
- Arms race.
- I do not expect such tools development can ever catch up with AI development.

ChatGPT current problems

- Learning database is only 2021
- Not citing information source
- Answers not reliable
- Can be mislead (training set, algorithm) (political, false information, existing bias)
- AI operation is a black box
- Leak of secrets (query info enters database)
- Analysis of figures and tables
- Domination by majority. Minority opinions are suppressed.

- Expected to improve very soon (already improved)
- Many competitors
- All problems exist before AI

Destructive Innovations

Steam engine, Electricity,

Transportation (wheel, train, airplane, self-driving car),

Computer, Word Processing, Internet, Telephone, Cell phone,

Biology (recombinant DNA, PCR, CRISPR/Cas9)

Google Search, Google Map, ChatGPT

- **Free and open for all. => Equality; raised baseline for all**
- **If you do not use the new tool, you will be competed out.**
- pay（upgrade）=> inequality (relatively minor)

Beware of errors

ChatGPT: references on TNBC and EGFR research：

Lehmann BD, Bauer JA, Chen X, Sanders ME, Chakravarthy AB, Shyr Y, Pietenpol JA. Identification of human triple-negative breast cancer subtypes and preclinical models for selection of targeted therapies. J Clin Invest. 2011;121(7):2750-2767. doi:10.1172/JCI45014

Ueno NT, Zhang D, Targeting EGFR in Triple Negative Breast Cancer. J Cancer Sci Ther 2014; 6(6): 236-243. doi: 10.4172/1948-5956.1000262

wrong

Baselga J, Albanell J. Mechanism of action of anti-HER2 monoclonal antibodies. Ann Oncol. 2001;12 Suppl 1:S35-S41. doi:10.1023/a:1011199018579

Yardley DA, Kaufman PA, Brufsky A, et al. Treatment patterns and clinical outcomes for patients with de novo versus recurrent HER2-positive metastatic breast cancer. Breast Cancer Res Treat. 2021;186(1):107-117. doi:10.1007/s10549-021-06105-5

Hynes NE, MacDonald G. ErbB receptors and signaling pathways in cancer. Curr Opin Cell Biol. 2009;21(2):177-184. doi:10.1016/j.ceb.2008.12.010

Moulder SL, Yakes FM, Muthuswamy SK, Bianco R, Simpson JF, Arteaga CL. Epidermal growth factor receptor (HER1) tyrosine kinase inhibitor ZD1839 (Iressa) inhibits HER2/neu (erbB2)-overexpressing breast cancer cells in vitro and in vivo. Cancer Res. 2001;61(24):8887-8895.

Siddiqui S, Chopra R. EGFR: A Potential Target for the Treatment of Triple-Negative Breast Cancer. Chemotherapy. 2017;62(3):177-184. doi:10.1159/000452984

totally false

Using AI on research

- Summarize past, avoid repetition, avoid mistake, improve rigor
- Reduce efforts and time. Very helpful.
- Based on past mass experience => mediocre; not innovative

AI-assisted product is still human creation

Author's contribution

- Tool is under the guidance of human
- The original query comes from author. The author is responsible for accuracy, framework, logic and making choices.
- Analogy: RA helps to find references, do experiments, analyze data. Not necessary listed as author.
- Author is responsible, not AI.

How to evaluate academic performance?

- Paper/Grant should be evaluated based on whether the work itself is worthy of publication or funded, not who did the work.
- Evaluation of personal achievement is for appointments and awards.

- Treat AI as a tool. Effective use of tools should be a plus.
- Should look at the outcome, not how much effort is spent.
- Integration (people, tools, data) is an important ability.
- Analogy: common to parcel out research
  - Experiments A,B,C executed by different collaborators or service providers.
  - Statistics and data analysis done by collaborators.
  - Important contribution in initial idea, design and integration.

ChatGPT and research ethics

Treat AI as a tool.

Tools are neutral.

Tools can be used for good or evil.

- Not plagiarism. (not copying)
- But can be used for evil and is not easily detectable.
- Author has to make sure the content is correct.
- Innovation and value are not research ethics problems.
- Journals:
  - AI cannot be author. (not accountable)
  - Should disclose the use of AI (as a tool).
  - Should not used to review grants or papers (prevent leak of confidential information)

How can we adapt?

- Require human verification. Human takes responsibility.
- When AI error rate is lower than human, human gets lazy.
- Our ability in expression (reading, searching, organizing, logic, writing, speaking) will decrease
- How do we demonstrate our value?
- How can we prove something is created by us?

感謝聆聽，敬請指教