SCIENCES FONDAMENTALES ET BIOMÉDICALES
Sciences
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La science pour la santé
From science to health

Science on the Edge: The Perils and Ethics of Research Integrity

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Inserm UMR-S 1124 – HealthFex

FEDERATION OF EUROPEAN BIOCHEMICAL SOCIETIES

DISCLOSURE

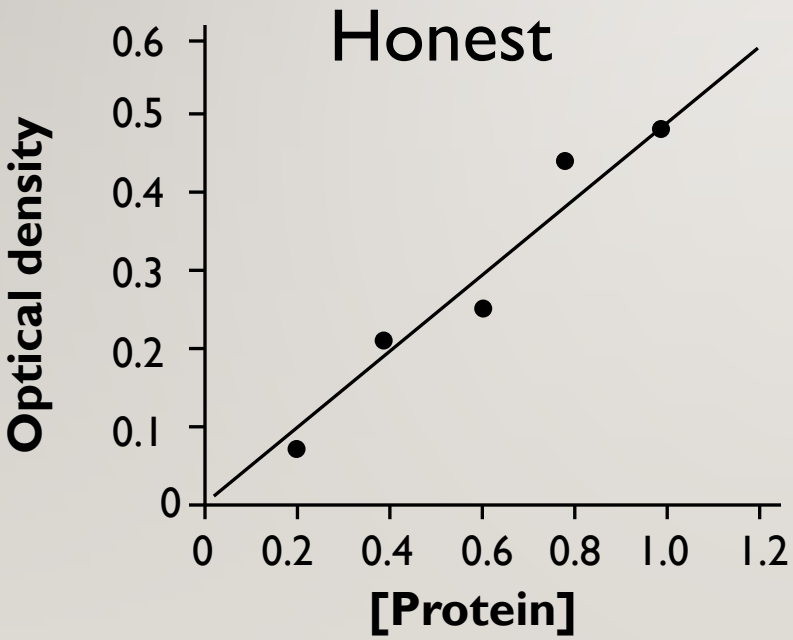
- Slides herein have been borrowed from
  - Dr Jacques Haiech
  - Dr Claude Forest
- who give lectures to students on this topic
- and modified/updated.

- XC and Claude Forest are editors of Biochimie (SFBBM-Elsevier)
- This lecture is in CC-BY

DATA FALSIFICATION BEGINS EARLY, LIKE DURING THE FIRST YEAR OF BACHELOR STUDIES (“LICENCE”)

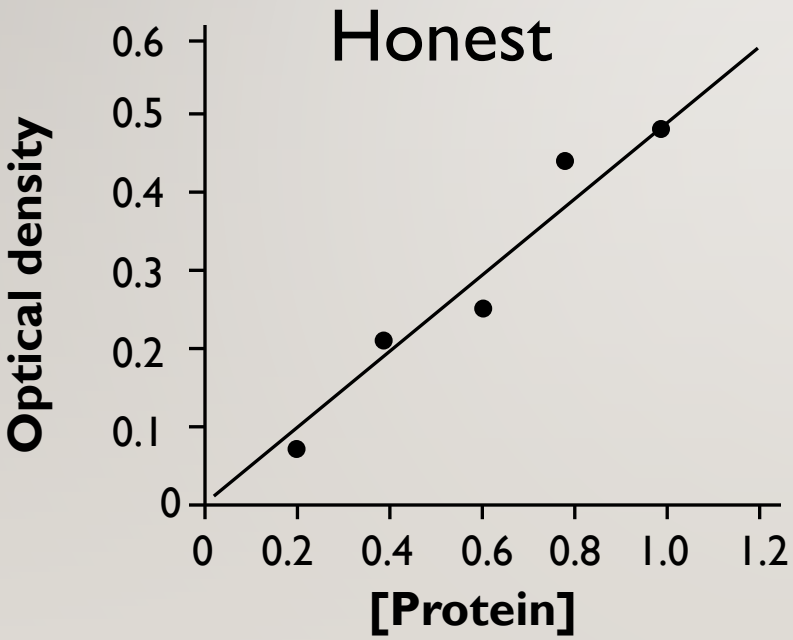
In search for excellence! A myth?

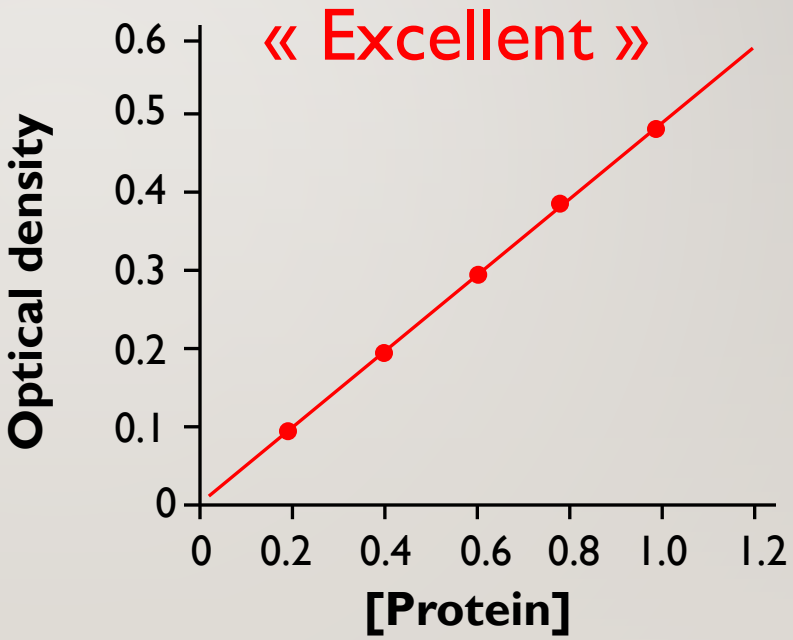
(Practical work in Bachelor Studies)



In search for excellence!

(Practical work in Bachelor Studies)





LECTURE PLAN

- Scientific Integrity
- Research misconduct
- Reflections to incite research institutions to promote scientific integrity

LECTURE PLAN

- Scientific Integrity: a definition
- Research misconduct
- Reflections to incite research institutions to promote scientific integrity

Scientific Integrity?

Defined as

“all of rules and values that must govern research in order to ensure its honesty and scientific rigor

Scientific Integrity?

Scientific integrity concerns all areas of research:

- the conduct of research projects
- the dissemination of knowledge and scientific communication
- the supervision of students
- the conduct of evaluations and expert appraisals

WORKSHOP
- Go deeper -> definitions (ethics vs integrity)
- Go beyond -> equality vs equity

LECTURE PLAN

- Scientific Integrity
- Research misconduct (divided in 4 subparts)
- Reflections to incite research institutions to promote scientific integrity

Misconduct in research

1- FACTS

2- CAUSES

3- SOME EXAMPLES

4- CONSEQUENCES

Misconduct in research

1- FACTS

2- CAUSES

3- SOME EXAMPLES

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Scientific misconduct has long been known

> Well-known fraud cases: small percentage (?)

Graft of black skin in white mice !
Dermatologist of the Sloan Kettering who performed mouse painting

Illustration from Jeff Dach, 2016
https://jeffreydachmd.com/2016/09/fake-research-heart-disease-sugar-industry/

Scientific misconduct has long been known

> Well-known fraud cases:
small percentage (?)

- Questionable research practices (QRPs) = high percentage…

…but potential serious consequences

Misconduct in research

1- FACTS

2- CAUSES

3- SOME EXAMPLES

4- CONSEQUENCES

Need for research funds

Need for recognition and fame

to establish one's notoriety and

to feed one's Ego

Need to dominate and

publish as much and as quickly

as possible

as possible (Publish or perish)

publish as much and as quickly

Need to dominate and

To get promoted, financed, reknown etc.,

researchers need to publish

a lot and **in journals with high impact factors**

SALAMI
&
Predatory
Journals

= DOPING

Predatory Journals: how to identify them ?

https://tressacademic.com/identify-predatory-journals/ (2019)

Predatory journals:
example of phishing

Dear Dr. Xavier Coumoul,

I'm glad to introduce myself - Julie from the Editorial Office of OpenAccess.

You are cordially invited to
"Submit any type of article with $450 USD only »

Currently, we are providing fabulous waivers in our 190+ journals.

Asian Journal of Medicine and Health

18(9): 14-21, 2020; Article no.AJMAH.60013
ISSN: 2456-8414

SARS-CoV-2 was Unexpectedly Deadlier than Push-scooters: Could Hydroxychloroquine be the Unique Solution?

Willard Oodendijk[1*], Michaël Rochoy[2], Valentin Ruggeri[3], Florian Cova[4], Didier Lembrouille[5], Sylvano Trottinetta[6], Otter F. Hantome[7], Nemo Macron[8] and Manis Javanica[9]

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[2]General Practitioner and Independent Seeker of Science, Ankh, Morpork, France.
[3]Observatoire of Zététique, Grenoble, France.
[4]Institute for Quick and Dirty Science, Neuneuchâtel, Switzerland.
[5]Département de Médecine Nucléaire Compliante de la SFR, île de Guyane, France.
[6]Collectif Laissons les Vendeurs de Trottinette Prescrire, France.
[7]University of Melon, Melon, France.
[8]Palais de l'Élysée, Paris, France.
[9]Institute of Chiropteran Studies, East Timor.

Authors' contributions

This work was carried out in collaboration among all authors. Author WO launched idea on Twitter, added some sentences, submitted the paper, corresponded with the kind publisher. Author MR launched MP group on Twitter and Google Docs, performed study 1, added some sentences here and there, responded to reviewers. Author VR needed SIGAPS points, did the minimum. Found a beautiful picture for figure 3. Author FC wrote a lot of sentences but didn't need too many SIGAPS points, so fourth place was not as bad. Also, performed Study 3 in his head (philosophers are good at thought-experiments). Author DL was on holidays and added his name at the last time. Author ST wrote nothing but provided the push-scooters and did the outside job. Author ÖFH did nothing but is a very good friend of us; he helped us get some administrative paperwork. Author NM said "waouf" when the authors started to doubt (doubts are common in science, don't let them win you over, believe in yourself and what you do, don't let anyone distract you from the truth you know). Author MJ wrote sentences and said that the last place will be "enough for him". He does it every time, and it works pretty well on interns, we have to admit. All authors read and approved the final manuscript.

THIS PAPER WAS RAPIDLY RETRACTED

BUT… **WAS FIRST ACCEPTED FOR PUBLICATION !!!**

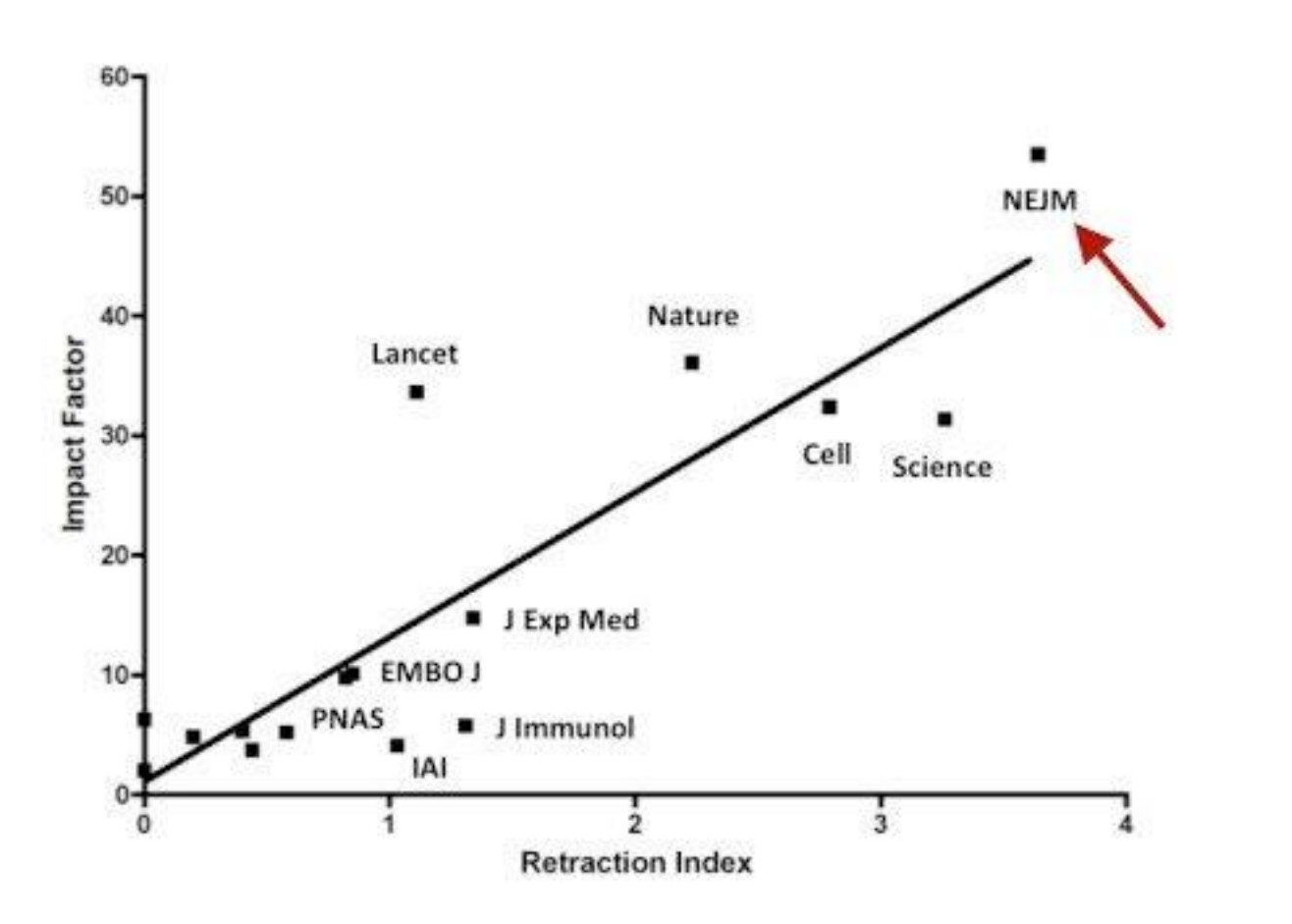
What about the impact factors?

Impact factor of scientific journals?

Renowned journals: IF > 40 (Nature, Science, Cell)

Biochimie or FEBS letters : IF ~ 4

Positive correlation between journal impact factor and proportion of frauds and paper retractions



Retracted Science and the Retraction Index

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3187237/ (2016)

San-Francisco declaration on research assessment (DORA)

The impact factor of scientific journals should no longer be used to assess the quality of an article or an individual or a research contract.

Misconduct in research

1- FACTS

2- CAUSES

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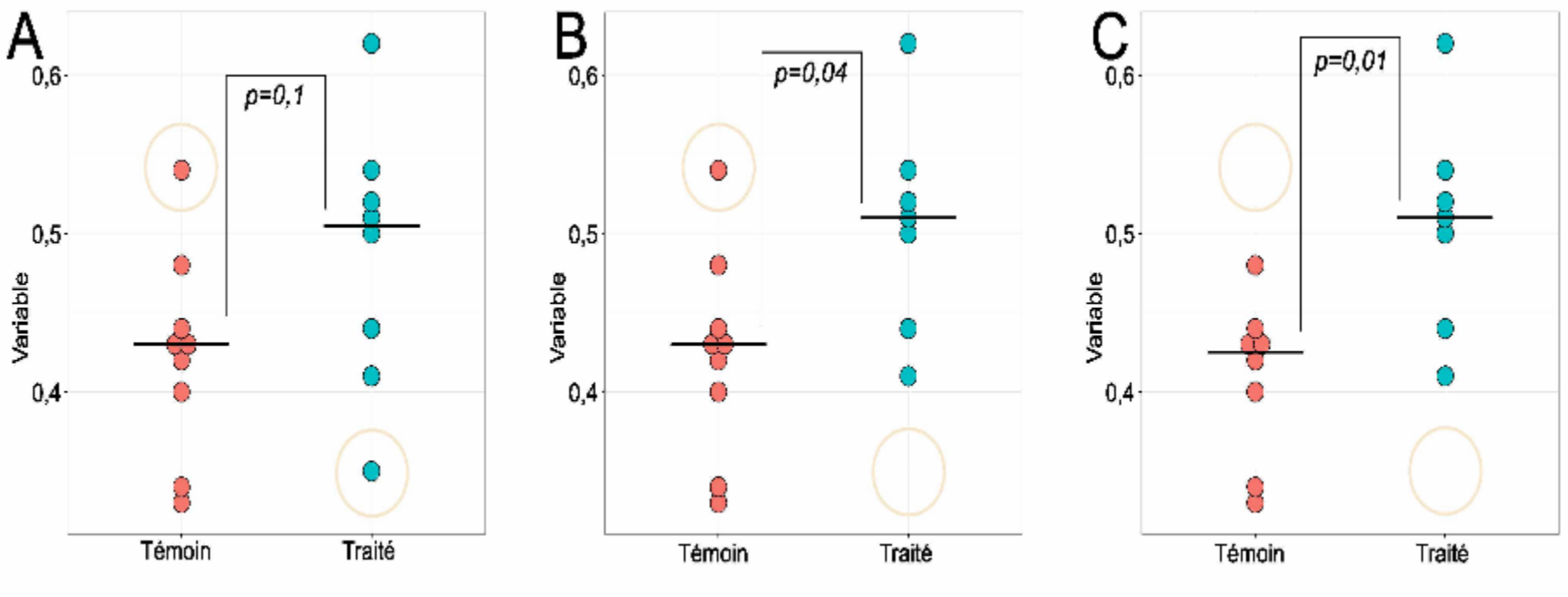
FALSIFICATION

SMALL ARRANGEMENTS WITH REALITY BY INTIMATE CONVICTION

SMALL ARRANGEMENTS WITH REALITY BY INTIMATE CONVICTION



Example of omission of data to obtain statistical significance.

(fake data created by Dr Ph. Noirez)


IMAGE MANIPULATION !

Misconduct case commonly found in PubPeer

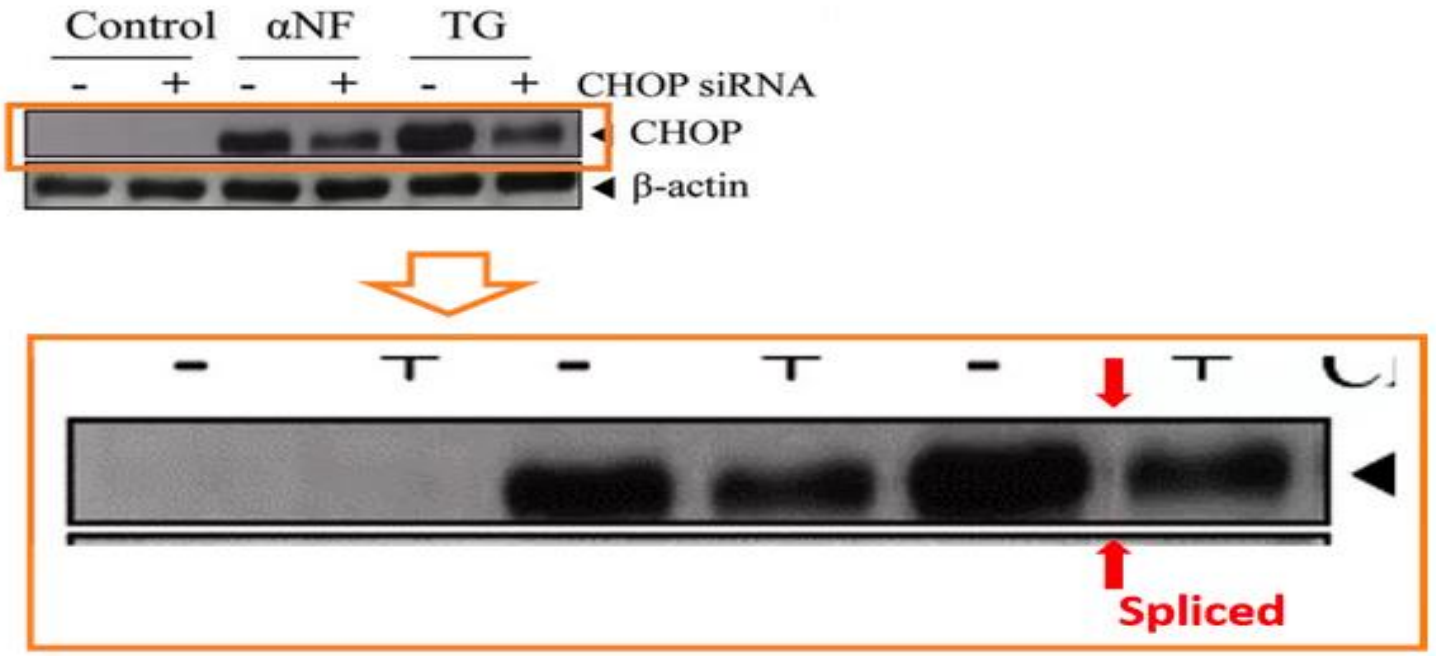
Alpha-naphthoflavone induces apoptosis through endoplasmic reticulum stress via c-Src-, ROS-, MAPKs-, and arylhydrocarbon receptor-dependent pathways in HT22 hippocampal neuronal cells

NeuroToxicology (2019) - 5 Comments
pubmed: 30508555 doi: 10.1016/j.neuro.2018.11.011 issn: 1872-9711 issn: 0161-813x

Ah-Ran Yu, Yeon Ju Jeong, Chi Yeon Hwang, Kyung-Sik Yoon, Wonchae Choe, Joohun Ha, Sung Soo Kim, Youngmi Kim Pak, Eui-Ju Yeo, Insug Kang

#1 Cyclosa Spirifera commented 2 years ago

Fig.2 F



FABRICATION BY AGENCIES: PAPER MILLS

PAPER MILLS ?

A paper mill is a profit-oriented organization

that produces and sells fraudulent scientific manuscripts

written by ghostwriters

on demand of "researchers"

At Biochimie, we receive

some 1,200 papers/year…

…among which around 30% (in 2020) are fake ones…

…and probably fabricated by agencies

PLAGIARISM

- Plagiarism and self-plagiarism are widespread and raise copyright issues

Fabrication
Falsification
Plagiarism
=
FFP

Are they detected ? YES but…

Nowadays, very strong increase of detected cases of FFP (Fabrication, Falsification, Plagiarism)

Development of computer tools for data analysis

Ease of dissemination of information *(Retraction Watch, Pubpeer …)*

- The detection of misconducts is facilitated
- Fraudsters are no longer safe

« PUBPEER » : POST-PUBLICATION PEER REVIEW

« International online journal club »

set-up in 2012 in the US

Comments on published articles


HOW DO AUTHORS REACT
WHEN THEY ARE CAUGHT?

Embellishment or not
An example of author response in PubPeer

1) Answer of Dr X (co-corresponding author)
Thank you for your comment. I am forwarding your comment to Dr. Y (Co-contributing author, in whose laboratory these studies were conducted by Dr. Z).

Embellishment or not
An example of author response in PubPeer

1) Answer of Dr. X (co-corresponding author)
Thank you for your comment. I am forwarding your comment to Dr. Y (Co-contributing author, in whose laboratory these studies were conducted by Dr. Z).

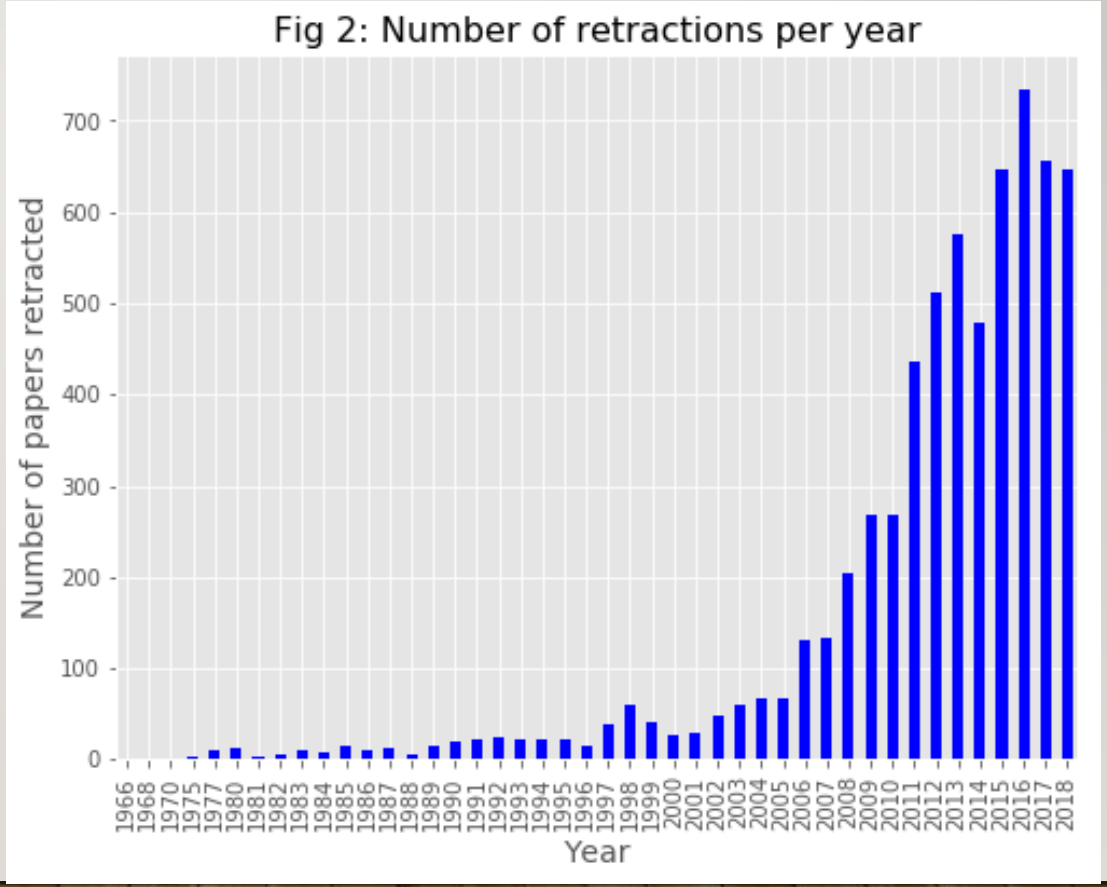
2) Answer of Dr Y (co-corresponding author)
Thanks, Pubpeer for reaching out and letting us inform a prior mistake in our figure no 6F. We apologize for this unintentional mistake. This must have happened during the rearrangement of the figures for the revision. We are going to rectify this error and going to replace the image. We are also going to write the editor and will soon publish an erratum.

PAPERS CAN BE EITHER CORRECTED OR RETRACTED

Retraction of published papers because of misconducts started long ago with a sharp increase very recently

Bhumika Bhatt

https://towardsdatascience.com/on-retractions-in-biomedical-literature-1565e773559e



Papers can be either corrected or retracted

But it's far from being the usual case

(Publishers and Editors do not like that…)

Ivan Oransky (RetractionWatch) estimates that the true number of papers that should be retracted is 10-fold what we're aware of."
https://theclick.news/unreliable-science-in-media/

Misconduct in research

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MISCONDUCT CAN HAVE VERY SERIOUS CONSEQUENCES

FOR THE PERPETRATORS

- Reputation
- Health
- Financial

Examples :

disciplinary committee, loss of employment, medal or prize withdrawn, request for reimbursement etc.

SANCTIONS : AN EXAMPLE

China sanctions hundreds of researchers following fraud investigation

Chemistry World, Dalmeet Singh Chawla, 21 December 2021

https://www.chemistryworld.com/news/china-sanctions-hundreds-of-researchers-following-fraud-investigation/4014943.article

MISCONDUCT CAN HAVE VERY SERIOUS CONSEQUENCES

FOR THE PATIENTS

Example of an anesthesiologist who had to retract 183 papers

Originaly detected because « Too good to be true »

http://retractionwatch.com/the-retraction-watch-leaderboard/

MISCONDUCT CAN HAVE VERY SERIOUS CONSEQUENCES

FOR THE SOCIETY

Cost evaluated by American economists:
28 billion USD a year in the US !

« An eye-popping $28 billion is spent in the United States each year on preclinical research that can't be reproduced by other researchers. That's the conclusion of a provocative analysis published today in part by economists who based it on past studies of error rates in biomedical studies. http://www.sciencemag.org/news/2015/06/study-claims-28-billion-year-spent-irreproducible-biomedical-research »

The performance **evaluation system** is the very first driver of scientific misconduct.

LECTURE PLAN

- Scientific Integrity: from Corvol's Report to a Definition in experimental Sciences
- Research misconduct
- Reflections to incite research institutions to promote scientific integrity: **the role of supervisors !**

HOW TO PREVENT BAD PRACTICES?

(AT THE BENCH)

- Training early on causes and consequences of misconduct

- Apply clear guidelines for Master & PhD supervision
  - Define protocols and stick to it (n)
  - Define analysis upfront… (stat)
  - Use quality control of research, required for data reliability
  - Lab meeting
  - Be proud of **negative results !**

- Use **shared** electronic laboratory notebooks (LabGuru)

HOW TO PREVENT BAD PRACTICES?

(AFTER THE BENCH - PUBLICATIONS)

- Publish **Negative Results** to avoid positive results "at any cost » and to inform the scientific community
- **Respect guidelines** for authorship
- **Do not publish in predatory journals**
- **Do not go to predatory conferences**

- Use **Open Science**: open access to publications and open data

- Change the evaluation system of research and of researchers (Strictly apply DORA): **read the papers !**

POSITIVE NOTE

Tremendous progress has been made over the years in life and health sciences, with significant benefits for the Society, which implies that there is quality research that needs to be supported, while combating the pollution of the system through breaches of ethics and integrity.

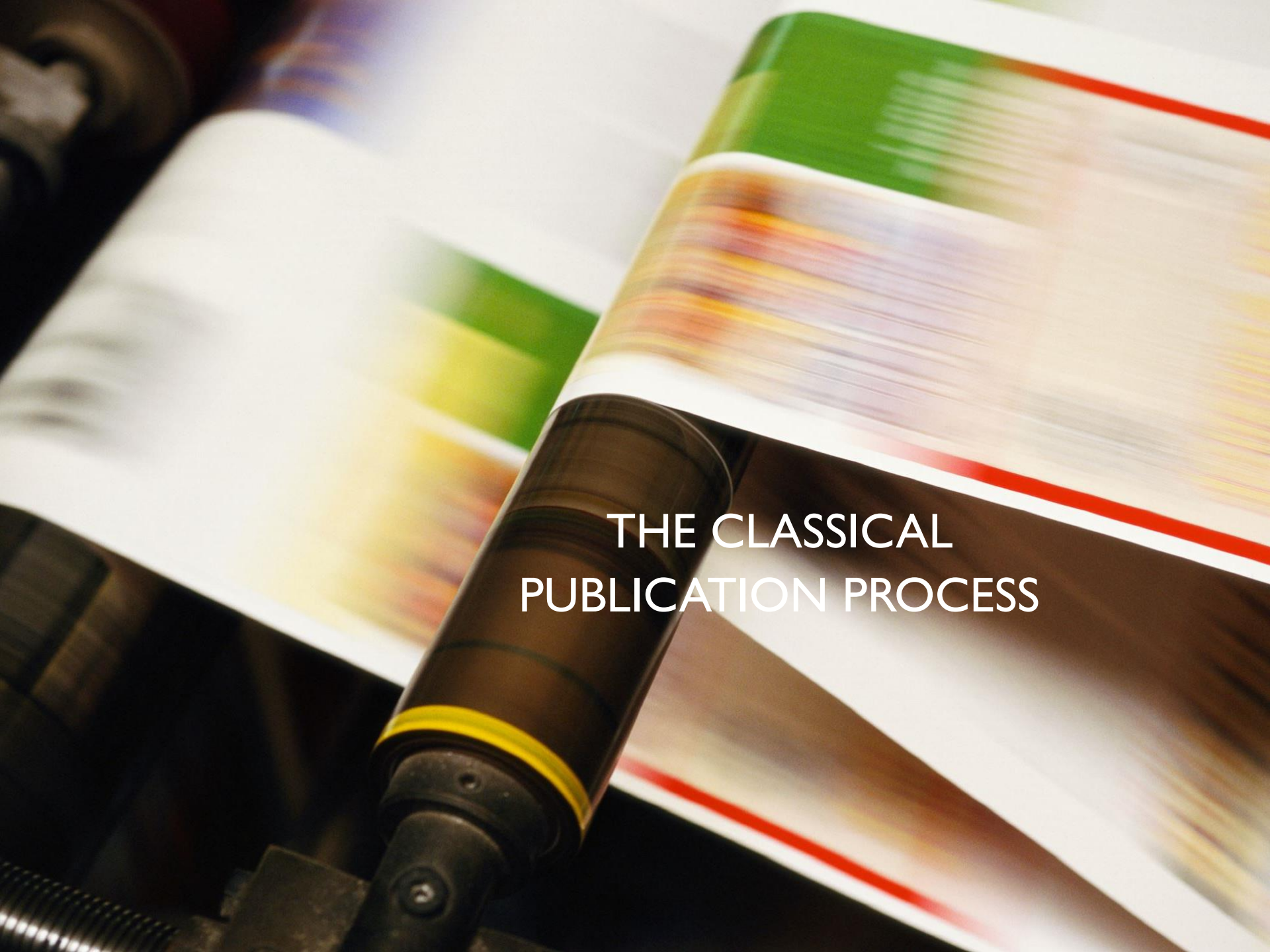
Scientific progress despite irreproducibility: A seeming paradox

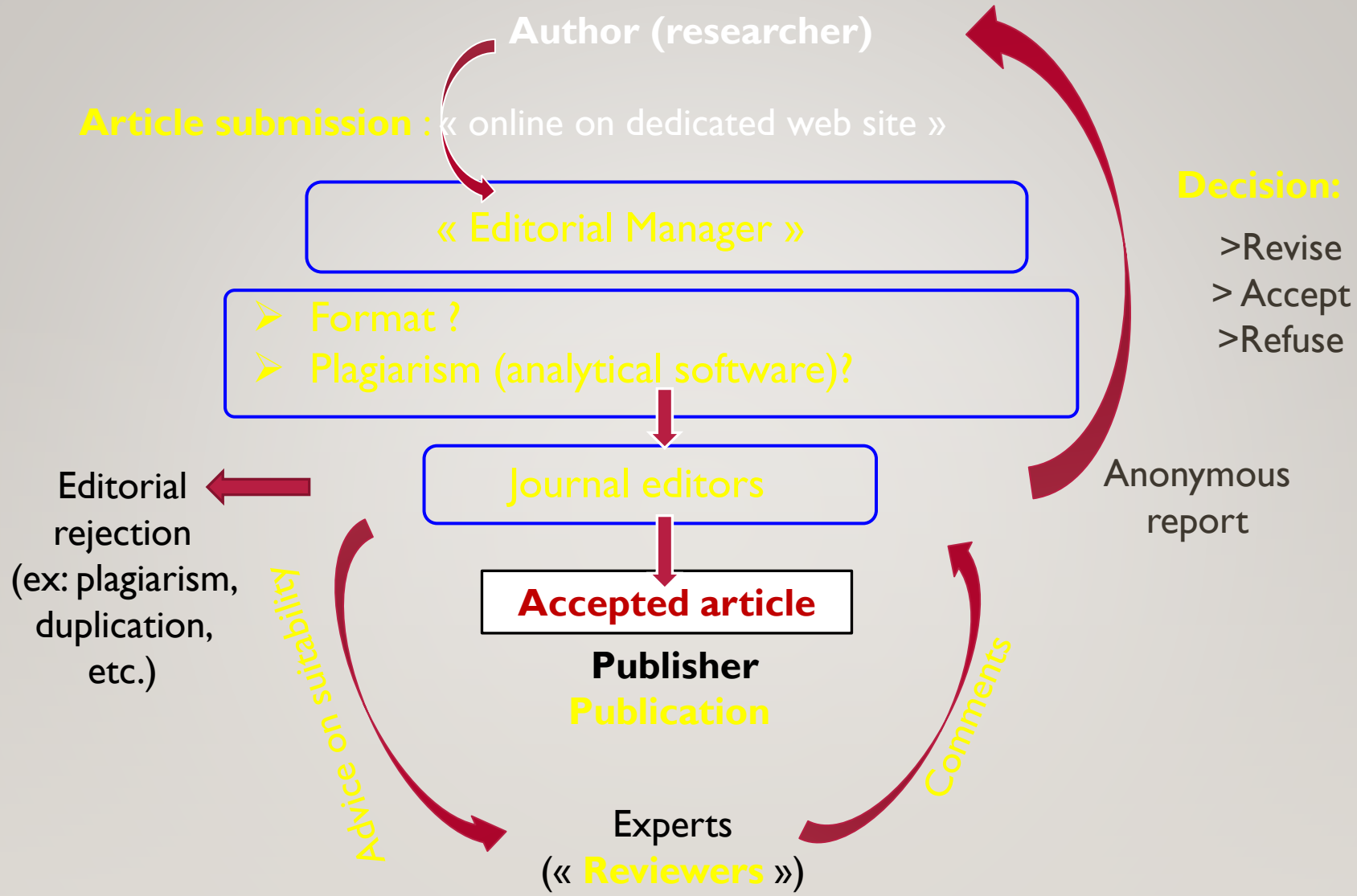
Richard M. Shiffrin, Katy Börner, and Stephen M. Stigler

PNAS, March 2018

THANK YOU FOR
YOUR ATTENTION !


SCIENTIFIC RESULTS ARE
PUBLISHED AS ARTICLES IN
SPECIALIZED JOURNALS


THE CLASSICAL
PUBLICATION PROCESS


Author (researcher)
Article submission : « online on dedicated web site »
« Editorial Manager »
Format ?
Plagiarism (analytical software)?
Journal editors
Editorial rejection (ex: plagiarism, duplication, etc.)
Accepted article
Publisher
Publication
Advice on suitability
Experts
(« Reviewers »)
Comments
Anonymous report
Decision:
>Revise
> Accept
>Refuse

AUTHORS PAY TO PUBLISH

- Publishers sell to universities, research bodies etc. the subscription to a set of journals for a high price (Paywall) and articles can be viewed only by members of the university or research organization.

- For article to be freely accessible (Open Access), authors must pay an Article Processing Charge (APC) that varies according to the notoriety of the journal (impact factor) from about 300 $ to up to 10 000 $

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THE OPEN ACCESS TO PUBLICATIONS IS BECOMING MANDATORY

« PRE-PUBLICATION »

BioRxiv

MedRxiv

Papers published in OA without peer reviewing

= uncertified science

QUESTION FOR YOU

What could be problematic when we publish uncertified results?

AN EXAMPLE LINKED TO THE COVID-19 PANDEMIC

mRNA COVID-19 Vaccination and Development of CMR-confirmed Myopericarditis

MedRxiv

https://doi.org/10.1101/2021.09.13.21262182

Paper uploaded on MedRxiv on September 16, 2021.

AN EXAMPLE LINKED TO THE COVID-19 PANDEMIC

"During the process of open peer review on MedRxiv, we quickly received a number of messages from reviewers concerned that there was a problem with our reported incidence of myocarditis post mRNA vaccination."

! Error x25 !

Paper withdrawn by the authors

on September 24, 2021.

PREDATORY CONFERENCES

Solicitations by email to attend a conference as a speaker:

- You are the best in your field so we ask you ...
- There are Nobel awards who also participate, like you
- Travel and housing are at your expense but it's prestigious

Crisis of trust of the scientific community and of the Society

« Science and trust » on the G7 agenda in 2019

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Promote science education and an understanding of how research is conducted from elementary school onwards…

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Promote science education and an understanding of how research is conducted from elementary school onwards…

Cultivate dialogue, mutual trust and confidence between public, politicians and scientists…

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« Science and trust » on the G7 agenda in 2019

Promote science education and an understanding of how research is conducted from elementary school onwards…

Cultivate dialogue, mutual trust and confidence between public, politicians and scientists…

Ensure that the fundamental principles of ethics, integrity and responsibility are a major component of science education…

Crisis of trust of the scientific community and of the Society

« Science and trust » on the G7 agenda in 2019

Promote science education and an understanding of how research is conducted from elementary school onwards…

Cultivate dialogue, mutual trust and confidence between public, politicians and scientists…

Ensure that the fundamental principles of ethics, integrity and responsibility are a major component of science education…

Ensure that the evaluation of science is based on criteria of quality, reproducibility, originality and relevance rather than on counts of publications, citations, or impact factors…

Thèmes d'ateliers

1) En temps de crise sanitaire, est-il pertinent de modifier les règles qui guident l'exercice de la recherche ?

a : **Oui,** car l'urgence c'est de soigner et non pas être freiné par la bureaucratie habituelle.

b : **Non**, car il ne faut pas confondre vitesse et précipitation. Il faut être encore plus intègre et plus éthique parce qu'on risque encore plus l'erreur à cause des conditions difficiles, et qu'il faut renforcer la confiance entre les pairs et la confiance avec la population et les patients**.**

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2) Compte-tenu de l'importance du résultat que je viens de trouver, il est normal que je le fasse connaitre au plus grand nombre sous forme d'un tweet ou d'une vidéo dans youtube ?

***a :* Oui**, car si je passe par une évaluation par les pairs (disputatio), cela va prendre trop de temps et je risque de me faire « scooper ». Pour la suite de ma carrière, il est important que j'apparaisse comme le premier publiant.

***b :* Non**, car ce qui compte , c'est un résultat scientifique solide. C'est important – et plus sûr- que mon résultat soit discuté et débattu dans ma communauté. Je peux toujours déposer un *pre-print* avec accès aux données (Plan S et FAIR data) et ensuite, faire une publication formelle.

Thèmes d'ateliers

3) Dois-je satisfaire toutes les demandes de mon responsable de stage même si cela entre en conflit avec ma morale et mon intégrité morale et parfois physique ?

a : **Oui,** car mon stage est plus important que mes principes. Mon responsable de stage peut me « blacklister » et m'empêcher de m'intégrer professionnellement. De plus, j'ai trop investi pour me permettre de me fâcher avec mon responsable de stage et l'institution ne m'aidera pas.

b : **Non,** car ce que j'aurais gagné en insertion professionnelle, je vais le perdre en estime de moi. Je vais me sentir déprécié, et peut-être trainer un sentiment de mal-être toute ma vie.

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4) Pour anticiper les pandémies, il vaut mieux les simuler en laboratoire. Vous avez été engagé pour modifier un coronavirus porcin donnant des diarrhées mortelles afin qu'il puisse coloniser les cellules humaines et se transmettre entre humains.

a : Vous acceptez ce travail parce que le travail vous intéresse et qu'il est bien payé.

b : Vous refusez parce qu'une mauvaise manipulation pourrait induire une pandémie mondiale et en plus, vous venez d'hériter de vos grands-parents une somme suffisante pour vivre sans travailler.