What is Open Science

(and why should I care)?

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University of Oxford

Plan for the Open Science Talks

1. What is Open Science?
    1. Why change the way research is done
    2. What is Open Science?

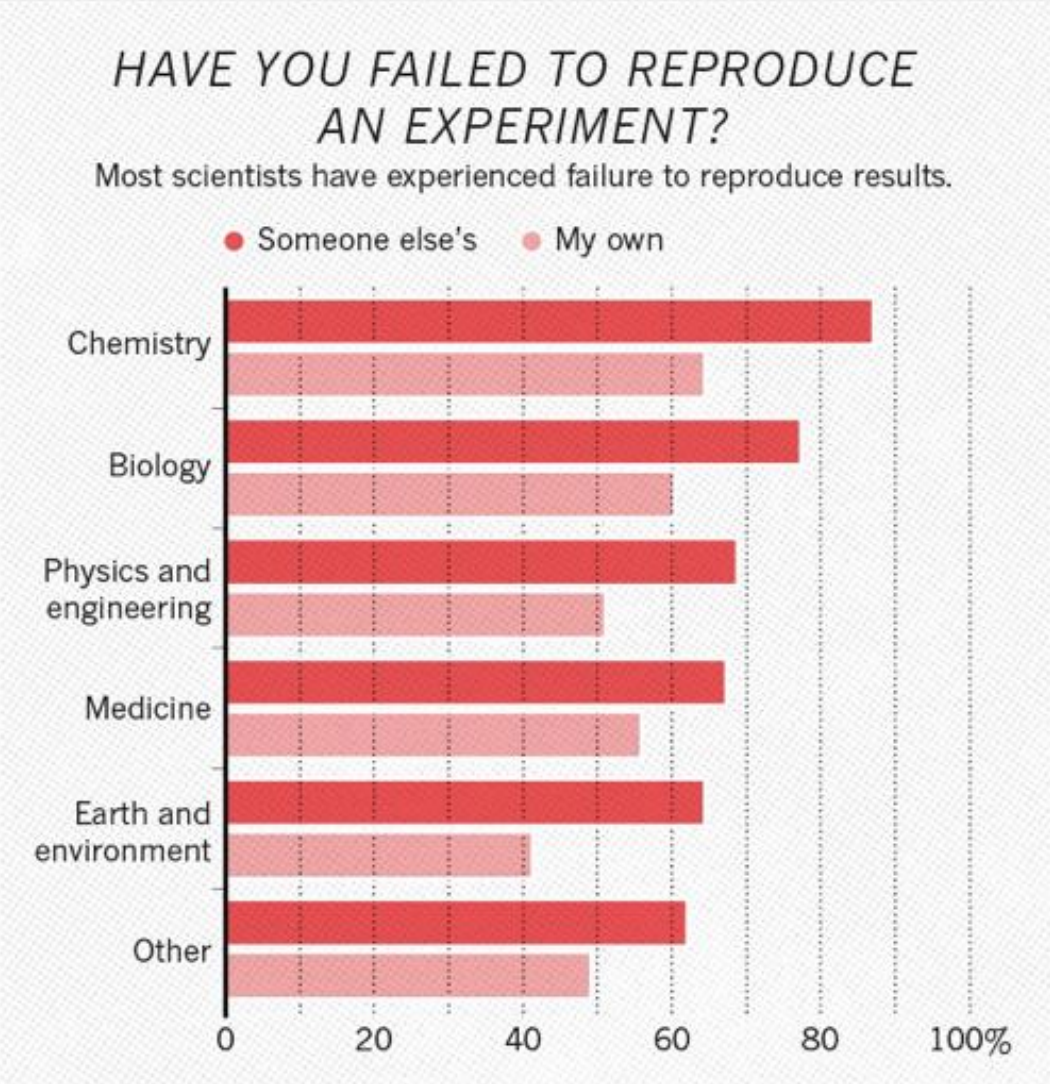
1. Open Science from a low/middle-income country perspective
    1. Why is Open Science not just something that happens “elsewhere”
    2. Taking concerns of LMIC researchers seriously
    3. Openness as a form of “science citizenship”

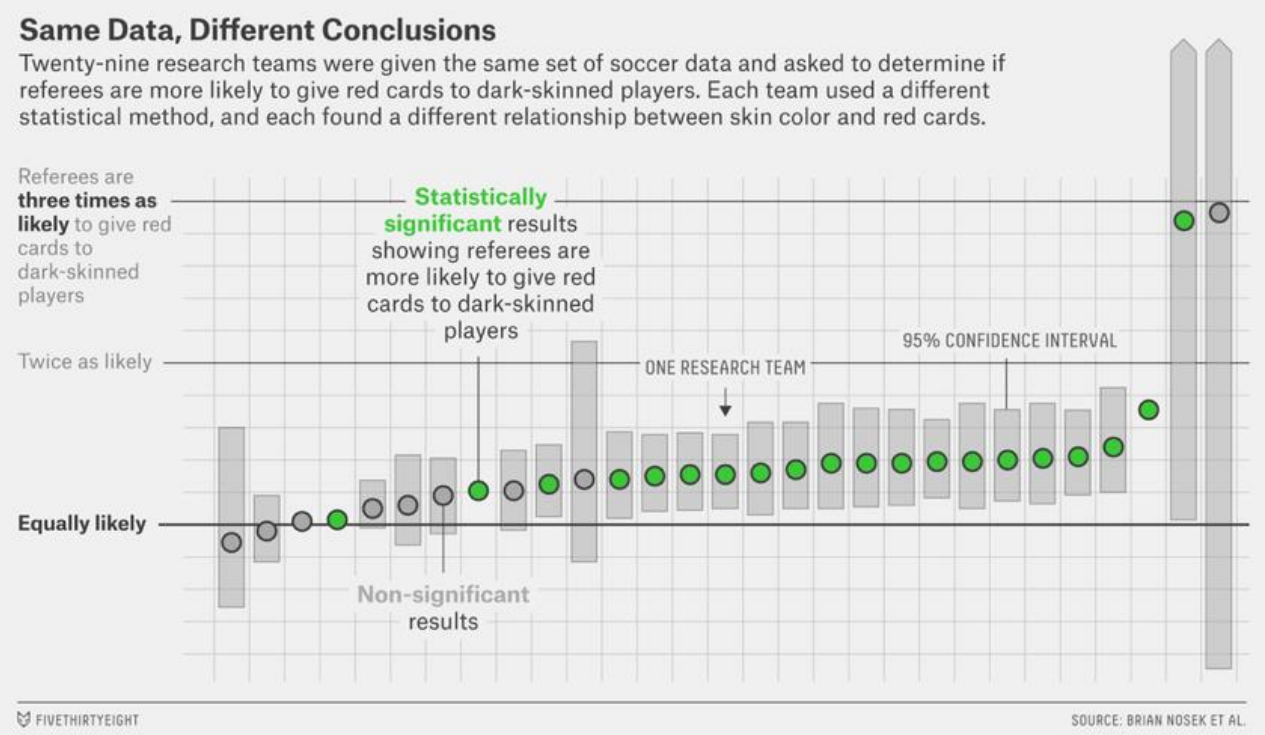
Open Science – History or Response?

- Who has heard of the term “Open Science”
- There is an historical precedence for this argument:
  - Openness is a core value of science/research
- Long tradition of sharing resources and scrutinizing research
- But, recent concerns about reproducibility, networking and public trust

- What do the Human Genome Project, a reproducibility crisis and the Sustainable Development Goals have in common?

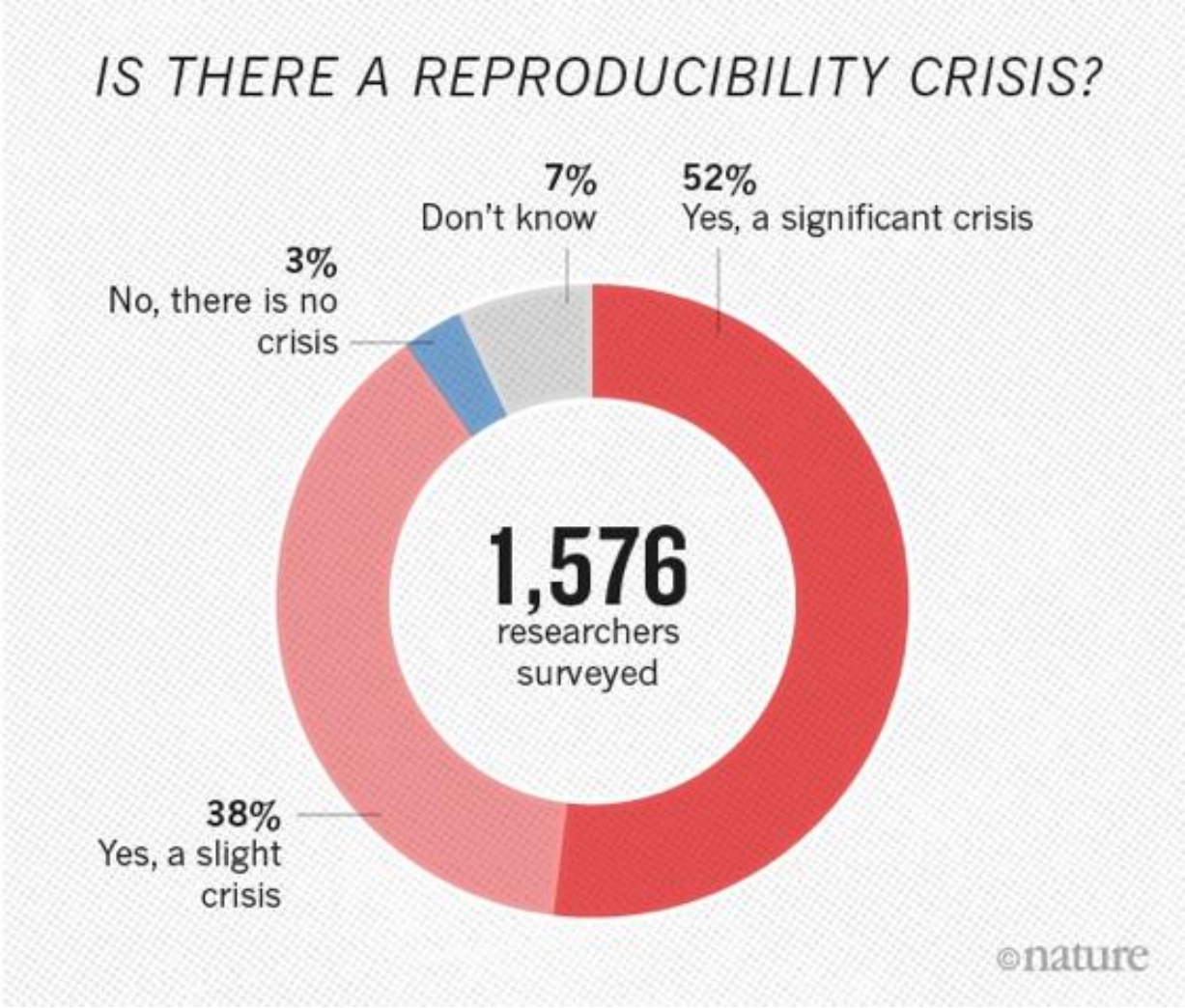
A Reproducibility Crisis?





- Nature survey of 1,576 researchers (Baker et al 2016)
- https://psyarxiv.com/qkwst/

A General Consensus?

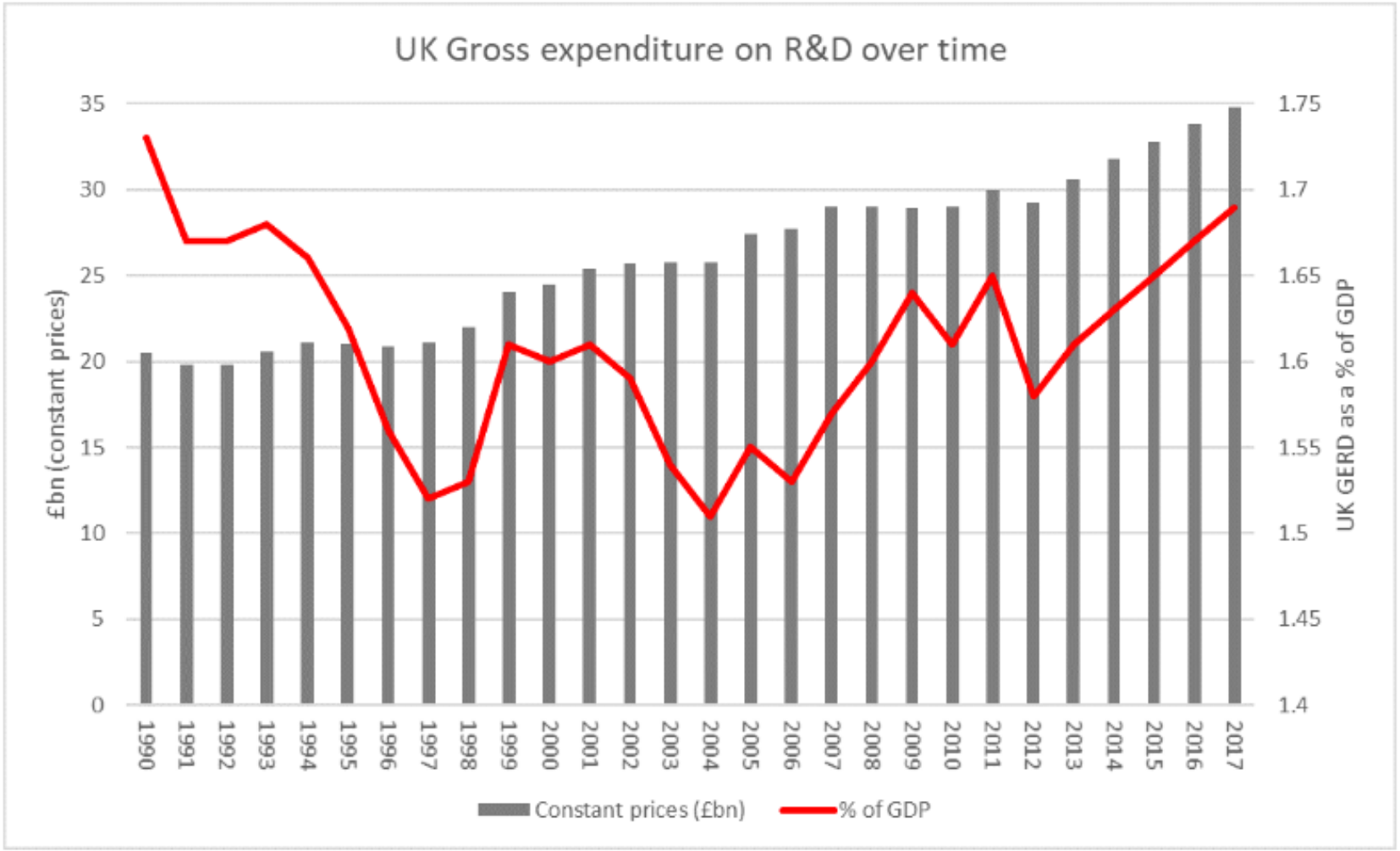


- Variability in analysis and methodology
- Incentives aligned towards publication not reproducibility
- Lack of transparency and access to data

Nature survey of 1,576 researchers

(Baker et al 2016)

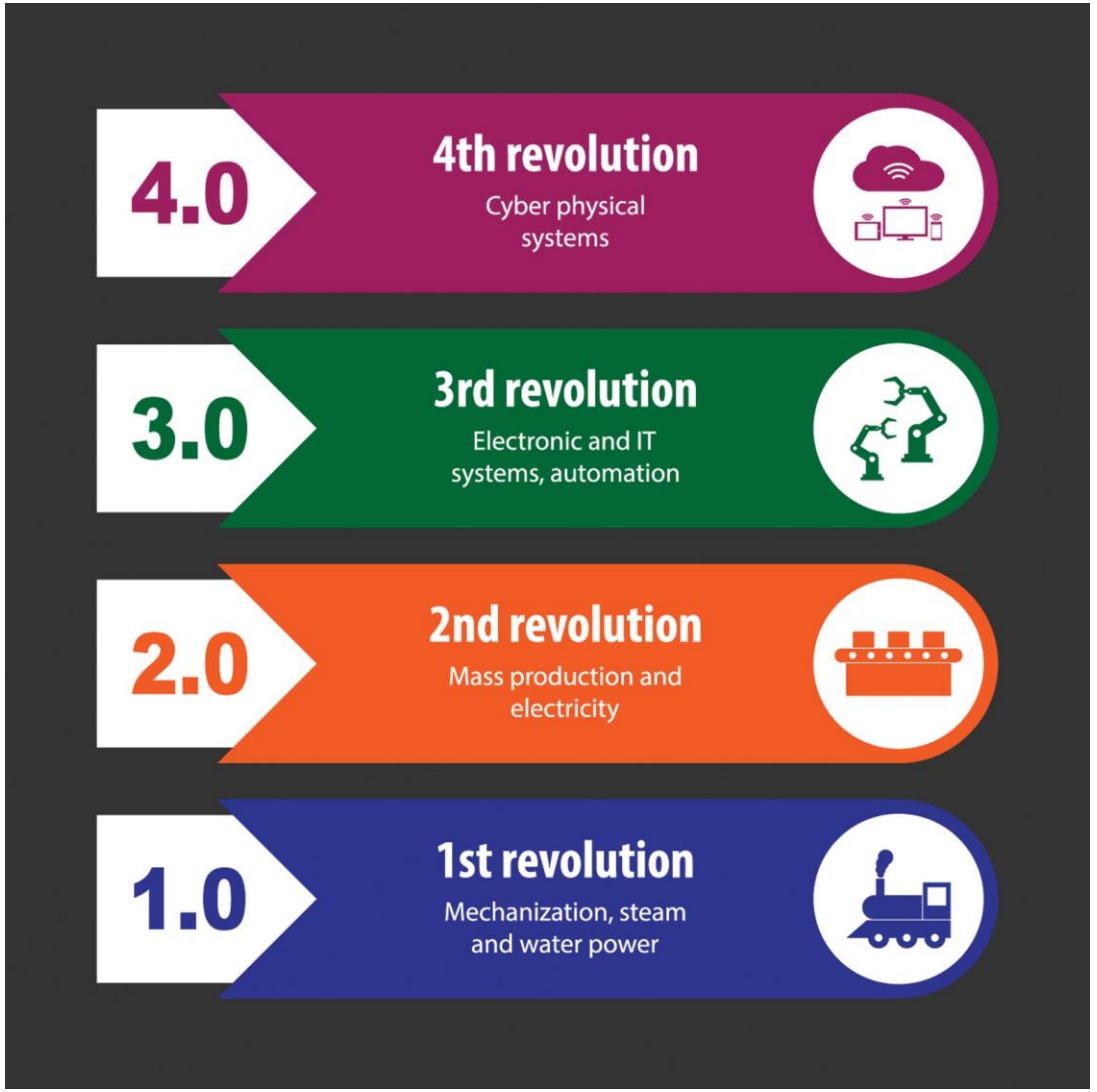
Returns on Public Investment



http://www.sciencecampaign.org.uk/news-media/case-comment/uk-r-d-investment-rises-in-2017.html

New Forms/Places of Knowledge Production

- HGP to Big Data
- AI
- Social data
- Citizen science
- Blurred boundaries between academia, commerce and government



https://www.britannica.com/topic/The-Fourth-Industrial-Revolution-2119734


SUSTAINABLE DEVELOPMENT GOALS
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SUSTAINABLE DEVELOPMENT GOALS

Time For A New Approach?

Increase trust in science, don't waste public resources

Get constructive feedback

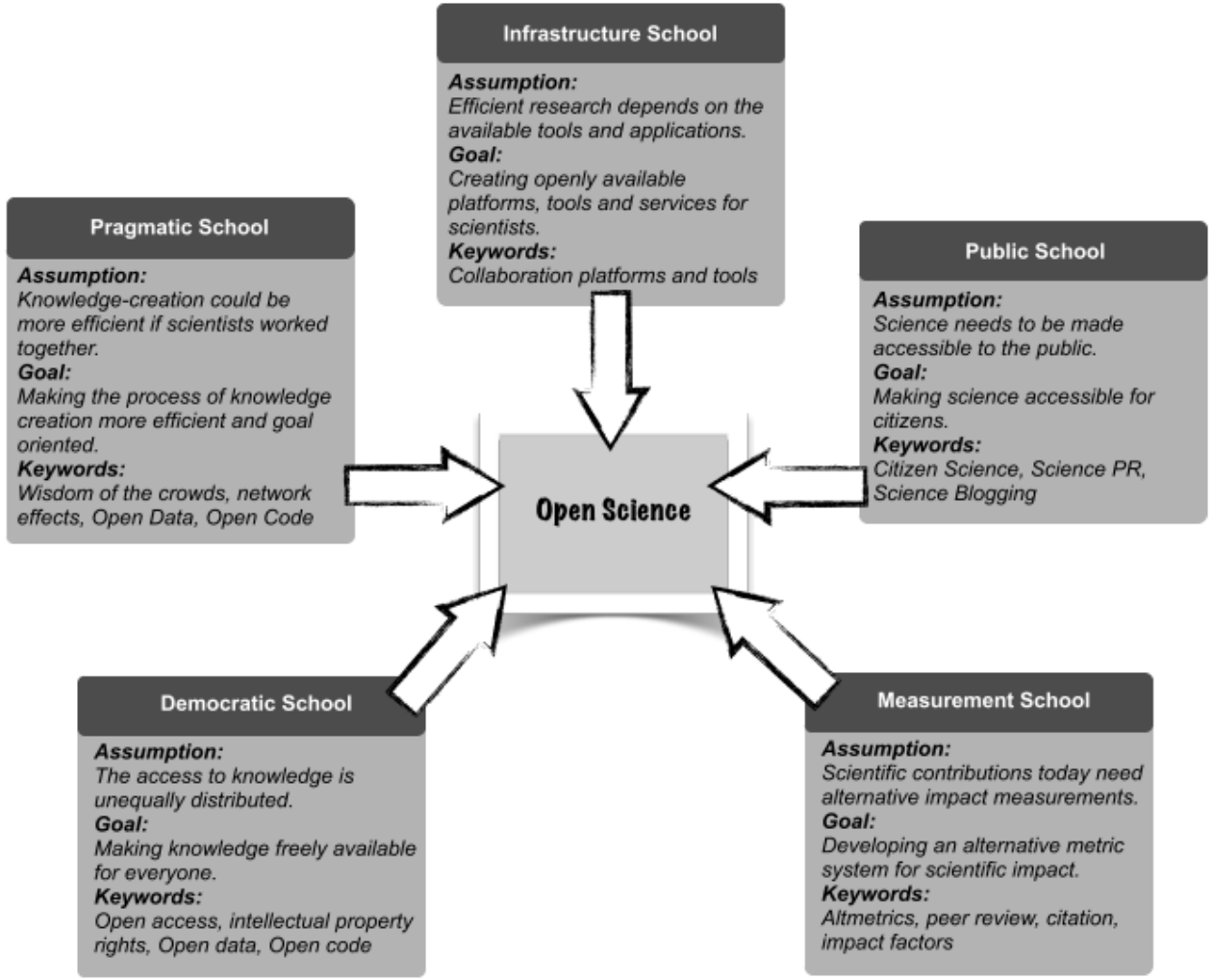
Be international and inclusive

Increase the speed of discovery

Pictures from freepik.com by @brgfx, @makyzz; flaticon.com by Icon Pond, Dimitry Miroliubov

Slide taken from the LMU OSC toolbox

Different Motivations, Same Response



(Fecher and Friesike, 2014)

https://www.fosteropenscience.eu/content/what-open-science-introduction

Open Science

- **The products of scientific research should be freely available to everyone to use and republish as they wish, without restrictions from copyright, patents or other mechanisms of control**

  - Transparency in experimental methodology, observation, and collection of data
  - Public availability and reusability of scientific data
  - Public accessibility and transparency of scientific communication
  - Using web-based tools to facilitate scientific collaboration

    http://www.openscience.org/blog/?p=269]

Open Science

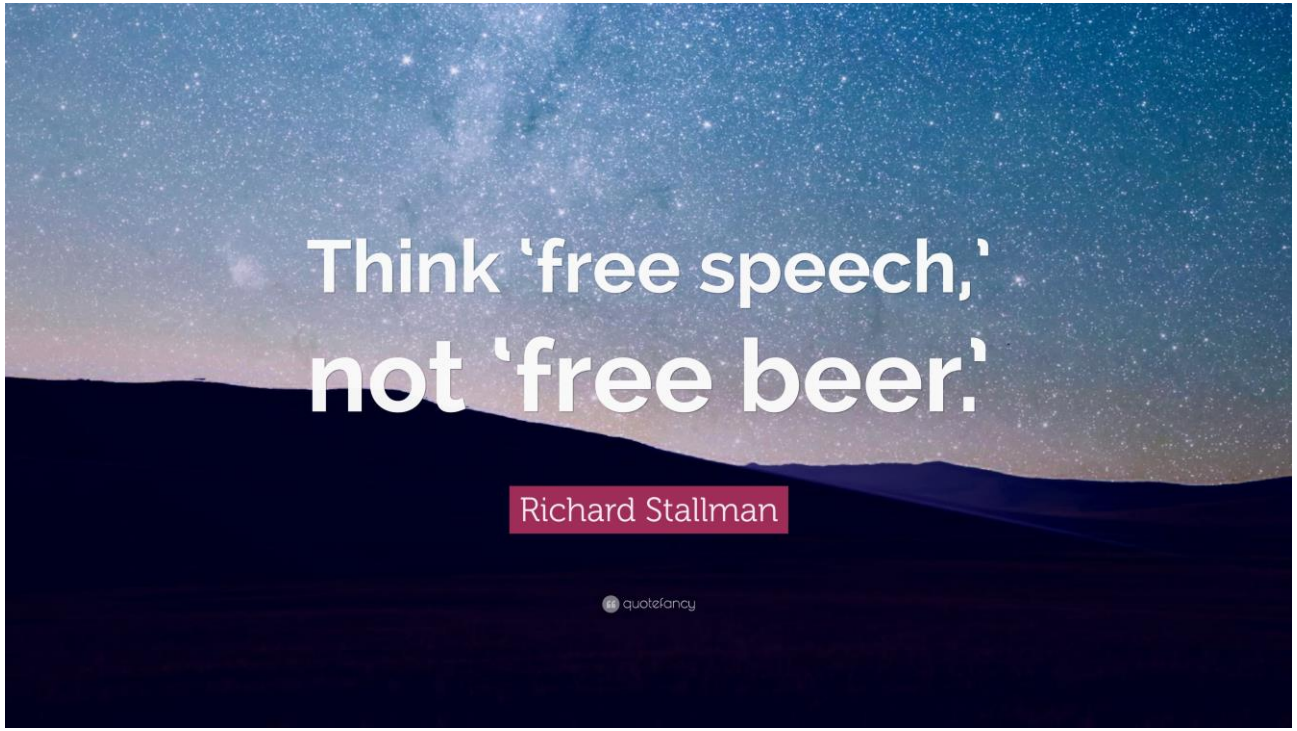
- The movement to make scientific research, data and dissemination accessible to all levels of an inquiring society

  https://www.fosteropenscience.eu/taxonomy/term/7

- Open Science includes activities that:
  - facilitate resource sharing
  - improve awareness of sharing
  - create linkages between resources
  - advocate for removal of financial barriers

Free Speech ... Not Free Beer

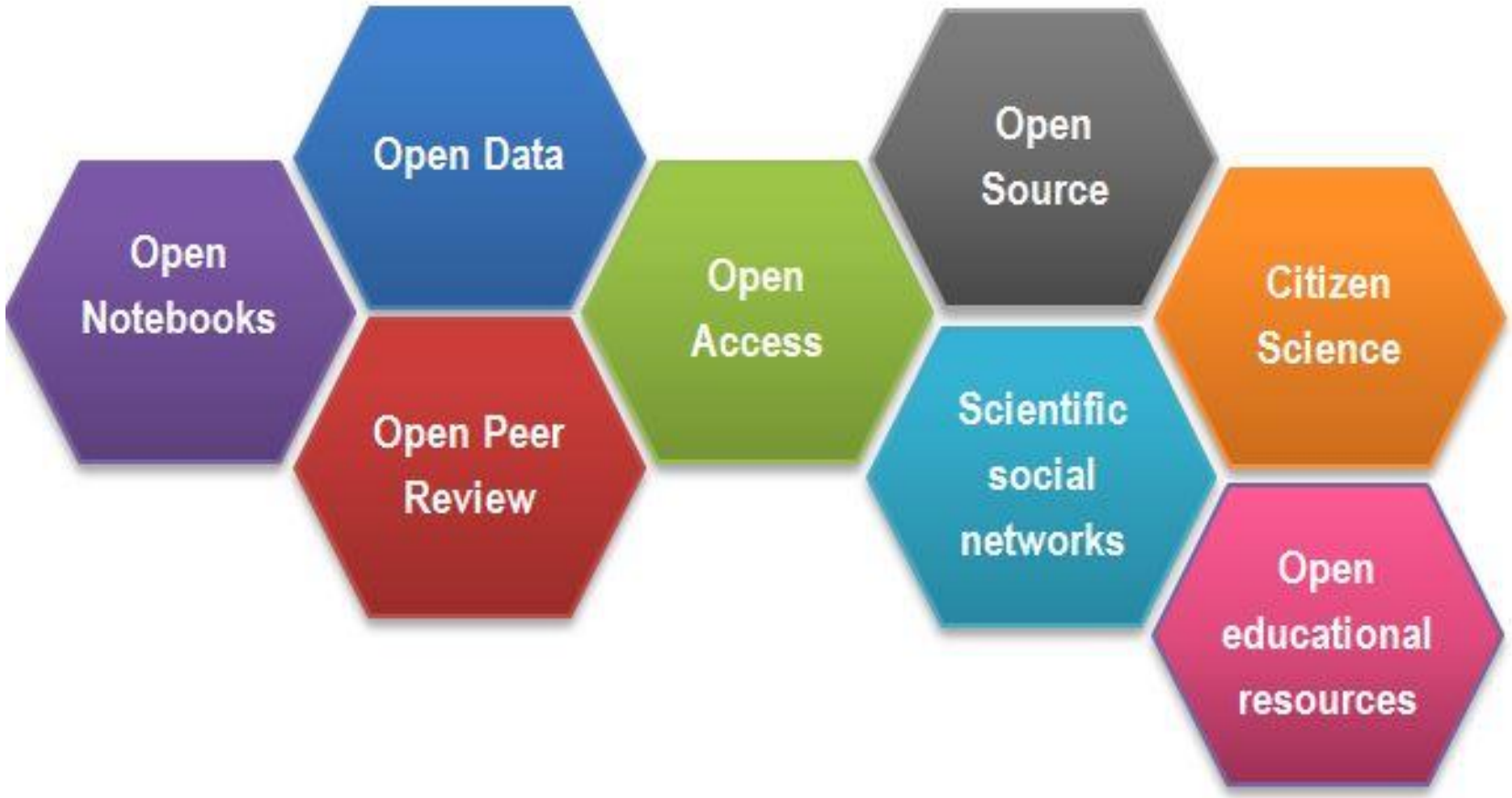
- *Libre* not *Gratis*
  - "**Free**" means there is no cost, where **libre** means "at liberty", referring to the freedom to modify source code. **Libre** doesn't mean **gratis**. **Libre** can mean available. **Libre** can mean without restriction



As Open As Possible, As Closed As Necessary

https://www.timeshighereducation.com/blog/data-should-be-open-possible-and-closed-necessary

Open Science: an Umbrella of Many Activities



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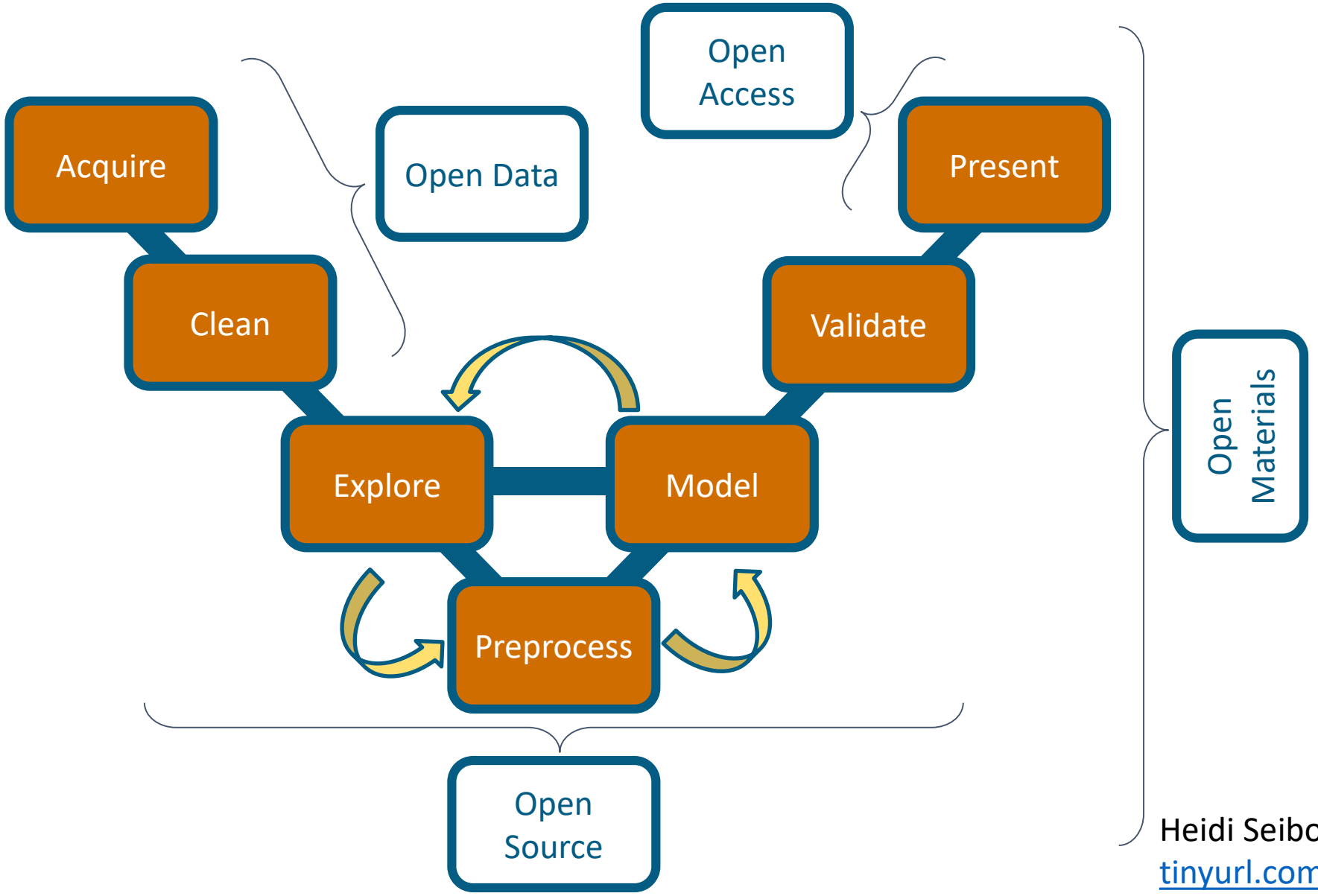
Open Science Throughout The Research Lifecycle

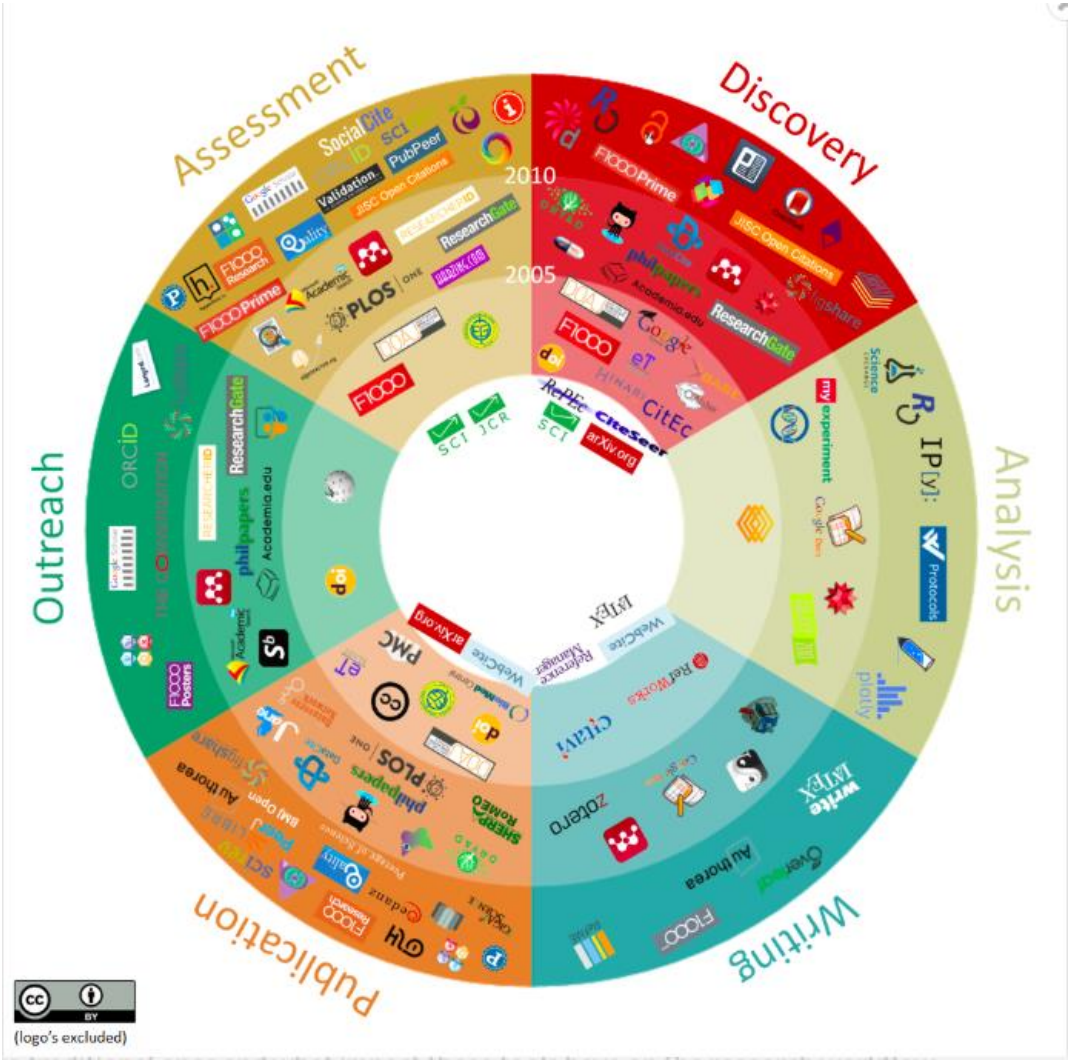


Heidi Seibold
tinyurl.com/opendatascience

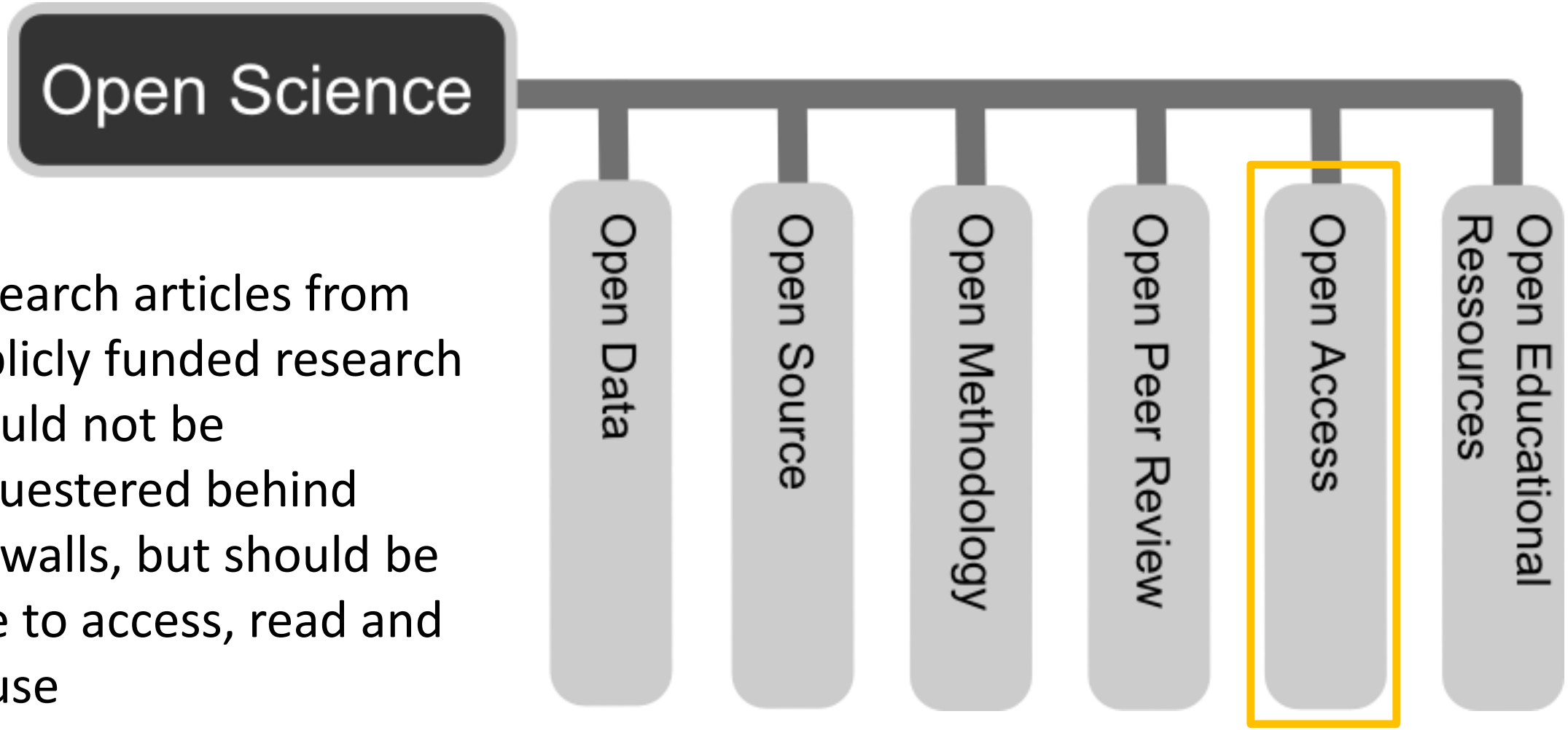
Changing the Way Research is Done

- Changing resources available
- Increasing global nature of research

https://figshare.com/articles/101_Innovations_in_Scholarly_Communication_the_Changing_Research_Workflow/1286826

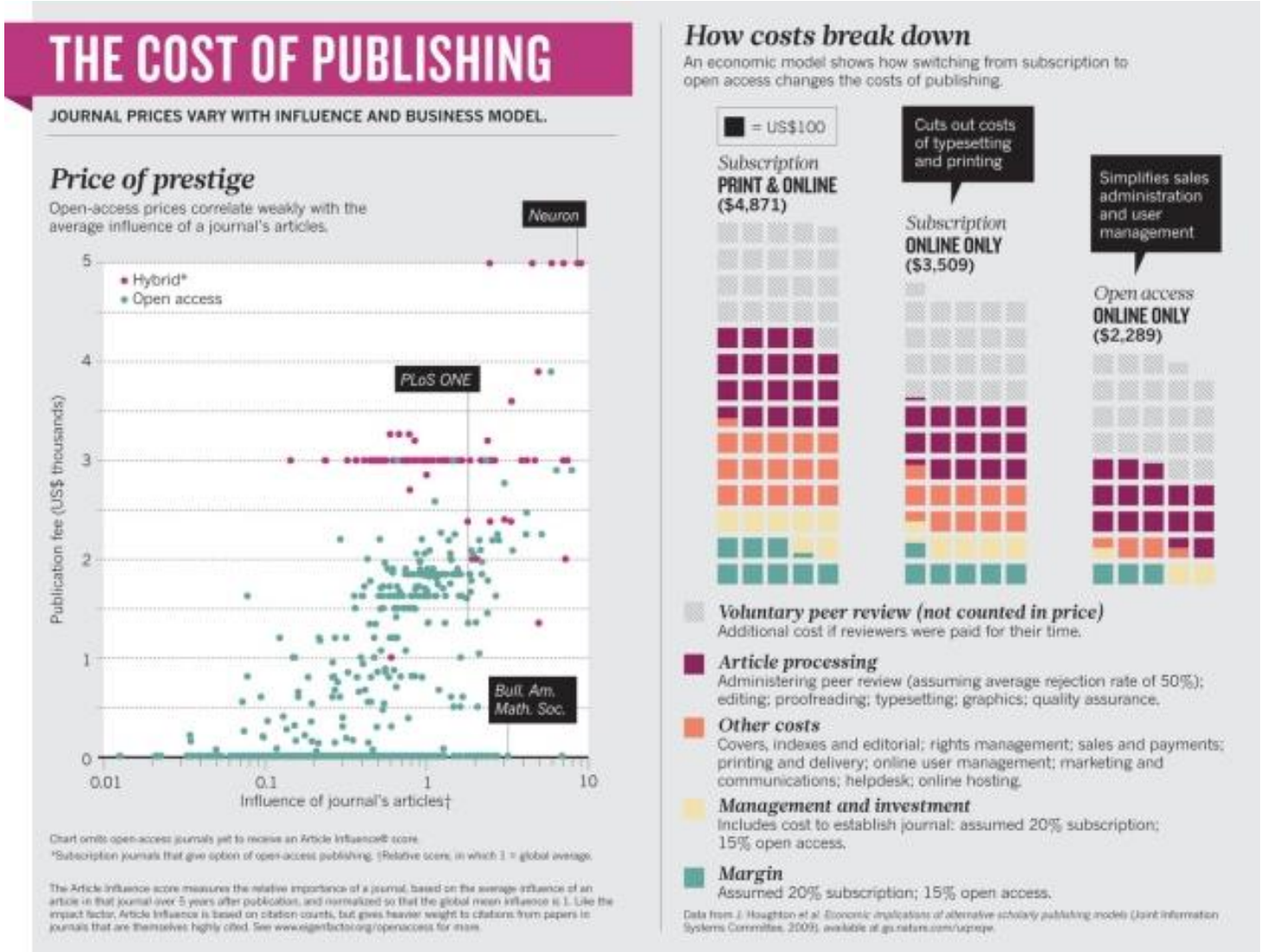


Open Access



Research articles from publicly funded research should not be sequestered behind paywalls, but should be free to access, read and re-use

The Cost of Academic Publishing



- Researchers and the public should be able to access the research they conducted and reviewed – particularly that funded by public money
- Paywalls lead to inefficiency
- Commercial publishers profiting grounded in prestige and impact factors

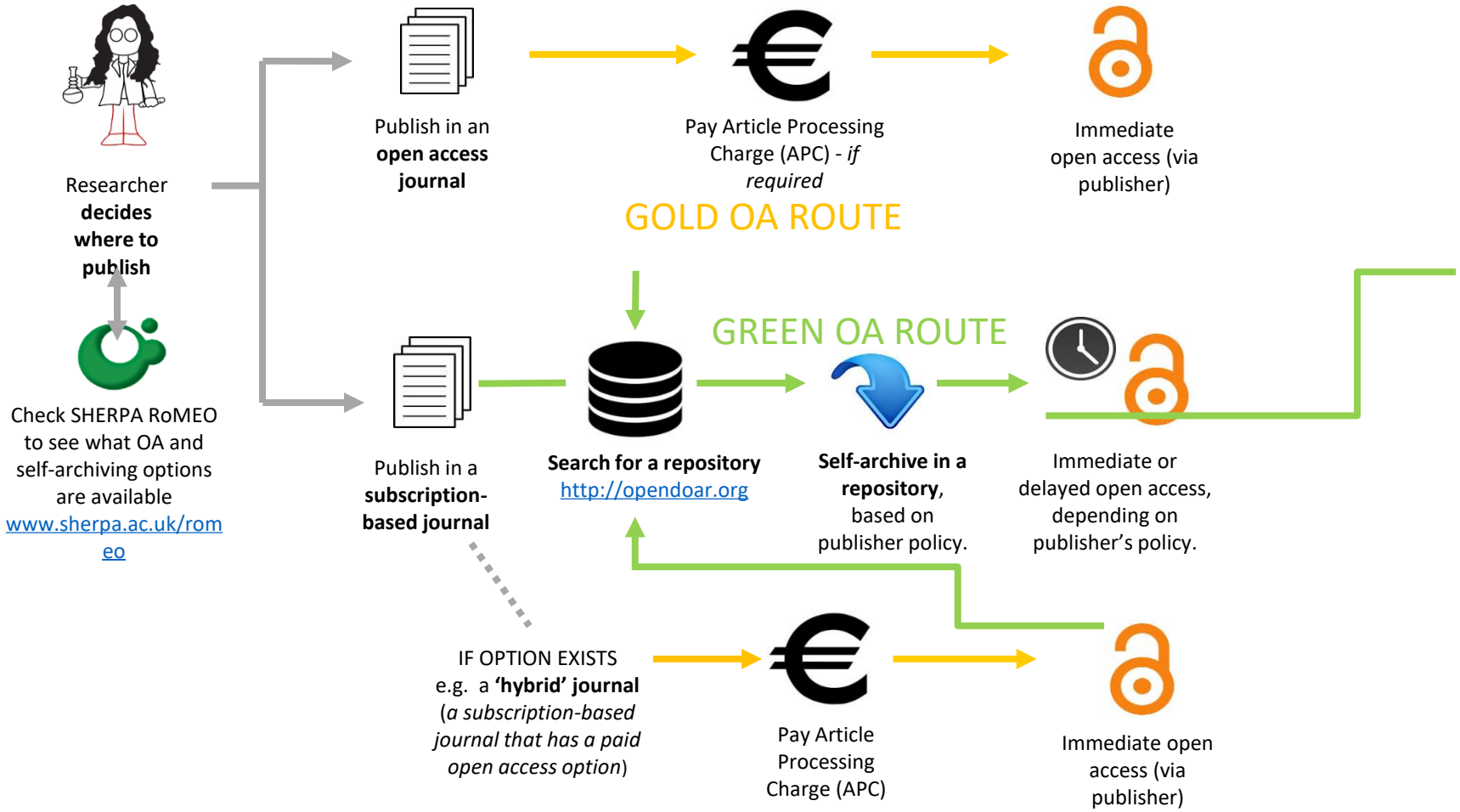
Van Noorden 2013

Unfair Compromises

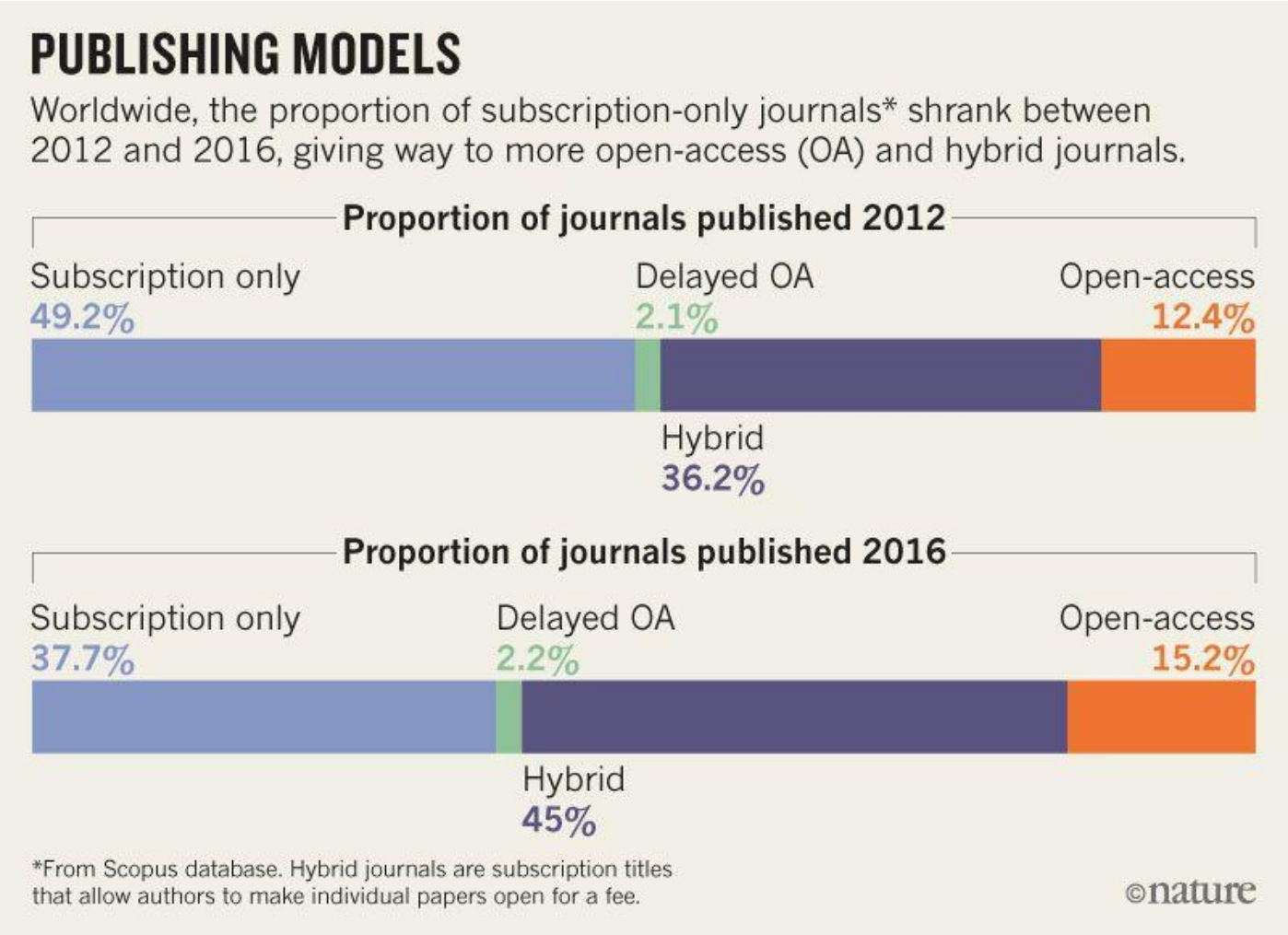
- The public pays for research it cannot access – similarly, researchers can’t access their own work
- Researchers forced to find dubious alternatives
  - Using friend’s log-in details
  - Asking friends to reproduce articles
  - Using SciHub
- Current publishing system is not only unnecessarily costly, but placing researchers in unethical positions

Open Access

Venkat will expand on this



Open Access

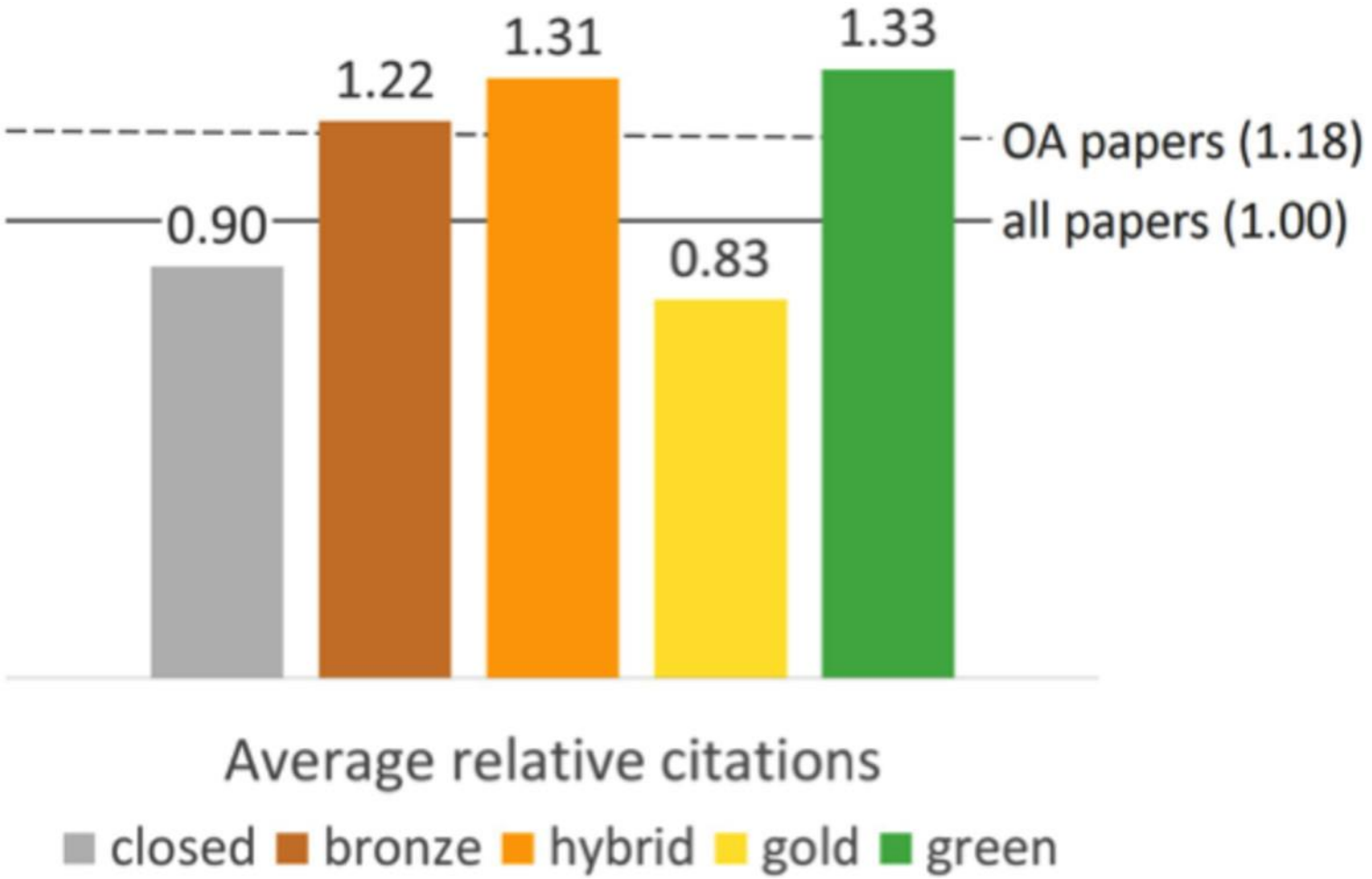


https://www.nature.com/articles/d41586-018-06178-7

Key Open Access Activities

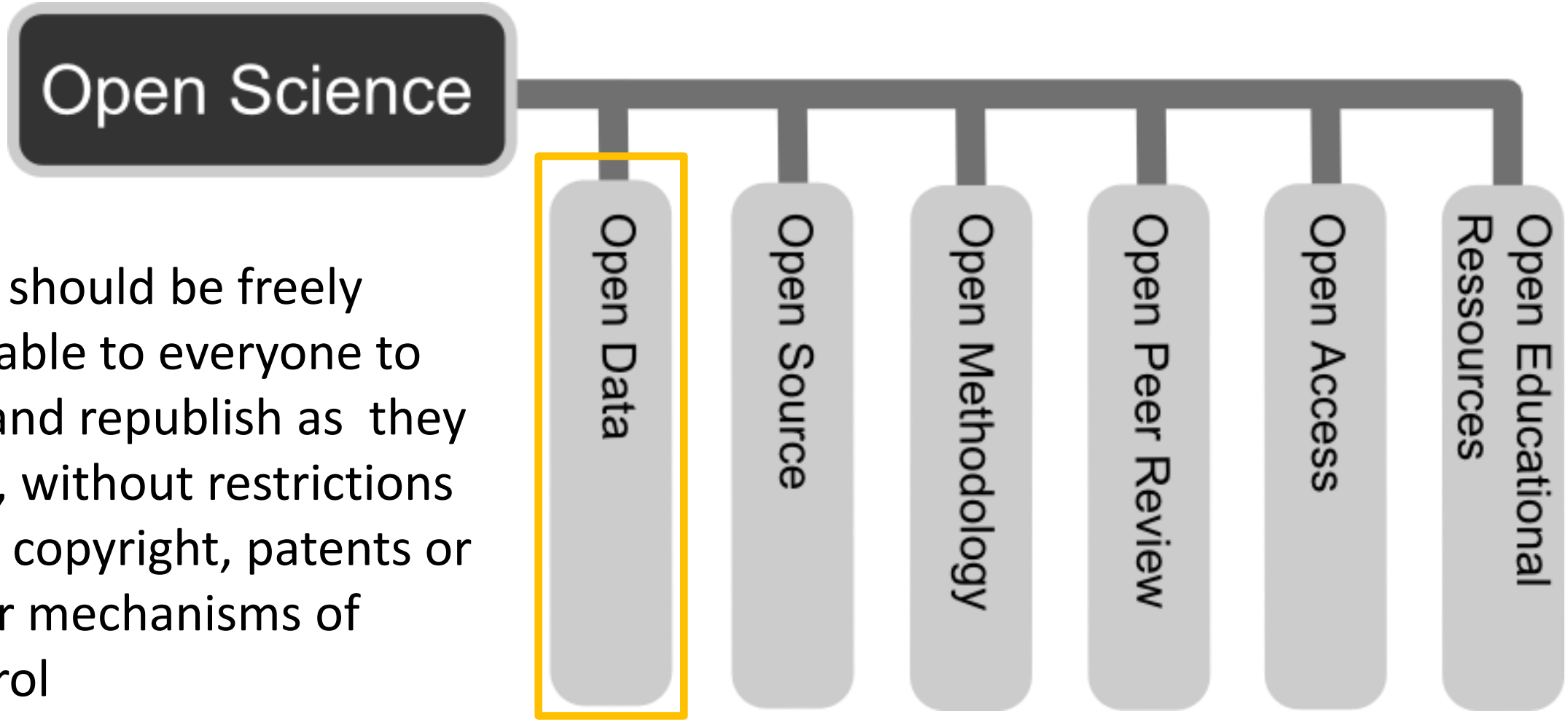
- Advocacy around changing publication models
- Institutional and governmental endorsement – ie. Plan S
- Rise in pre-print publishing
- “Alternative” publishing practices
  - Open peer review
  - Massive Open Online Papers
  - Publons credit for peer review practices

Open Access Citation Advantage



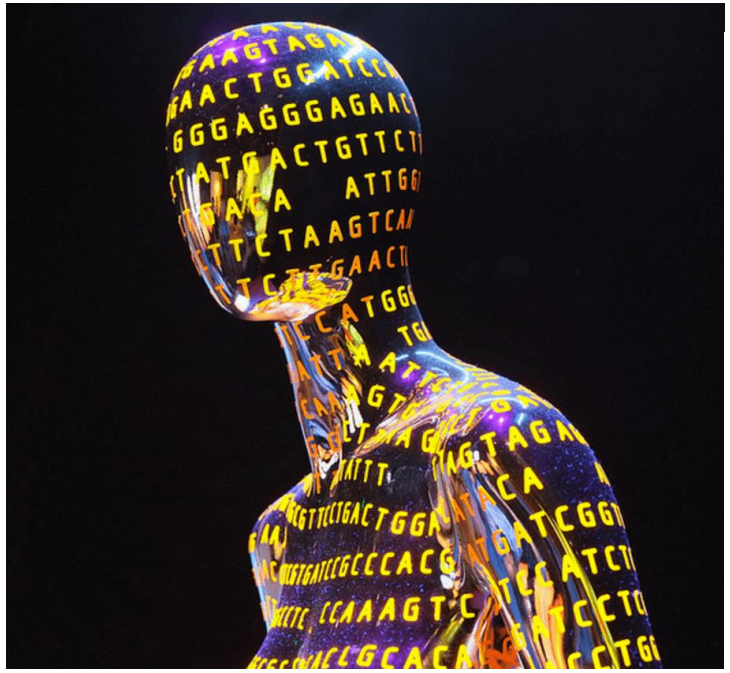
Piwowar 2018

Open Data



Data should be freely available to everyone to use and republish as they wish, without restrictions from copyright, patents or other mechanisms of control

Value of Data Lies in Scrutiny and Re-Use



The Open Data Movement

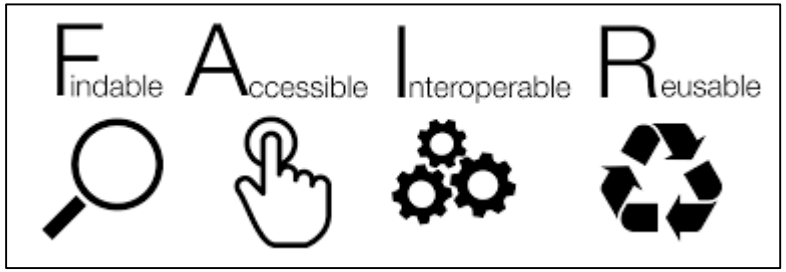
- Open Data movement is broadly understood as including activities that:
  - facilitate data sharing
  - improve awareness of sharing
  - create linkages between datasets
  - advocate for removal of financial barriers

- Include sharing data, re-using data and building/curating data infrastructures

Key Areas of Action

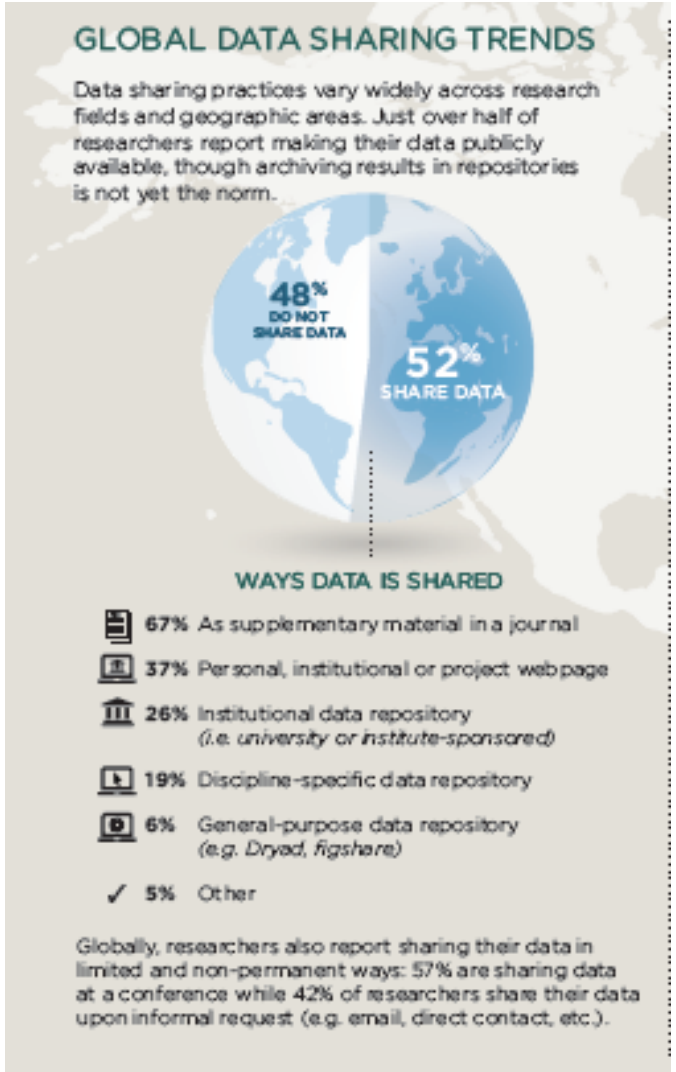
Venkat will expand on this

- Setting data standards
  - FAIR
  - Ontologies
- Enhancing machine-actionability of data
- Improving data curation practices
- Expanding network of repositories
- Changing cultures – individual sharing of data



zenodo

Exciting Times … Legitimate Concerns



Survey of 2500 researchers

Wiley 2014

Challenges to Overcome

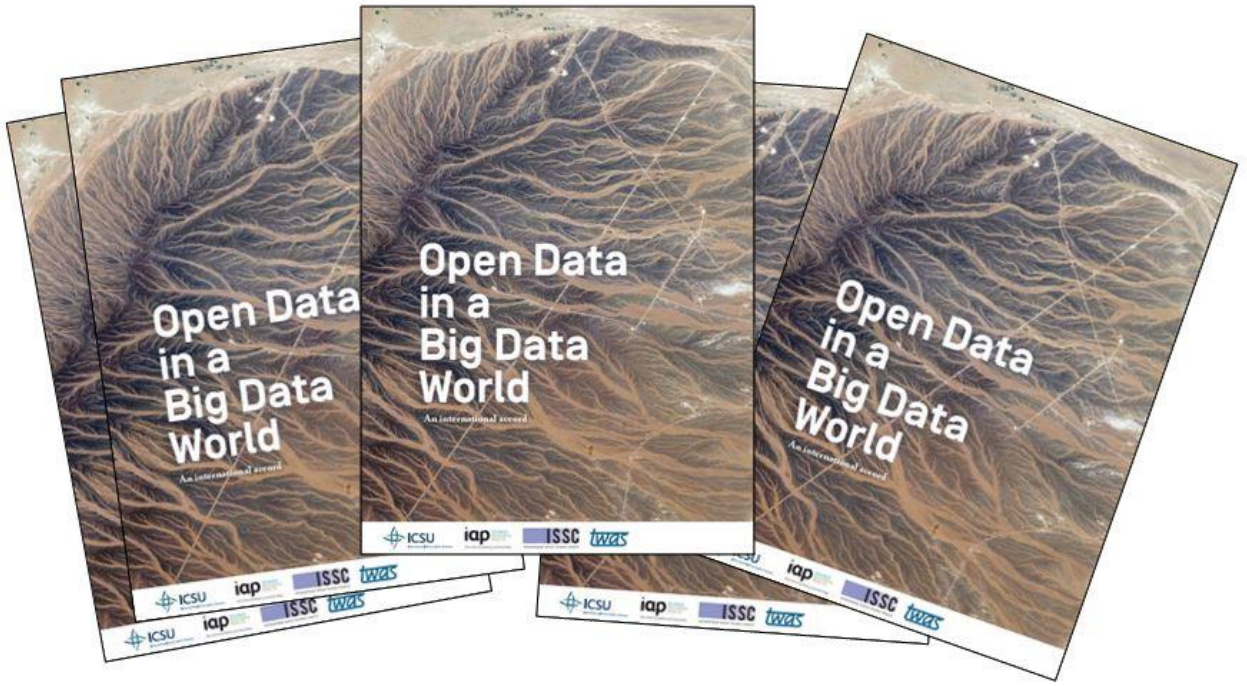
- Engaging with the Open Data paradigm involves addressing and overcoming some common challenges:
    - Fears of “being scooped”
    - Lack of credit for sharing
    - Lack of tangible rewards such as promotion
    - Lack of time and resources to share
    - Lack of expertise and mentors
- Establishing cultures of sharing is a mediated process in which these challenges are discussed and solutions agreed on
- If individual benefits do not outweigh harms, Open Data will continue to only be an ideal

Pros and Cons of Open Data

Benefits	Concerns
• Increase re-use of data – improve returns on public investment and decrease replicate research	• Relating to human data: confidentiality, privacy, ownership
• Improve visibility of research and researchers	• Relating to authors: credit, purposes of re-use, limits of informed consent
• Provide research resources for scientists who might not otherwise have access	• Motivations to share and rewards for sharing
• Maximize use of data contributed by research subjects	• Sharing in ways that do not unintentionally cause marginalization

Taking Concerns Seriously

- Creative Commons and other licensing options
- Funders dedicating resources
- Investment in ICT support
- Rationalization and interlinking of repositories
- Development of data standards to assist interoperability
- Training
- Development of policy and legislation



The Ability to Decide

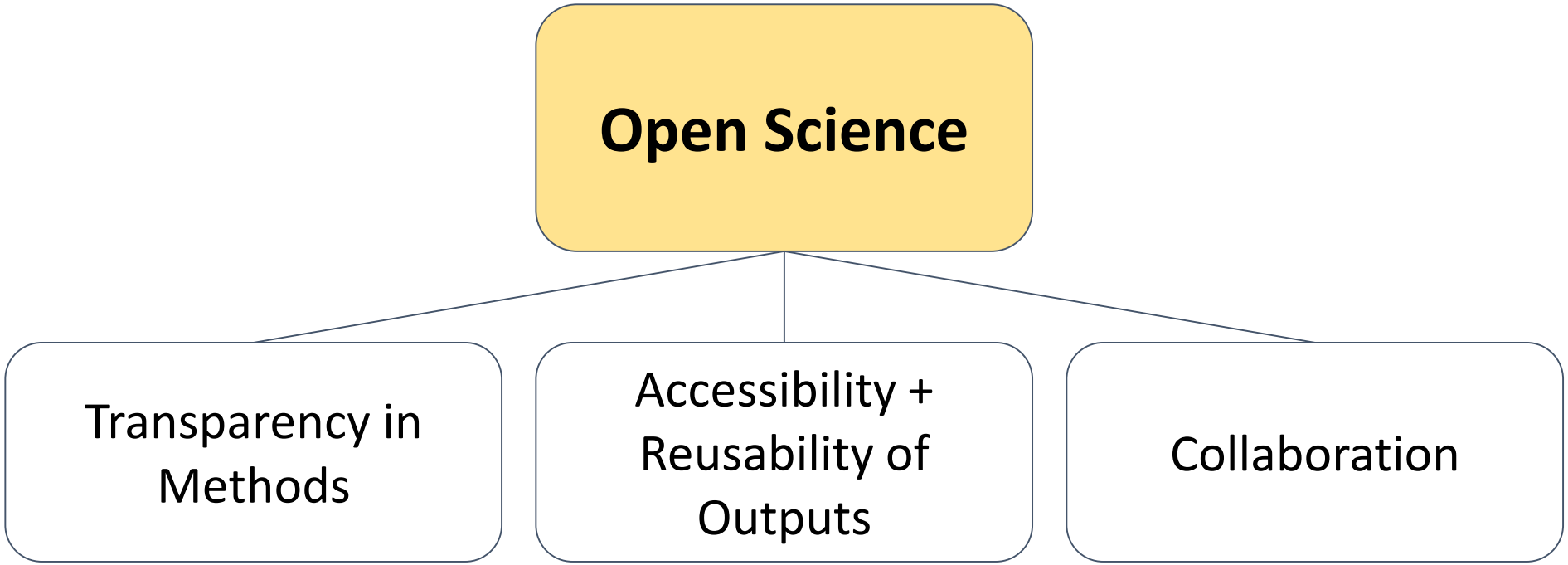
Venkat will expand on this

- No “one size fits all”
- “Open as possible, as closed as necessary”
- Individual researcher has considerable agency to decide how to share

Making Research Open Has Many Benefits

- Increasing transparency and quality in the research validation process, by allowing greater replication and validation of scientific results.
- Speeding the transfer of knowledge promote swifter development from research to innovation.
- Increasing knowledge spill-overs to the economy – Increased access to the results of publicly funded research can foster spill-overs and boost innovation.
- Addressing global challenges more effectively – Global challenges require co-ordinated international actions
- Promoting citizens' engagement in science and research - may lead to active participation in scientific experiments and data collection
- Big Data research requires the availability of data

What Is Open Science Really?



See also https://open-science-training-handbook.gitbook.io/book/open-science-basics/open-concepts-and-principles

A Way of Thinking And Doing

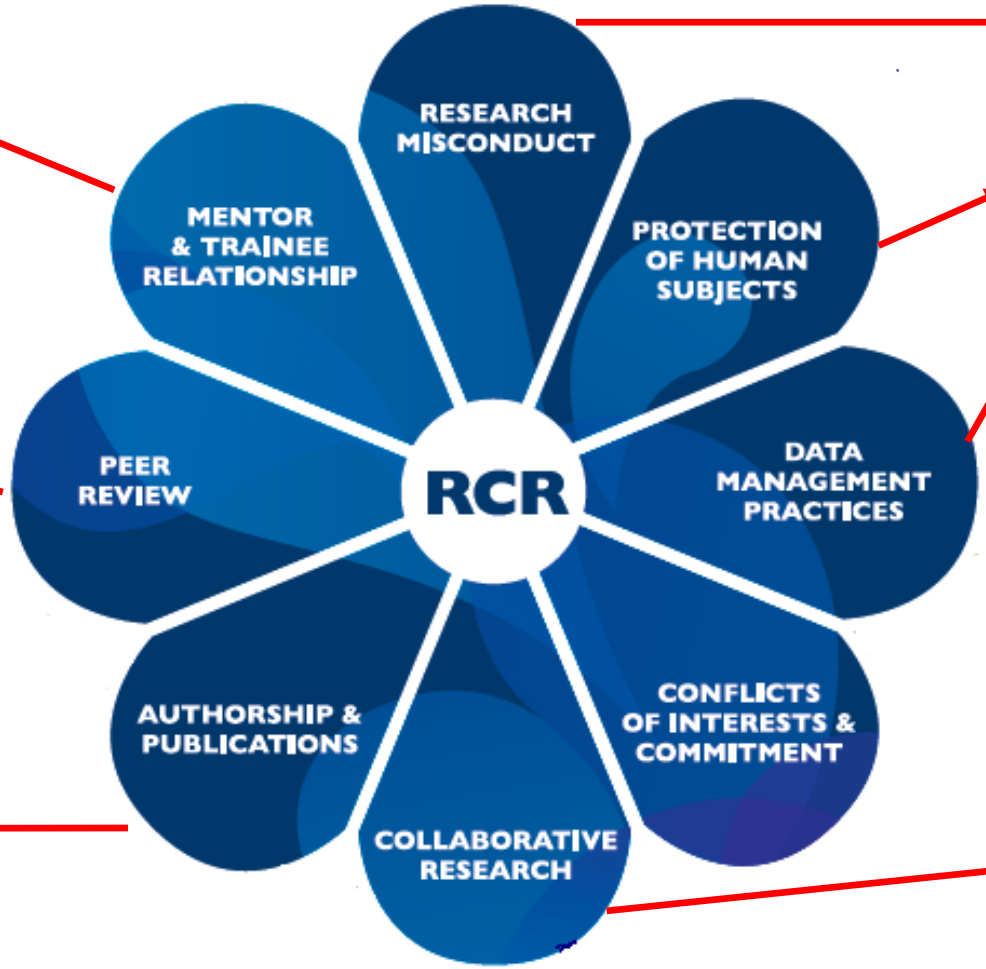
- An culture as well as a set of practical activities
  - Changing the way we think about responsible research, justice and societal good
  - Changing how we collaborate
- Requires buy-in and commitment from
  - Individuals
  - Institutions
  - Funders
  - Publishers
  - governments

Openness and Responsible Conduct of Research

Open Lab Books: Transparency in research practices
Sharing and openness: enhance transmission of values

Open Peer Review:
Transparency in peer review leads to better dialogue and collegial behaviour

Open Access: Improves availability of research outputs
Open publishing: leads to improved citations, credit and collaboration



Open Data and Open Methodologies:
Improve transparency and reproducibility of research

Open Science Tools:
Improve collaboration

Open Science and Low/Middle-Income Countries

- Open Science discussions have evolved without representative inclusion
  - It's not my discussion
  - It's not how we do things here
  - It's not a priority
- Open research is a commitment – time, financial, expertise – and requires considerable research, social and national infrastructures
  - We are being forced to divert scarce resources to things that will not help us
  - We are being required to do things that are difficult/impossible in our context
- We have historical examples of why this is not a good idea

In The Next Session

- Locating discussions on openness and ownership in LMICs
- Dealing with resource limitations
- Building infrastructures that are truly global
- Getting diverse opinions and many voices into one discussion

- Please write down three things that concern you about engaging in Open Science practices in your home environment. Use one post-it per issue.