Open Science in environmental science:
Has the time come to mainstream it?

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Cyberinfrastructure Forum, MSU
October 22, 2015

Current issues in science and society

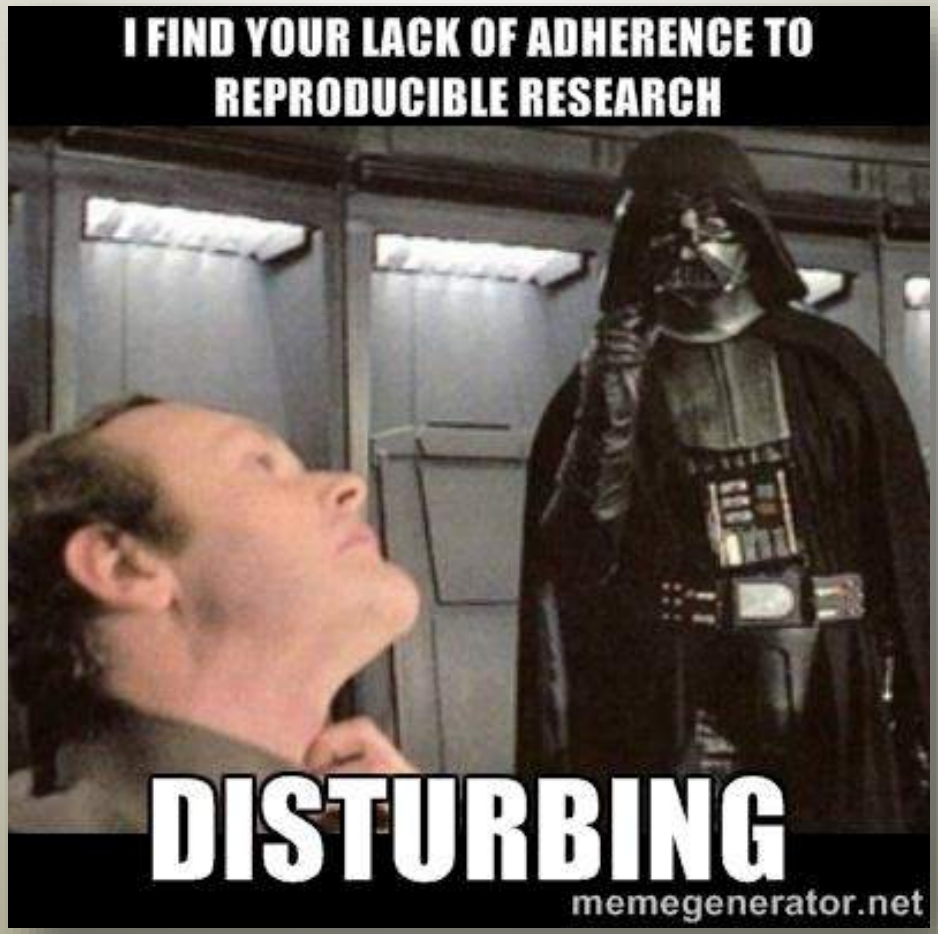
(a) Access

OPEN ACCESS

Current issues in science and society

(a) Access

(b) Reproducible research



http://memegenerator.net/instance/62383372

Current issues in science and society

(a) Access

(b) Reproducible research

(c) Public trust

Why Most Published Research Findings Are False

John P. A. Ioannidis

Published: August 30, 2005 • DOI: 10.1371/journal.pmed.0020124

But, current ‘norms’ in science

(a) Access: *History of ‘closed’ science*

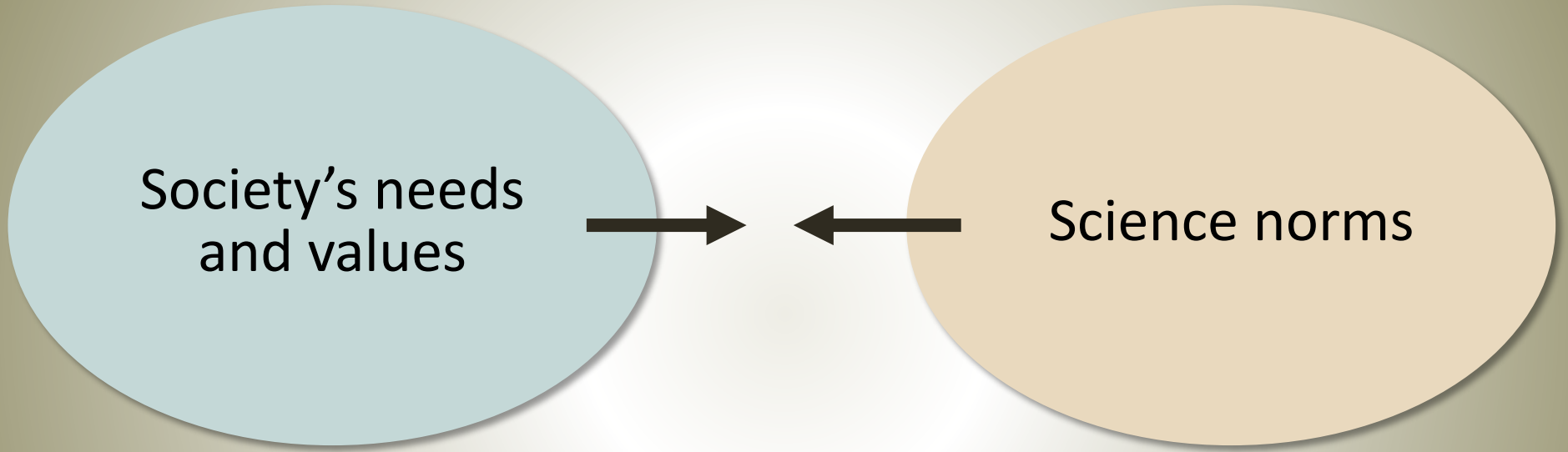
But, current ‘norms’ in science

(b) Reproducible research: *Not rewarded*

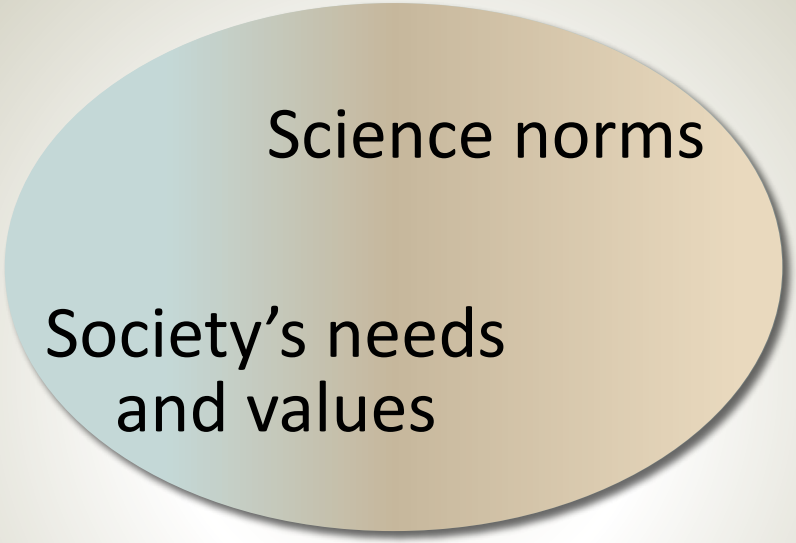
But, current ‘norms’ in science

(c) Public trust: *Lack of incentives for scientists to engage with non-scientists*

Challenge/disconnect



Need for better overlap between:



= Open science

Solution: Open Science

Defined as science that has:

1. *Fully accessible publications*
2. *Fully accessible data*
3. *Transparent and reproducible methods*

But, are ‘norms’ in science easy to change?

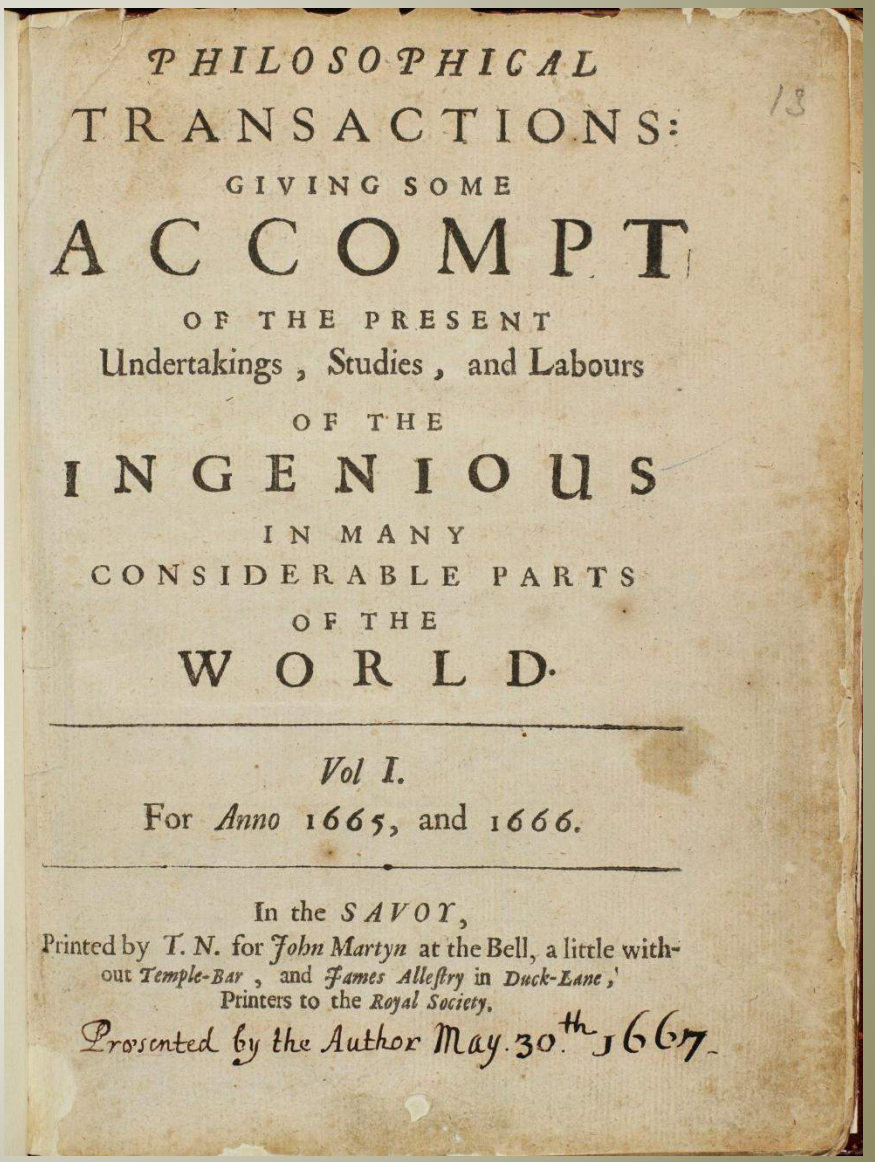
Barriers to open science

- High-stake issues for scientists -- *Precedence, attribution, investment, and payoff*
- Time to adopt new practices, learn new standards and tools
- Relinquishing control
- Mindset of ‘data ownership’

- Hampton et al. 2015

History of open science

First journal published 350 yrs ago:



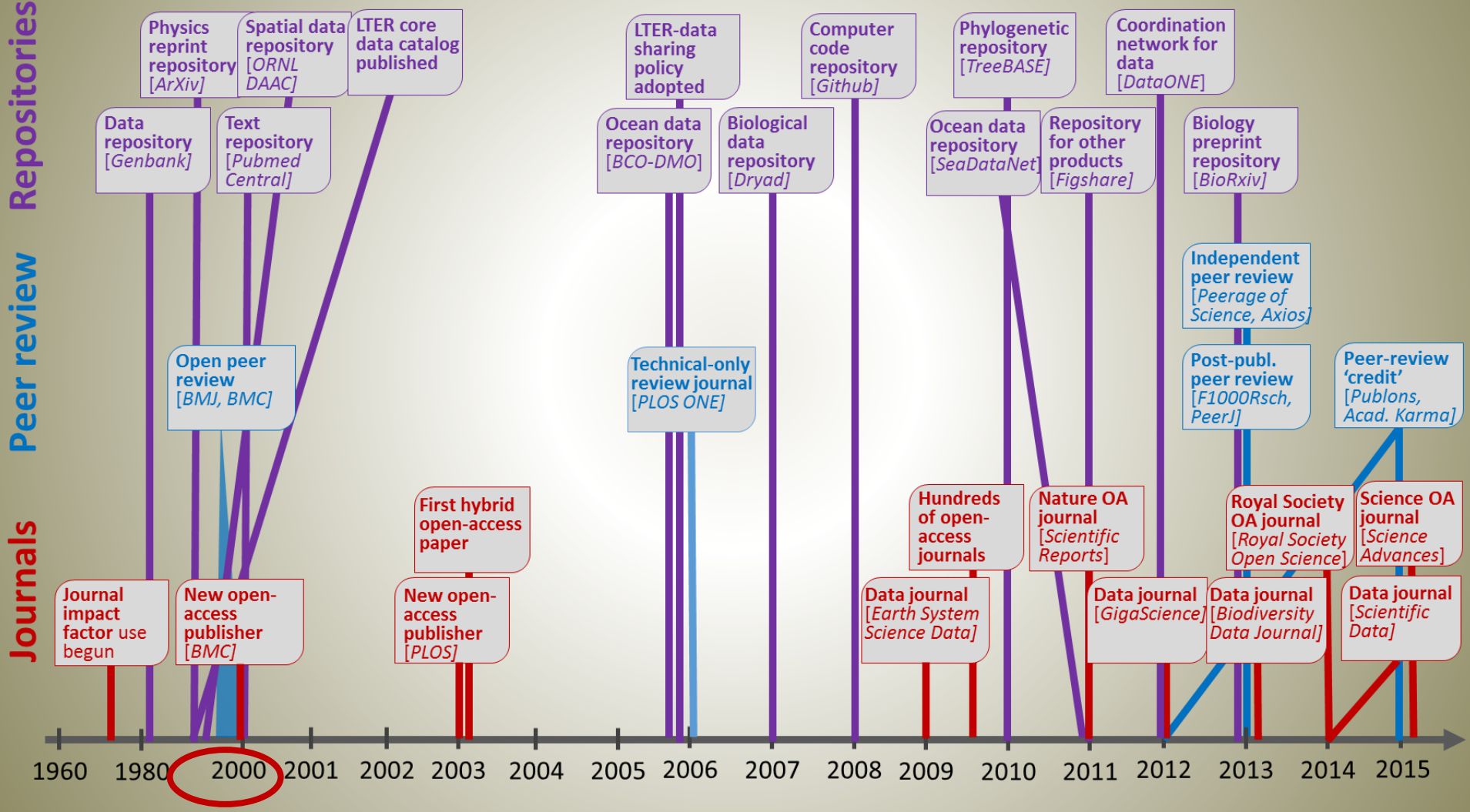
PHILOSOPHICAL
TRANSACTIONS:
GIVING SOME
ACCOMPT
OF THE PRESENT
Undertakings, Studies, and Labours
OF THE
INGENIOUS
IN MANY
CONSIDERABLE PARTS
OF THE
WORLD.

Vol I.
For *Anno* 1665, and 1666.

In the *SAVOY*,
Printed by *T. N.* for *John Martyn* at the Bell, a little without *Temple-Bar*, and *James Allestry* in *Duck-Lane*,
Printers to the *Royal Society*.
Prosented by the Author May. 30th 1667.

http://rstb.royalsocietypublishing.org/content/370/1666/20140380

Trends in open science & publishing in last 30 yrs



Soranno, unpublished

Open-science strategies

(1) Publishing: **Open Access** *journals & publishers*

Open-science strategies

(2) Data: **Data repositories**

re3data.org

REGISTRY OF RESEARCH DATA REPOSITORIES

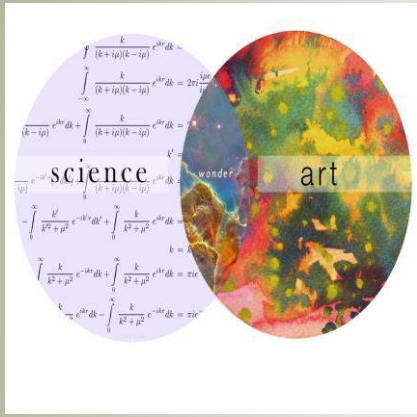
DRYAD

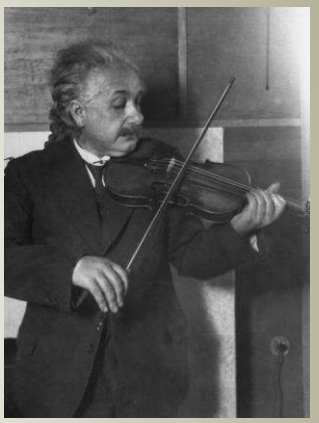
Open-science strategies

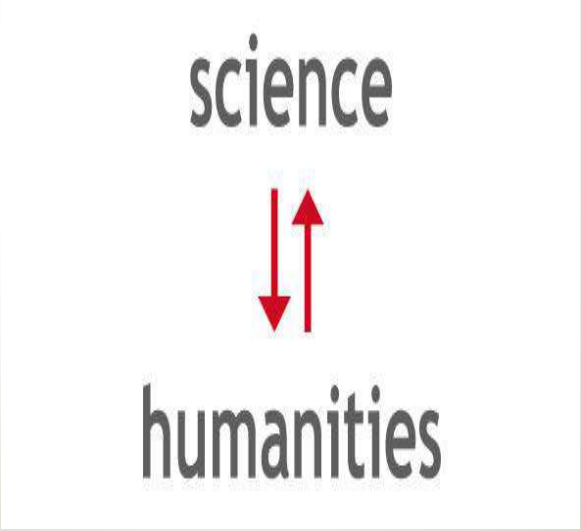
(3) Transparency: **Data papers, methods papers, metadata, etc.**

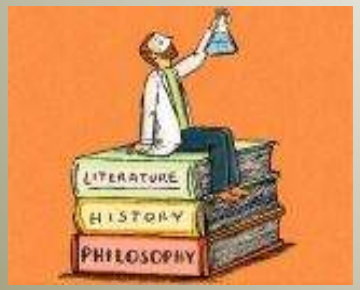
Where are we with ‘data sharing’ in environmental science?

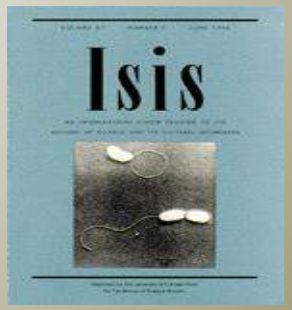
Case Study: *It's good to share: Why environmental scientists' ethics are out of date*











Case Study: *It's good to share: Why environmental scientists' ethics are out of date*

Ecology

Patricia Soranno

Kendra Cheruvelil

History

Georgina Montgomery

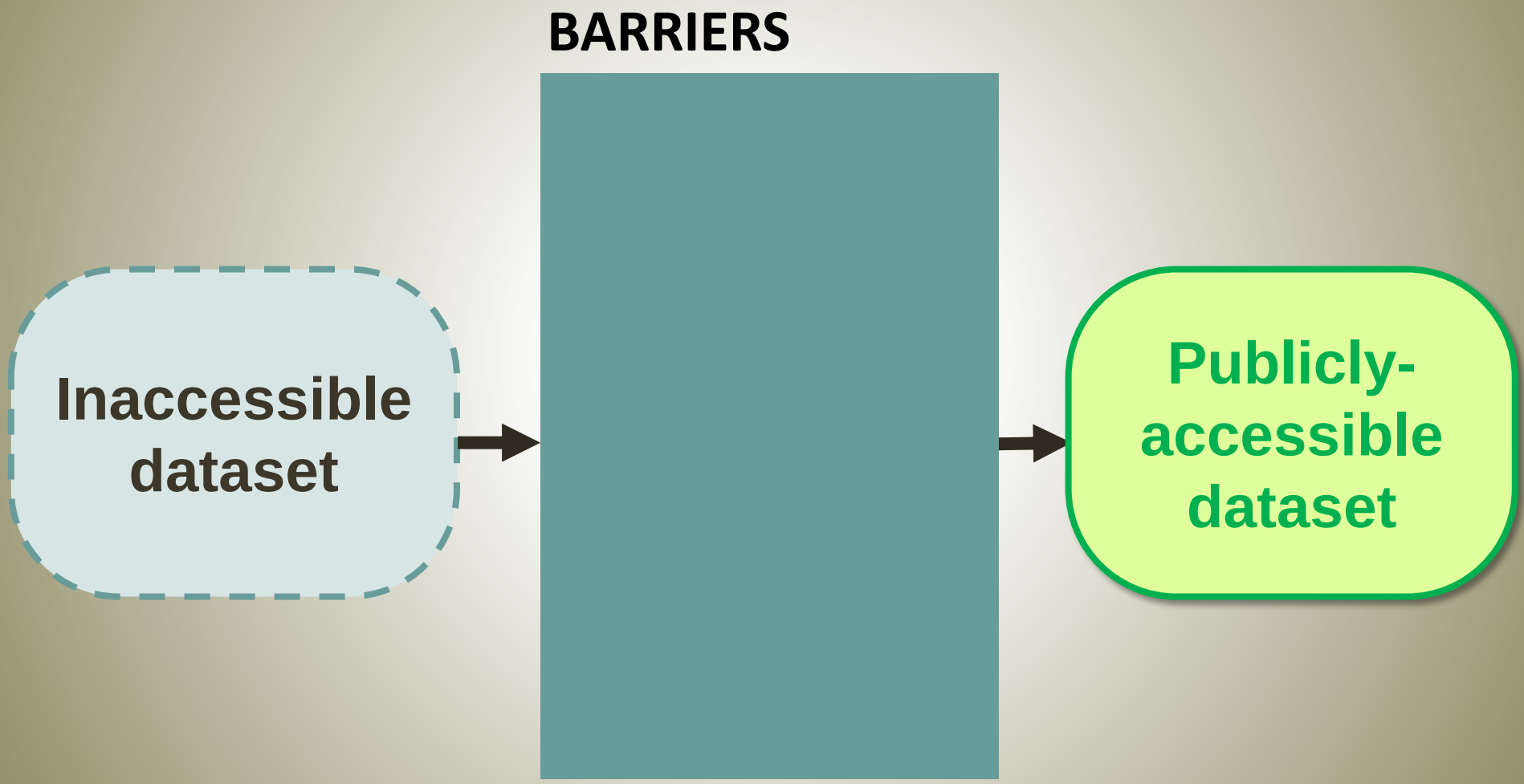
Philosophy

Kevin Elliott

A TINY fraction of ecological datasets are currently shared

Soranno et al. 2015. BioScience.

Case Study: *It's good to share: Why environmental scientists' ethics are out of date*



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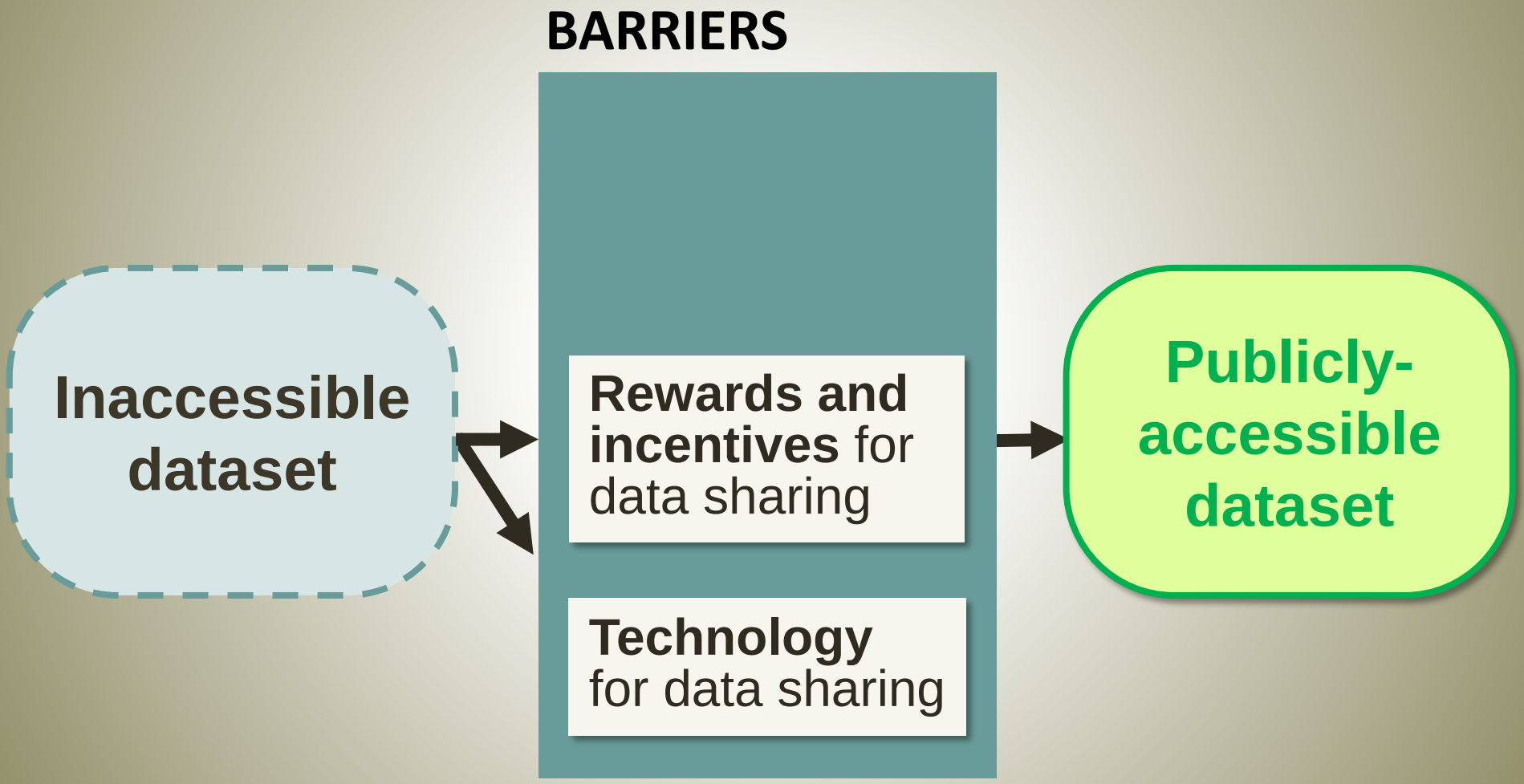

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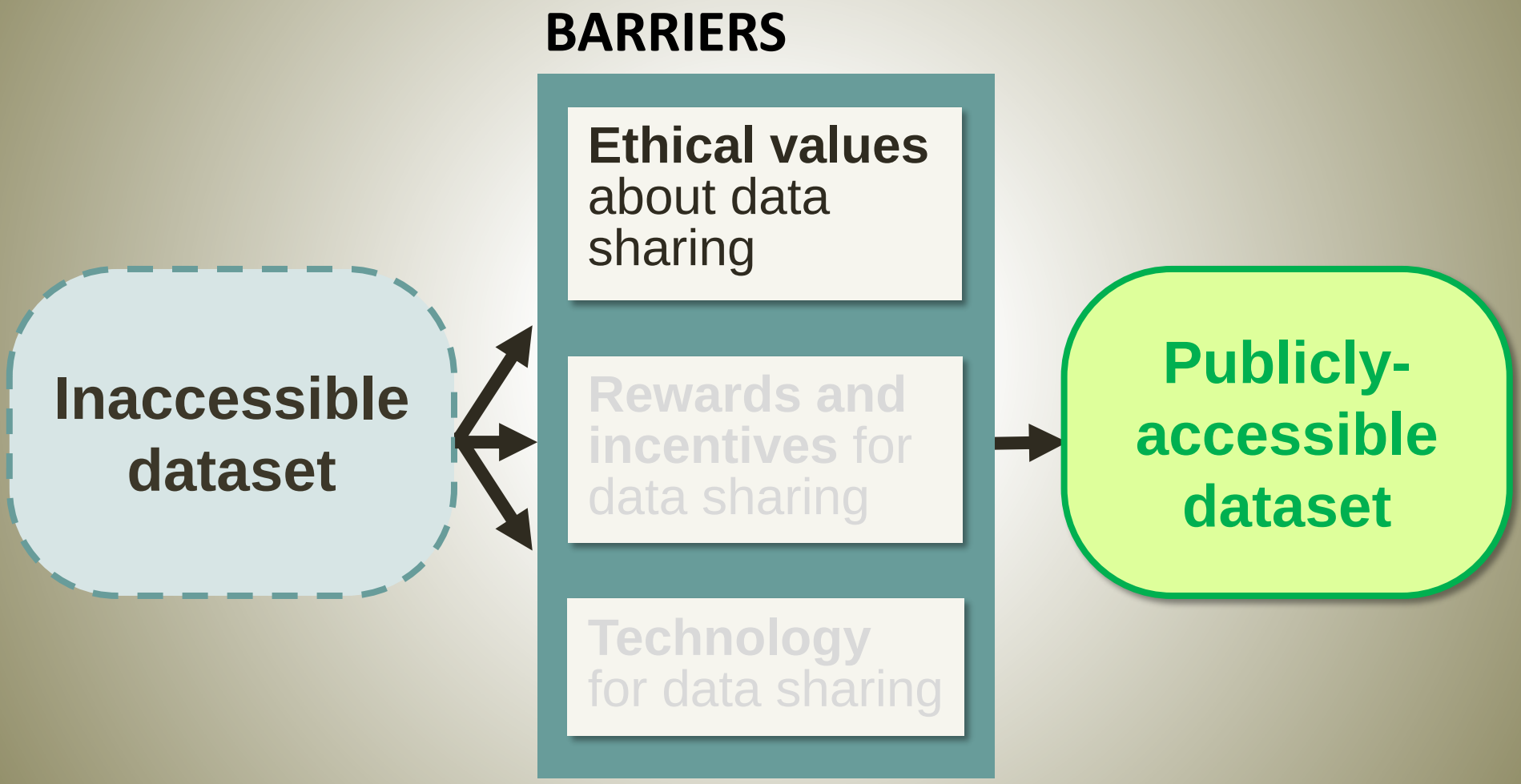


Soranno et al. 2015. BioScience.

Case Study: *Ethical arguments FOR data sharing*

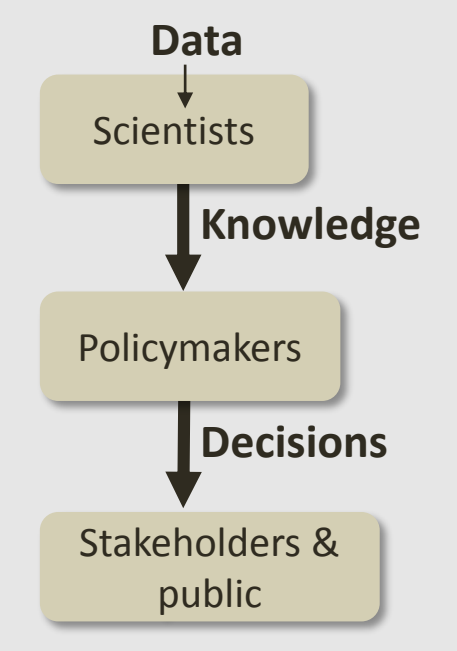
1) Inclusion in research teams and networks
2) Increasing public access to data and 'citizen science'

Soranno et al. 2015. BioScience.

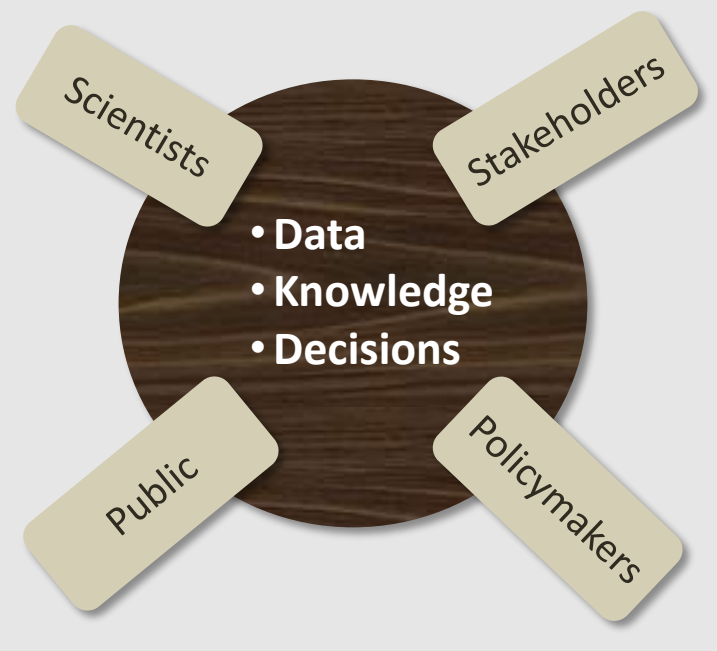
Case Study: *Ethical arguments FOR data sharing*

3) Improving the science-policy interface

Deficit-linear model



Round-table model



Soranno et al. 2015. BioScience.

If environmental science is to be truly inclusive, including diverse groups of people at the tables of research, decisionmaking, policy, and public debate, **it is not only necessary to share, it is ethically obligatory**.

Soranno et al. 2015. BioScience.

Arguments AGAINST data sharing:

- Should not have a 'blanket' policy because scientists should be using 'proprietary' data.

  *"Requiring data to be…open access **may feel right** but could have perverse consequences for the future of science."*

  - Fenichel and Skelly 2015

Arguments AGAINST data sharing:

- Key problems with open-access policies:

  Science progresses through innovation; innovation progresses by closed-system private markets; and, so should science (e.g., patents).

  - Katzner 2015

Arguments AGAINST data sharing:

- Scientists should not be expected to share because they have intimate knowledge of their 'systems', and:

  *"There is also the emerging issue of a generation of what we term as '**parasitic' scientists** who will never be motivated to go and gather data because it takes real effort and time and it is simply easier to use data gathered by others."*

  - Lindenmayer and Likens 2013

Where do we stand in environmental science now?

- We are in the midst of a transition between closed and open science:
  - Backlash and pushback occurs
  - Many are getting on board *(lots of emails & positive tweets in response to our data sharing paper)*

OPEN SCIENCE =

(1) Accessible publications
(2) Accessible data
(3) Reproducibility and transparency in methods

Where do we stand in environmental science now?

- How can we help facilitate the transition?

    1) Provide **training and tools** to non-experts

    2) Develop **incentives and rewards** for sharing

    3) Change the **culture** of science from closed to open