

# Open and replicable methods and protocols

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DAVIDE BONAZZI

## Plan to replicate 50 high-impact cancer papers shrinks to just 18

# Science

By Jocelyn Kaiser | Jul. 31, 2018, 5:45 PM



# 2%

experiments with open data

# 70%

of experiments required asking for key reagents

# 69%

of experiments needing a key reagent original authors were willing to share

# 0%

of protocols completely described

# 32%

of experiments the original authors were not helpful (or unresponsive)

# 41%

of experiments the original authors were very helpful

# Progress in open science

Beginning of the  
open science  
movement

Today

Open access

Open data

Open code

Open software

**Open methods** were  
conspicuously absent  
from the discussions this  
morning

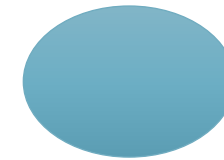
**Open methods**

**BIH QUEST**  
Transforming Biomedical Research

# The focus on open data and code means that we often overlook the value of open and re-usable methods

## Open / FAIR data & code

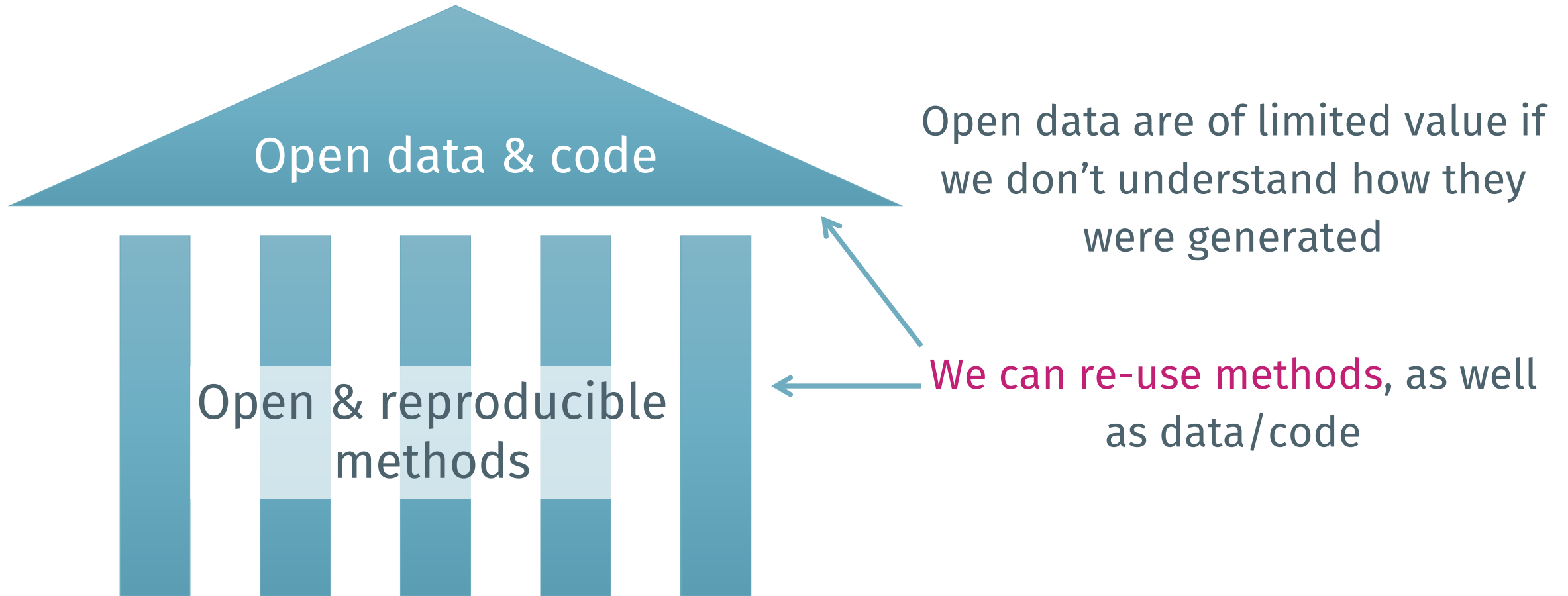
- Repositories
- Initiatives
- Tools
- Resources to support data depositors
- Funder mandates



## Open & replicable methods

- Repositories
- Limited awareness / use

# Open methods are the foundation that holds up open data



# Open methods are the foundation that holds up open data



Consequences of missing & poorly described methods:

- Inability to replicate
- Failed replication
- Inability to use open data
- Inappropriate use of open data
- Failure to understand limitations of secondary analyses

# Limitations of our current approach to publishing methods

- **Publications focus on results**, at the expense of methods
  - Undervalues methods development work
  - Disincentives protocol sharing
- When implementing a method, **step by step protocols are more useful than general text descriptions** in methods sections
- **Static methods sections or methods publications obscure the evolution of methods**

# Protocol repositories allow us to share living protocols

Static methods papers:

- Reflect what a single lab is doing at one point in time
- Rapidly become outdated

The question is not whether your protocol will change, but when and how it will change or be adapted by others.

Protocol repositories should:

- Allow versioning and forking
- Have a long-term preservation strategy



# Different readers have different needs

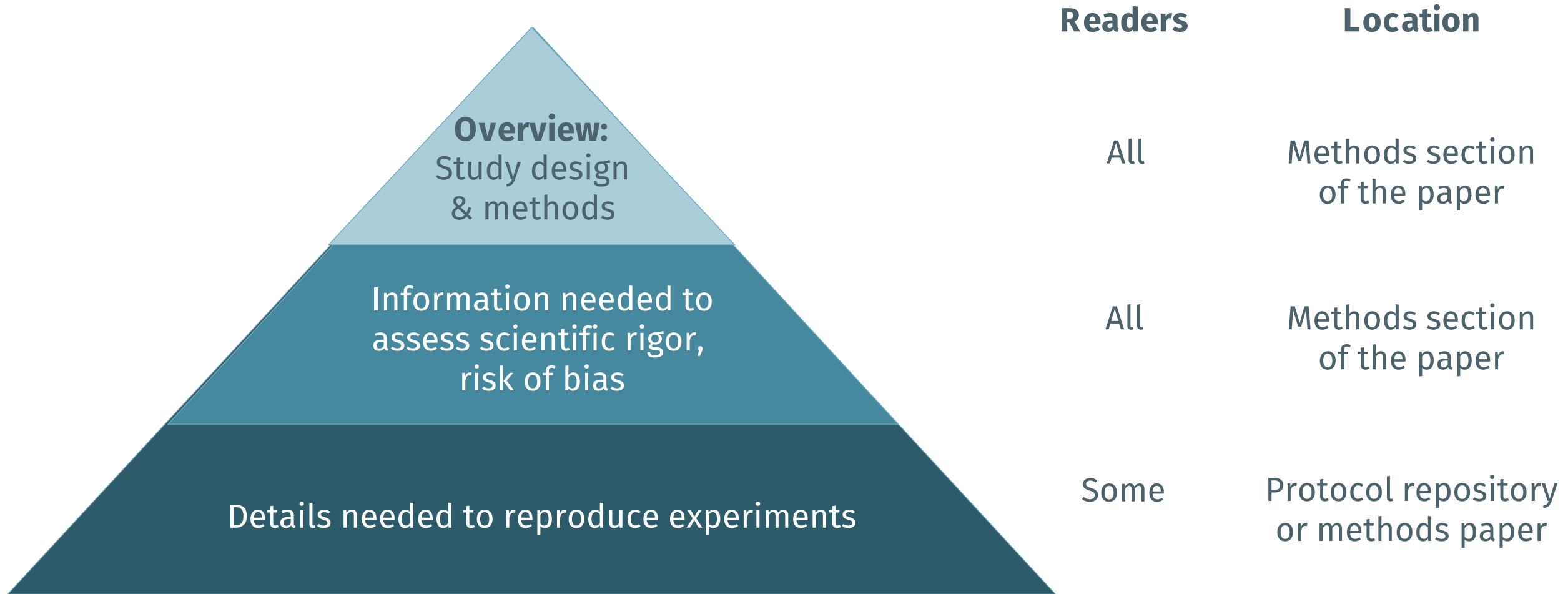


Figure from Standvoss et al., bioRxiv, 2022

# Methodological shortcut citations

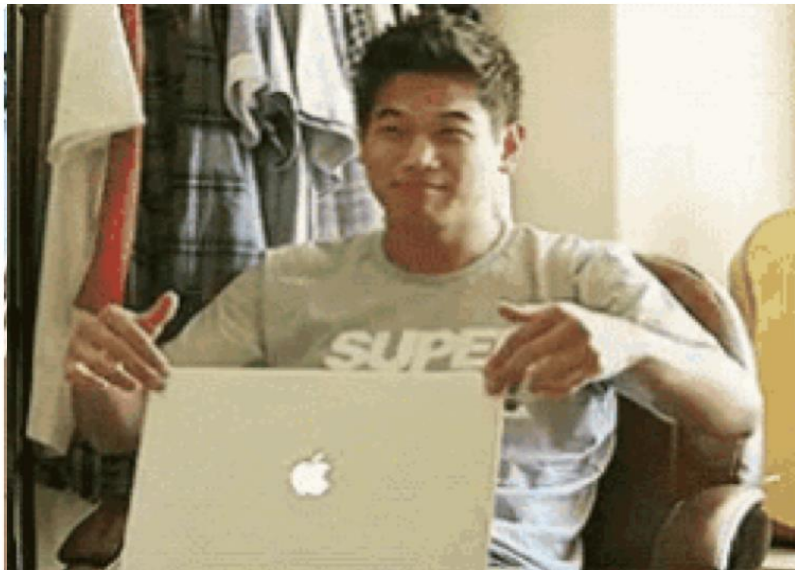
**Definition:** Instead of fully describing their methods, authors cite a resource that used similar methods. The cited resource may, or may not, fully describe the method.



Morgan Halane  
@themorgantrail

Follow

Looking for protocol in 1997 paper: "as described in (x) et al '96". Finds '96 paper: "as described in (x) '87." Finds '87 paper: Paywall.



Daniel Gonzales  
@dgonzales1990

Follow

2017: "Devices were fabricated as previously described [ref 8]"

[ref 8] 2015: "Devices were fabricated as previously described [ref 4]"

[ref 4] 2013: "Devices were fabricated as previously described [ref 2]"

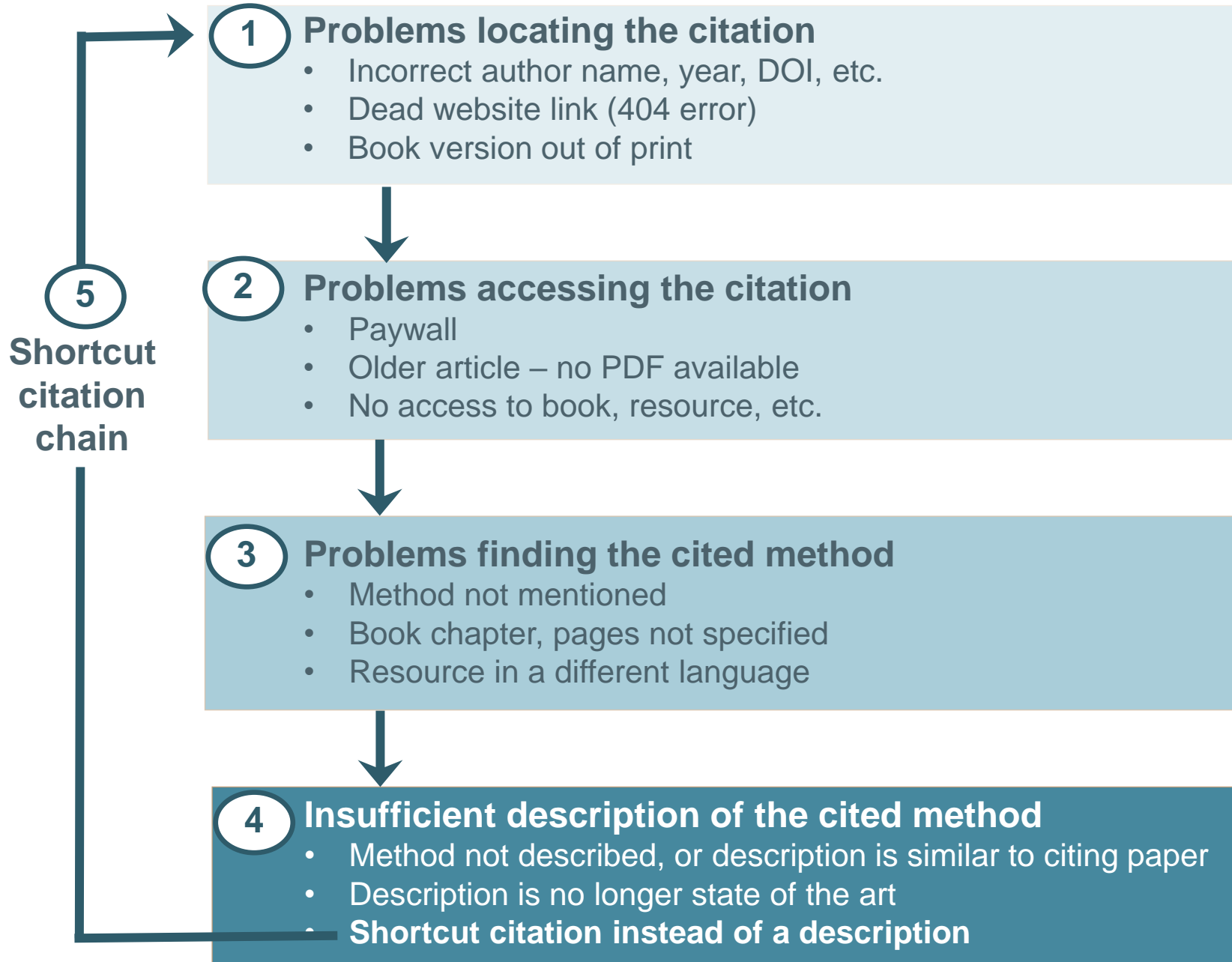
[ref 2] 2009: "Devices were fabricated with conventional methods"

# Methodological shortcut citations: Current practices

## Insights from a meta-research study of publications in neuroscience, biology and psychiatry

- >90% of papers use at least one shortcut citation
- Papers often use many shortcut citations
- 31-54% of citations in the methods section are shortcuts, depending on the field

# Potential problems when examining shortcut citations for detailed methods



While shortcut citations can be used effectively, they can also create problems for reproducibility

# Criteria for responsible use of shortcut citations

1. The cited resource contains a **very detailed description** of the method, allowing others to replicate the method
2. The **method you used is very similar or identical to the method described** in the shortcut citation. Any modifications can be briefly described in the methods section of your paper.
3. The cited resource is **open access**

**Alternative to 3:** Move all methods sections in front of the paywall

# Lessons learned from teaching “Publish my protocol”

1. Many labs are working with pseudoprotocols, or without protocols
2. Early career researchers aren't trained in protocol writing
3. Supervisors are worried about sharing their methods on open repositories

## Solutions

- Hands-on training
- A cultural shift to normalize protocols
- Incentives that reward protocol sharing

What can we do to shift towards a culture of open and replicable methods?

# Incentivize open methods. Create an open methods community.

**Reward open methods, open data and open code on par with publications highlighting results.** Otherwise, those who make materials re-usable are doing more work for the same unit of credit.

Create a large, vocal **community advocating for open methods.**



# How can funders reward and incentivize open and replicable methods?

- Add “Methods and Protocols” sections to applicant CVs
- Allow / encourage scientists to list methods papers and protocols deposited on open access repositories in funding applications
- Mandate or strongly encourage depositing of open and replicable protocols created during funded research
- Encourage authors to augment static methods sections with links to protocols
- Monitor citations of deposited protocols in publications describing funded work
- Fund, support or require hands on training in protocol writing and

Thank you!