

About Reproducible Science

and about science that can be trusted in N yrs

Lourdes Verdes-Montenegro & AMIGA team



- Reproducibility? vocabularies
- Reproducibility as a technical specification: where we are now
- Incentives/Metrics
- Benefits for the SKA community

REPRODUCIBILITY?

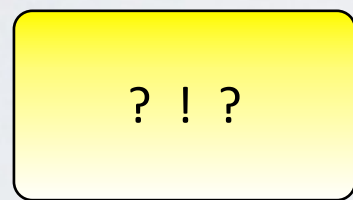
- **Open access:** sharing and dissemination of published papers ---> **the PDF**
- **Open science (H2020)**
 - *As other challenges need to be addressed such as infrastructure, IP rights, content-mining and alternative metrics, but also inter-institutional, inter-disciplinary and international collaboration among all actors in R+I, the EC is now moving decisively from 'Open access' into the broader picture of 'Open science'.*
- **And Astronomy?**
 - Data: IVOA
 - Individuals: Personal script-based recipes, Multi-archive VO recipes, Processing pipelines, etc
 - Community initiatives: Cyber-SKA, Montage, Astro-WISE, Helio-VO, ADSLabs, etc
- **Enough?**
 - Exascale era
 - Not only about access, but about reuse or peer verification

REPRODUCIBILITY?

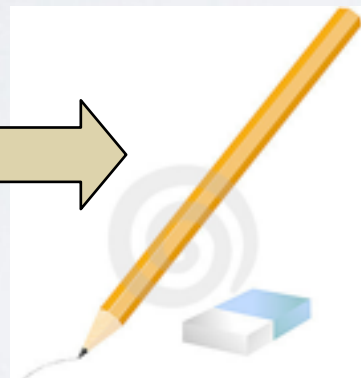
Life cycle of an experiment



Define
problem



Design



Find for re-purpose



Inspection



Modify
Execute



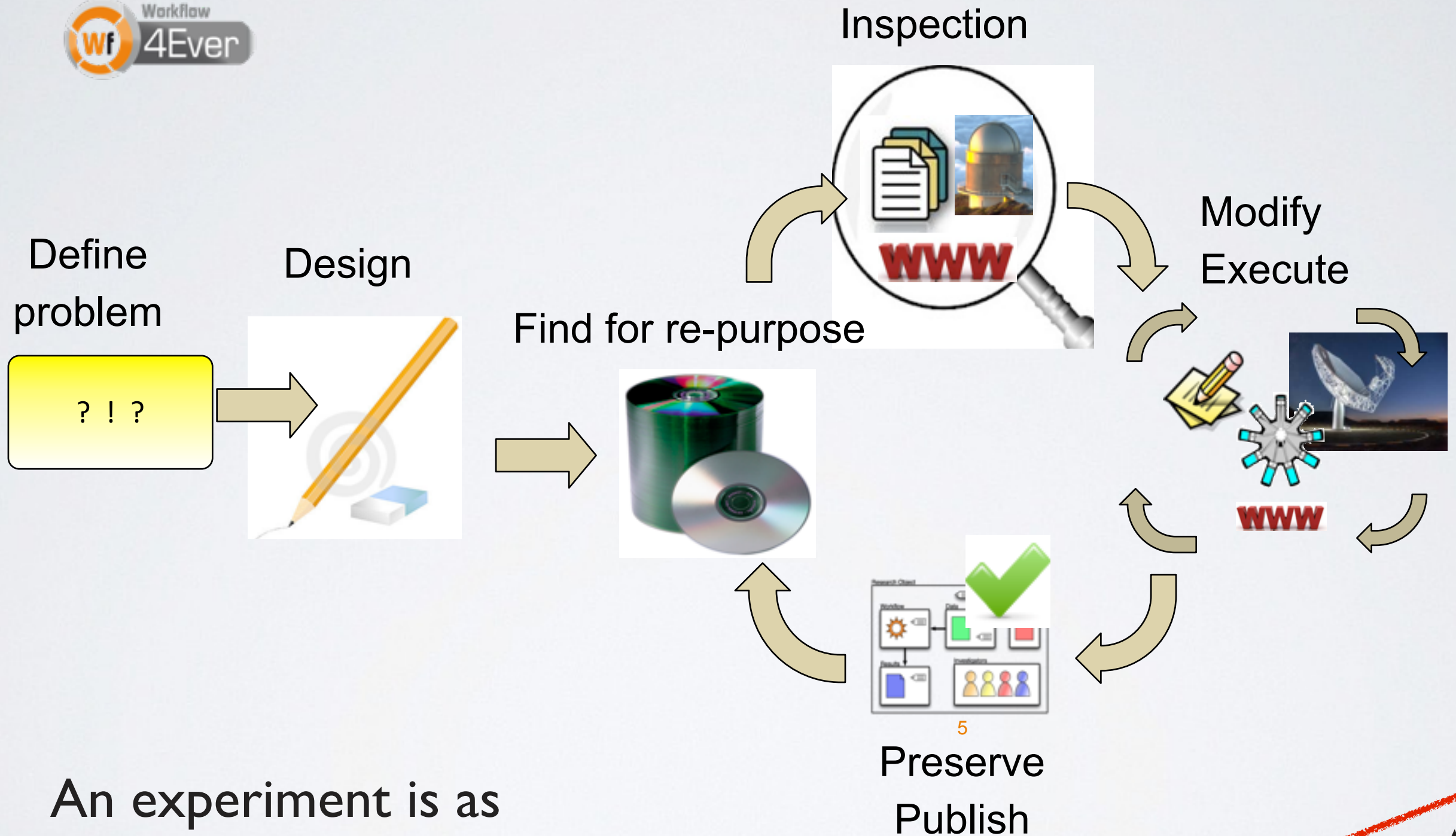
Preserve
Publish

- Details on contents and link between pieces
- Annotations as in wet lab
- Dependences, acknowledgements, information on usage by other researchers

See Julian's talk
for details

REPRODUCIBILITY?

Life cycle of an experiment



An experiment is as transparent as the visibility of its steps

See Julian's talk for details

REPRODUCIBILITY?

repeat

same
experiment
same lab

replicate

same
experiment
different lab

test

same
experiment
different set up

reproduce

different
experiment
some of same

reuse

REPRODUCIBILITY AS A TECHNICAL SPECIFICATION

WHERE ARE WE NOW

- **Gaining momentum in**
 - computer science, engineering, life sciences, biomedical sciences, climate science, ecology, epidemiology, psychology, econometrics, social sciences
- **Creating and sharing reusable scientific workflows and web services**
 - MyExperiment, **Wf4ever**, overview in e.g. Davidson & Freire 2008, here Rosa Filgueira and e-Science buddies
 - Science Gateways (talks today)

REPRODUCIBILITY AS A TECHNICAL SPECIFICATION

WHERE ARE WE NOW



ABOUT

[The Project](#)

[External Advisory Board](#)

[Objectives and Deliverables](#)

[Connect](#)

[Collaborate](#)

[Code](#)

[Staff](#)

[Employment](#)

[Policies](#)

[Use Our Logo](#)

[Publications](#)

[Newsletter](#)

THE PROJECT

The Agave Platform: NSF-funded cloud platform for reproducible science, initially for iPlant (2008) now CyVerse (2013). TB resources, starting collaboration with the WWT

VISION: TRANSFORMING SCIENCE THROUGH DATA-DRIVEN DISCOVERY.

MISSION: OUR MISSION IS TO DESIGN, DEPLOY, AND EXPAND A NATIONAL CYBERINFRASTRUCTURE FOR LIFE SCIENCES RESEARCH, AND TO TRAIN SCIENTISTS IN ITS USE.


THE PROJECT

CyVerse is funded by the National Science Foundation's Directorate for Biological Sciences. We are a dynamic virtual organization led by the University of Arizona to fulfill a broad mission that spans our partner institutions: Texas Advanced Computing Center, Cold Spring Harbor Laboratory, and the University of North Carolina at Wilmington.



REPRODUCIBILITY AS A TECHNICAL SPECIFICATION

WHERE ARE WE NOW

-  (US NSF funded)
 - Preservation + access to multi-scale, multi-discipline, and multi-national science data:
 - biological data from the genome to the ecosystem of environmental data available from atmospheric, ecological, hydrological, and oceanographic source

• The Collage Authoring Environment

(Nowakowski et al)

A software infrastructure which enables domain scientists to collaboratively develop and publish their work in the form of executable papers

• Paper Maché: Creating Dynamic Reproducible Science

(Brammer et al 2011)

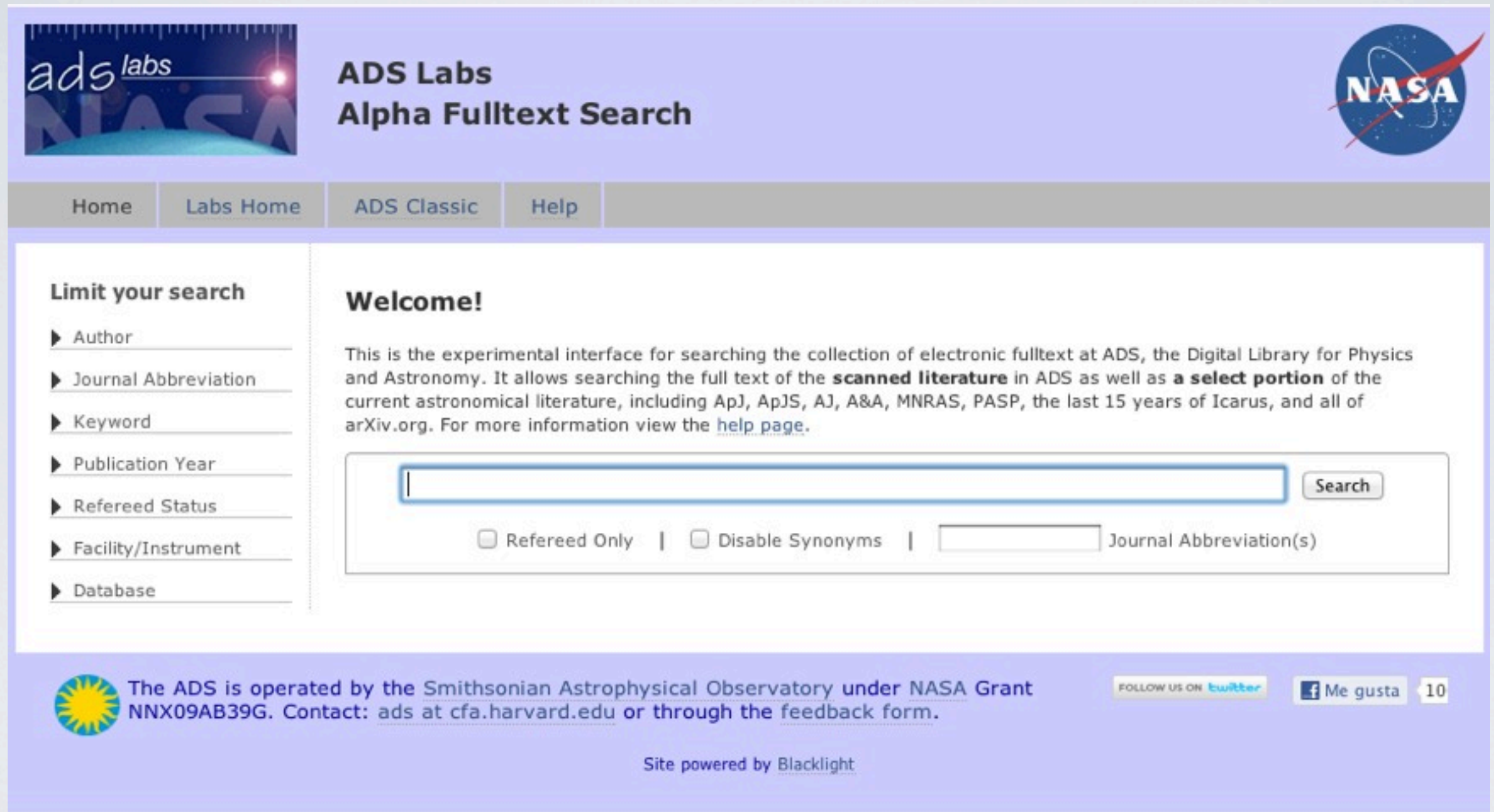
Paper management system using virtual environments so that the full experiment is packaged with a Virtual machine.



REPRODUCIBILITY AS A TECHNICAL SPECIFICATION

WHERE ARE WE NOW

- ADS Labs (open repository for Astronomy)



The screenshot shows the ADS Labs Alpha Fulltext Search interface. At the top left is the 'ads labs' logo with a NASA logo below it. To the right is the text 'ADS Labs Alpha Fulltext Search' and the NASA logo. Below this is a navigation bar with links for 'Home', 'Labs Home', 'ADS Classic', and 'Help'. The main content area is divided into two columns. The left column is titled 'Limit your search' and lists several criteria: Author, Journal Abbreviation, Keyword, Publication Year, Refereed Status, Facility/Instrument, and Database. The right column is titled 'Welcome!' and contains a paragraph of text: 'This is the experimental interface for searching the collection of electronic fulltext at ADS, the Digital Library for Physics and Astronomy. It allows searching the full text of the **scanned literature** in ADS as well as a **select portion** of the current astronomical literature, including ApJ, ApJS, AJ, A&A, MNRAS, PASP, the last 15 years of Icarus, and all of arXiv.org. For more information view the [help page](#).' Below this text is a search form with a large input field, a 'Search' button, and two checkboxes: 'Refereed Only' and 'Disable Synonyms'. There is also a small input field for 'Journal Abbreviation(s)'. At the bottom of the page, there is a footer with a sun icon, text stating 'The ADS is operated by the Smithsonian Astrophysical Observatory under NASA Grant NNX09AB39G. Contact: [ads at cfa.harvard.edu](mailto:ads@cfa.harvard.edu) or through the [feedback form](#).' There are also social media links for 'FOLLOW US ON twitter' and 'Me gusta' with a count of 10. At the very bottom, it says 'Site powered by Blacklight'.

ADS has been linking papers with VizieR data. Now also observing proposals, telescope, software is being referenced

REPRODUCIBILITY AS A TECHNICAL SPECIFICATION

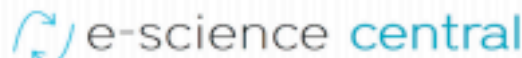
WHERE ARE WE NOW



Olive Executable Archive
recomputation.org
Open Science Framework



Share



Workflows, makefiles



Virtual Machines



Portable Packaging



Science as a Service

Integrative frameworks



Open Source

Workflows

INCENTIVES AND METRICS

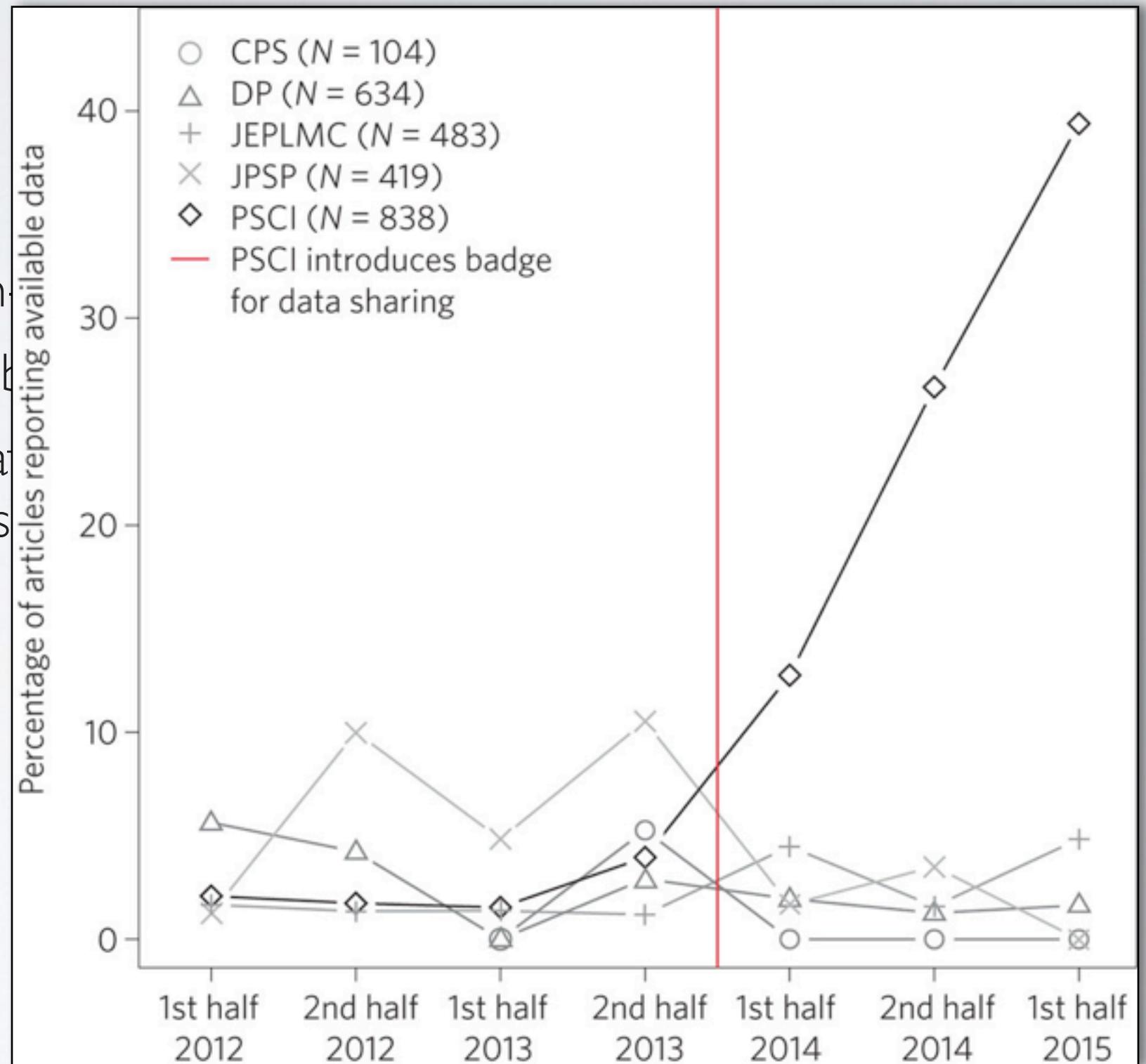
- **Why making the effort?**

- Scientific Method...
- Product of several person-years' worth of effort
- Imperatives from funding bodies and governments
- Some Journals require that source code and data is made available online under some form of open source license (often optional)

INCENTIVES AND METRICS

- **Why making the effort?**

- Scientific Method...
- Product of several person
- Imperatives from funding b
- Some Journals require that
- under some form of open s
- **Incentive from journals**



In January 2014, the journal *Psychological Science* (PSCI) introduced badges for articles with open data.

INCENTIVES AND METRICS

- **Why making the effort?**

- Scientific Method...
- Product of several person-years' worth of effort
- Imperatives from funding bodies and governments
- Some Journals require that source code and data is made available online under some form of open source license (often optional)
- Incentive from journals

- **Why not?**

- Pressure to “make the discovery”: Publish or perish
- Give your competitors an advantage
- (Lack of) Resources, training, tools, cost of preparation and curation
- And getting worse with generation of new data/ publications at an unprecedented rate

INCENTIVES AND METRICS

- Is “Number of papers” a measure of scientific productivity?
 - I am not a big fan of counting but...
 - if we'd start counting instead Number of reproducible papers?
- Are citations a good measure of impact?



EC STREP
2008 - 2011

- Is peer review any good? (Casati et al 2009)
 - Rankings of the review process vs impact (citations):
Very little correlation

INCENTIVES AND METRICS

Exploring and Understanding Scientific Metrics in Citation Networks (Krapivin et al 2009)

PaperRank

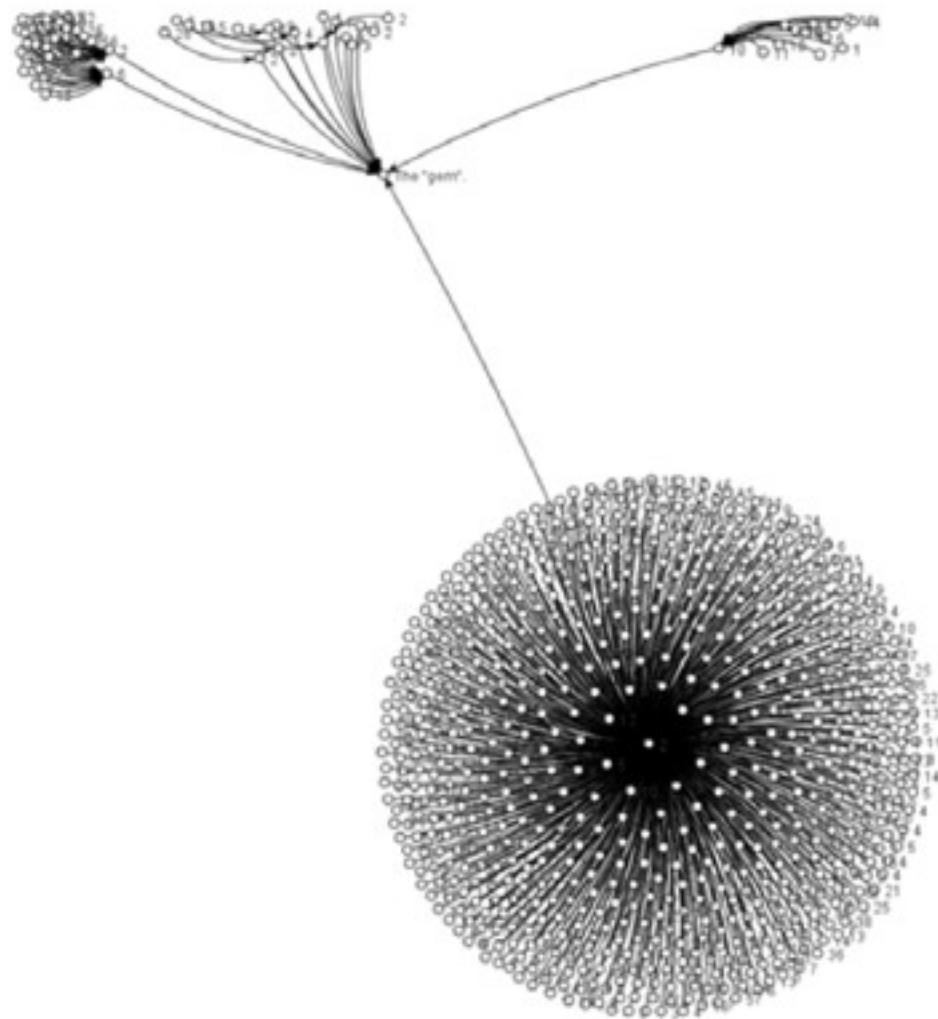


Fig. 4. "Hidden gem" in the dataset

Citation counts

PaperRank

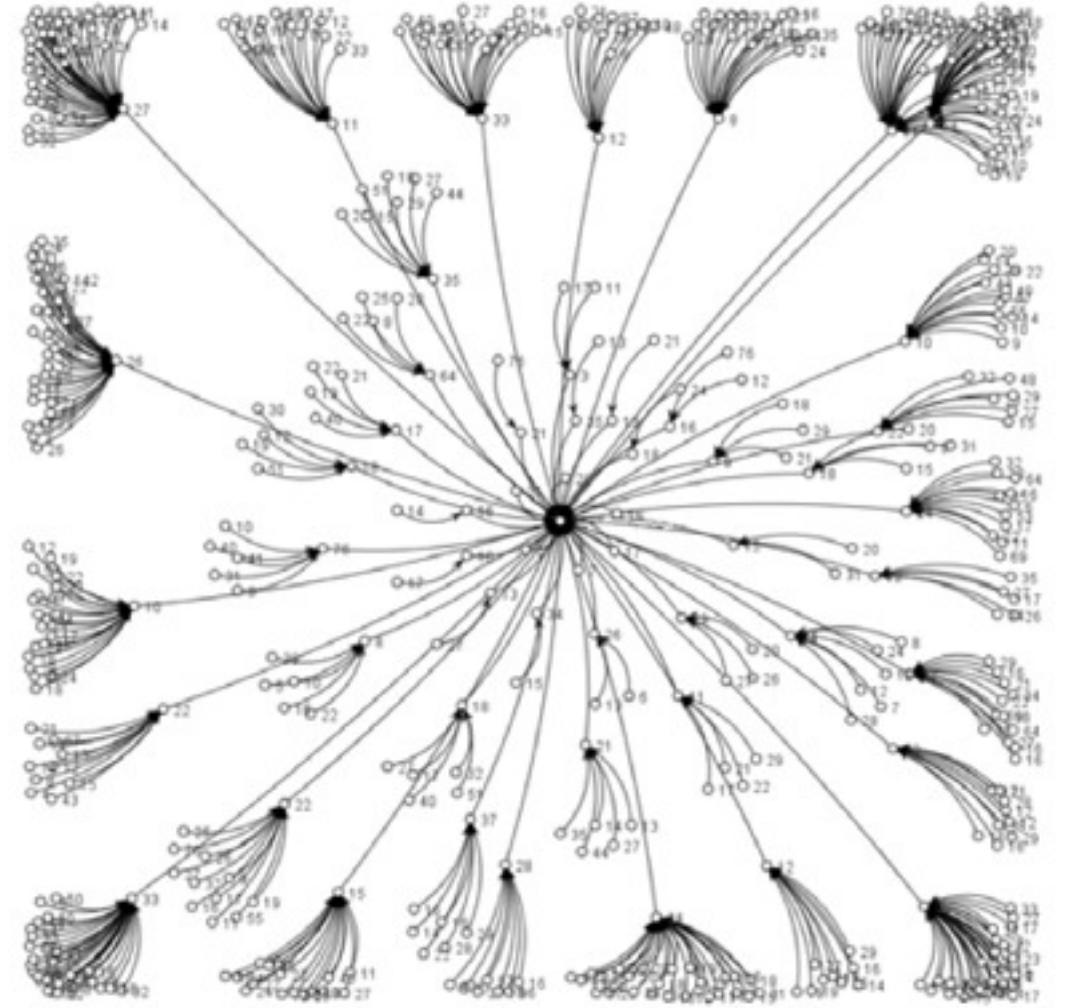


Fig. 5. "Popular paper" (in the center).

Citation counts

POLICYFORUM

SCIENTIFIC PUBLICATIONS

Coercive Citation in Academic Publishing

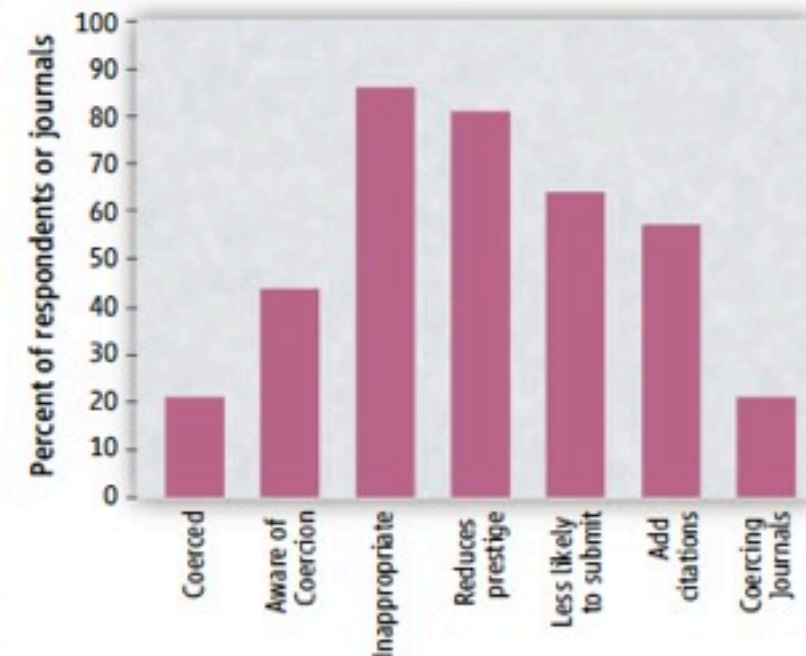
Allen W. Wilhite*† and Eric A. Fong*

Despite their shortcomings (1–4), impact factors continue to be a primary means by which academics “quantify the quality of science” (5). One side effect of impact factors is the incentive they create for editors to coerce authors to add citations to their journal. Coercive self-citation does not refer to the normal citation directions, given during a peer-review process, meant to improve a paper. Coercive self-citation refers to requests that (i) give no indication that the manuscript was lacking in attribution; (ii) make no suggestion as to specific articles, authors, or a body of work requiring review; and (iii) only guide authors to add citations from the editor’s journal. This quote from an editor as a condition for publication highlights the problem: “you cite *Leukemia* [once in 42 references]. Consequently, we kindly ask you to add references of articles published in *Leukemia* to your present article” (6). Gentler language may be used but the message is

fied multiple times, with the worst offender being named by 49 different respondents. To put this in context, our respondents reported a total of 45,955 accepted articles, an average of 55.2 articles per journal. By that calculation, the most flagrant offenders may be coercing most of their contributors. However, this rough calculation does not account for variation in the number of articles in journals, references per article, or disciplines. In our regression analyses, we control for those attributes to get a more accurate picture.

Although 86% of our respondents view coercion as inappropriate, 81% agree that coercion reduces a journal’s prestige, and 64% even say they are less likely to submit to a coercive journal, the majority (57%) still say they

Many journal editors appear to strategically target authors and papers to pressure them into citing the editors’ journals.



Survey results reflecting the extent, and opinions, of coercion. Percentages of respondents who (i) have been coerced, (ii) are aware of coercion, (iii) think coercion is inappropriate, and agree or strongly agree that (iv) coercion reduces the prestige of a journal, (v) they are less likely to submit to a coercive journal, and (vi) they are likely to add journal-specific citations before submission. The percentage of journals in the study identified as coercers is also shown. See SOM for details.

INCENTIVES AND METRICS

BULLETIN

of the ASSOCIATION for
Information Science and Technology

altmetrics is the creation and study of new metrics based on the Social Web for analyzing, and informing scholarship.

asis&t
APRIL/MAY 2013

Volume 39, Number 4
ISSN: 1550-8366

SPECIAL SECTION

Altmetrics: What, Why and Where?

- 8] Introduction
by Heather Piwowar, Special Section Guest Editor
- 10] The Power of Altmetrics on a CV
by Heather Piwowar and Jason Priem
- 14] Open Access and Altmetrics: Distinct but Complementary
by Ross Mounce
- 18] Ask Not What Altmetrics Can Do for You, But What Altmetrics Can Do for Developing Countries
by Juan Pablo Alperin
- 22] New Opportunities for Repositories in the Age of Altmetrics
by Stacy Konkiel and Dave Scherer
- 27] The Many Faces of Article-Level Metrics
by Jennifer Lin and Martin Fenner
- 31] Five Challenges in Altmetrics: A Toolmaker's Perspective
by Jean Liu and Euan Adie
- 35] Are Alternative Metrics Still Alternative?
by Mike Buschman and Andrea Michalek

DEPARTMENTS

- [2]
Editor's Desktop
- [3]
President's Page
- [5]
Inside ASIS&T

COLUMNS

- [42]
IA
Enabling Action:
Digging Deeper into
Strategies for Learning
by Thom Haller
- [44]
RDAP
Collaborative Annotation
for Scientific Data
Discovery and Reuse
by Kirk Borne

The New
ASIS&T
Unveiled!

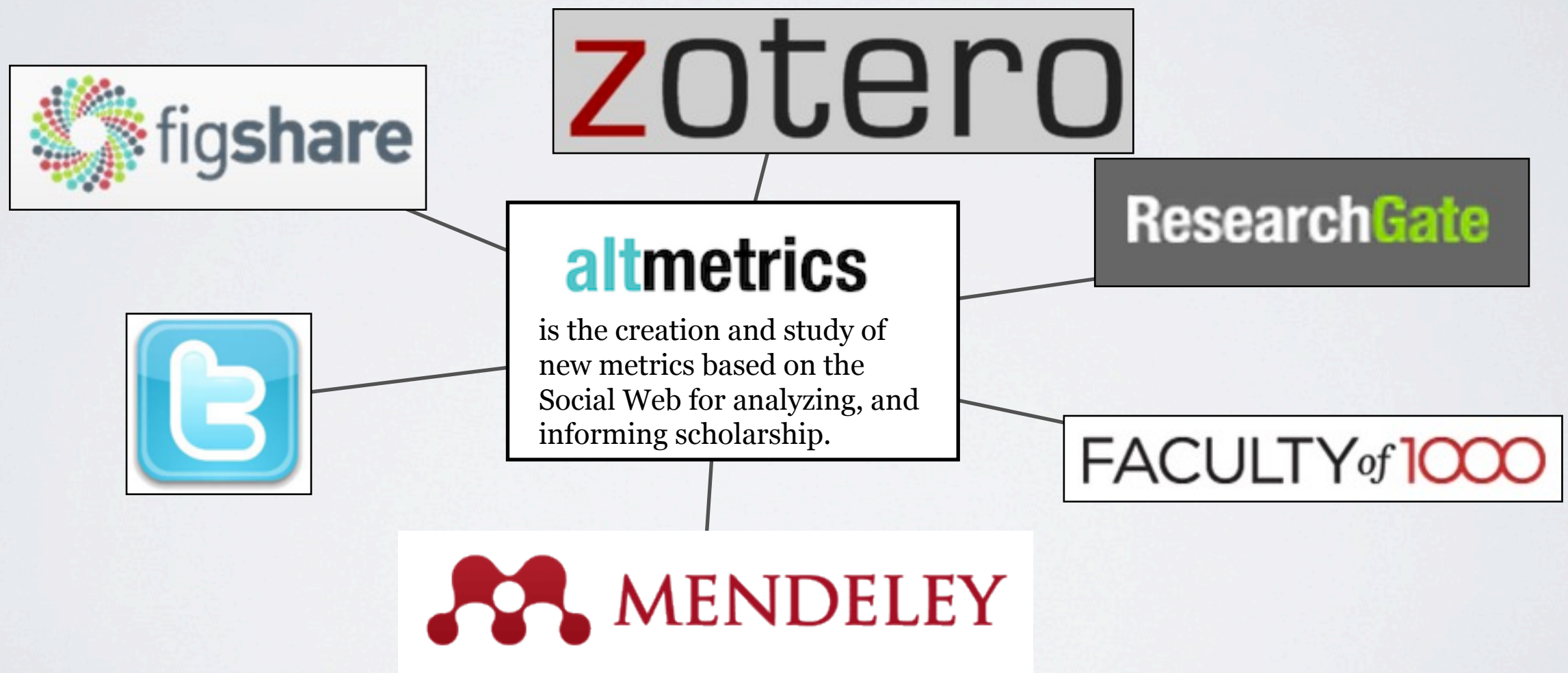
asis&t
ASSOCIATION for INFORMATION
SCIENCE and TECHNOLOGY

page 5

INCENTIVES AND METRICS

- In the Web era, scholarship leaves footprints.
- The flow of scholarly information is expanding by orders of magnitude, swamping our paper-based filtering system

J. PRIEM, 2013. NATURE, 495, 437



INCENTIVES AND METRICS



Altmetric now collects paper mentions from YouTube videos

Up until now, Altmetric has focused on collecting mentions from [text](#) and [images](#). Today, we'd like to announce that we've begun collecting mentions of papers from YouTube videos. These mentions are now displayed in the new "Videos" tab on article details pages, and are also indicated in green on the Altmetric donut. To see some YouTube mentions, navigate to



altmetrics
is the creation and study of new metrics based on the Social Web for analyzing, and informing scholarship.



INCENTIVES AND METRICS

- “Understanding metrics, reducing reliance on rankings, and suggesting new ways to evaluate scientists are only the beginning”

“It’s going to take a sea change and lots of **cooperation** among scientists, journals, and academic and government institutions **to banish the “publish or perish” mentality**”

(K. Shaw, Scientific Method blog)

INCENTIVES AND METRICS

- “Understanding metrics, reducing reliance on rankings, and suggesting new ways to evaluate scientists are only the beginning”

“It’s going to take a sea change and lots of **cooperation** among scientists, journals, and academic and government institutions to banish the “publish or perish” mentality”

(K. Shaw, Scientific Method blog)



The screenshot shows the top navigation bar of the European Commission Research & Innovation Open Science website. It includes the European Commission logo, the text "RESEARCH & INNOVATION Open Science", and a breadcrumb trail: "European Commission > Research & Innovation > Open Science > Expert Group on Altmetrics". Below the navigation bar, the page title "Expert Group on Altmetrics" is displayed. A prominent blue headline reads "NEW: Final Report of the Expert Group on Altmetrics is available". The publication date is listed as "20 March 2017" and is underlined in red. The main text of the page describes the report's focus on advancing next-generation metrics in the context of Open Science, aligned with the Open Science Agenda's policy lines: "Fostering Open Science, Removing barriers to Open Science, Developing research infrastructures and Embed Open Science in society." It also mentions that the report will be presented and discussed at the Open Science Policy Platform on 20 March 2017.

| A-Z index | Site map | About this site | What's New | L

European Commission

RESEARCH & INNOVATION
Open Science

European Commission > Research & Innovation > Open Science > Expert Group on Altmetrics

Home Open Access European Open Science Cloud Open Science Policy Platform Expert G

Expert Group on Altmetrics

NEW: Final Report of the Expert Group on Altmetrics is available

Publication date: 20 March 2017

The Expert Group on Altmetrics outlines in this report how to advance a next-generation metrics in the context of Open Science and delivers an advice corresponding to the following policy lines of the Open Science Agenda: Fostering Open Science, Removing barriers to Open Science, Developing research infrastructures and Embed Open Science in society.

The report will be presented and discussed at the Open Science Policy Platform on 20 March 2017



Next-generation metrics: Responsible metrics and evaluation for open science

Report of the European Commission Expert Group on Altmetrics

James Wilsdon, Professor of Research Policy at University of Sheffield (UK)

Judit Bar-Ilan, Professor of Information Science at Bar-Ilan University (IL)

Robert Frodeman, Professor of Philosophy at the University of North Texas (US)

Elisabeth Lex, Assistant Professor at Graz University of Technology (AT)

Isabella Peters, Professor of Web Science at the Leibniz Information Centre for Economics and at Kiel University (DE)

Paul Wouters, Professor of Scientometrics and Director of the Centre for Science and Technology Studies at Leiden University (NL)

INCENTIVES AND METRICS



3 NEXT GENERATION METRICS FOR OPEN SCIENCE

3.1 Headline findings

Based on our review of the literature, evidence submitted by stakeholders, and deliberations by expert group members, we offer the following **five headline findings**:

#2 Transparency and accuracy are crucial (NISO, 2016; Wass 2016). The development and application of metrics should be based on user needs, rather than on the interests of data providers. We reaffirm the conclusion of *The Metric Tide* (Wilsdon et al., 2015) and Leiden Manifesto (Hicks et al., 2015) that responsible metrics should be understood in terms of:

Transparency: keeping data collection and analytical processes open and transparent, so that those being evaluated can test and verify the results;

BENEFITS FOR THE SKA COMMUNITY

- Reproducibility is not the aim, is the mean
- SRCs synonymous of Science as a Service (SClaaS)? (not meaning outsourcing)
 - Supporting scientific communities to access, share, and reuse research objects, methods, experiments, stimulating the development of new knowledge
- Keeping a project at the scale of the SKA funded requires all of the science to be spotless

ADDITIONAL REFERENCES

- Reproducibility as a Technical Specification. Crick et al 2015
- G. Begley and J. Ioannidis 2015
- Workflows4ever Project
- And plenty of material and ideas from talks and/or discussions with:



Carole Goble



Victoria Stodden



Dave de Roure