Indicators for Open Science and its Impacts

New Trends in STI Policy

Santander, Spain

|September 4, 2019

ORCID | Connecting Research and Researchers

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"The ability to uniquely identify contributors is a deceptively simple concept which, if realized, could enable forms of real-time understanding of scientific research that up to now have been extremely costly (if not impossible)."

-Jonathan Kram, Wellcome Trust

Underpinning STI policy and within the context of Open Science, we rely on indicators to analyse trends in order to effect change…

A Vision for Open Science

"Funders have the **opportunity and the responsibility** to shift the incentives inherent in grant application processes and improve the way research is evaluated."

"If open science practices are required, at the same time as **researchers continue to be judged, measured and rewarded** by the number of publications in high impact factor venues, disjoint and distrust will develop within the academic community."

"**Research libraries are key in the promotion and advocacy of open science** within institutions and active participants in data stewardship, helping, supporting and encouraging researchers to increasingly make their outputs openly available."

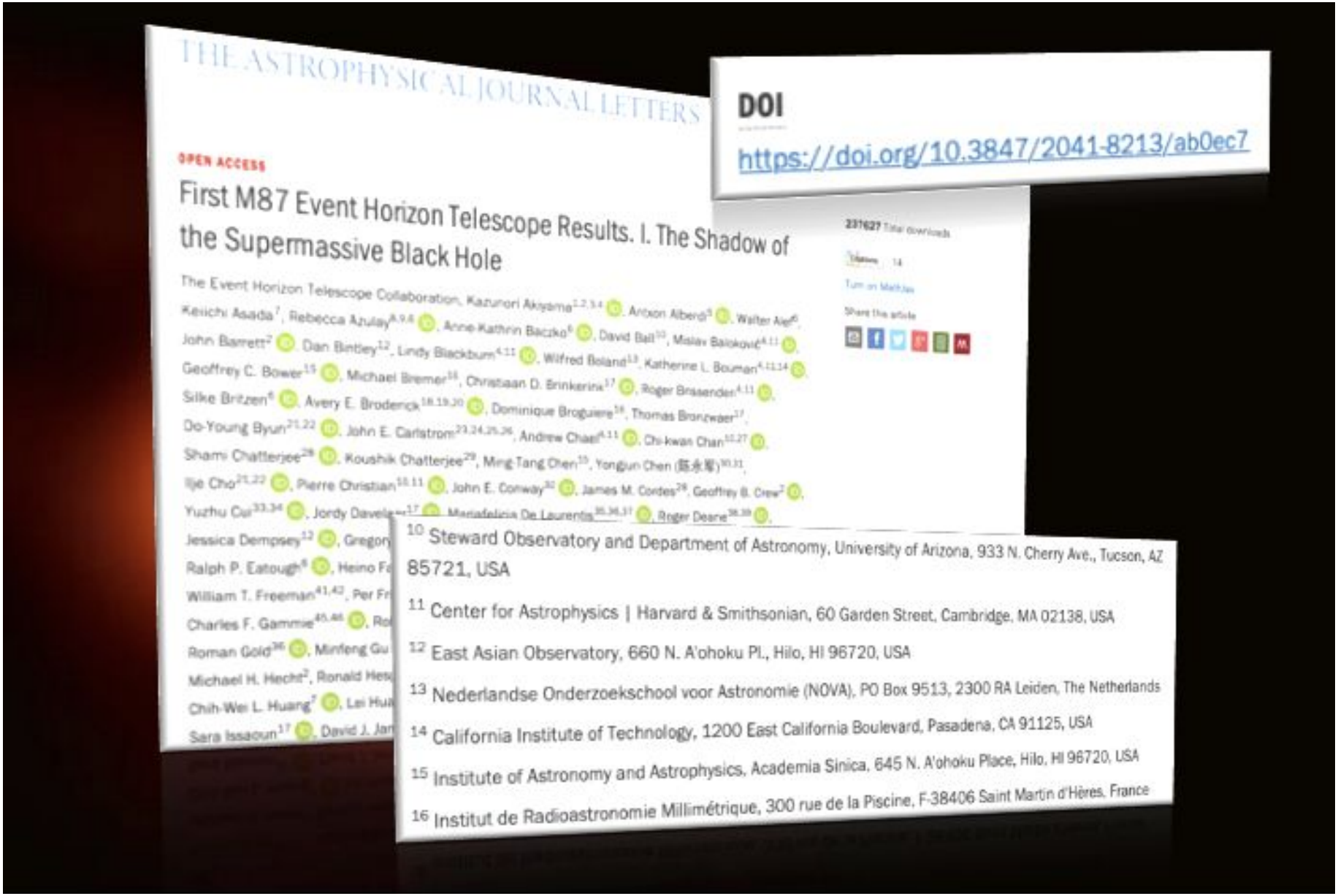
Michael Ball, Margreet Bloemers, David Carr, Valentino Cavalli, Maria Haglund, Vasso Kalaitzi, … Karen Vandevelde. (2018, November 19). A Vision for Open Science. Zenodo. http://doi.org/10.5281/zenodo.1491303

Looking into the future

"We imagine a future where all **funding bodies as well as institutions and researchers** recognise the benefit of open science and **embed best open science practices into their processes**. Collaboration and concerted efforts of all key players involved in research are necessary to ensure a future where research benefits from **optimal reuse of research output, and a real impact on society can be achieved**"

Michael Ball, Margreet Bloemers, David Carr, Valentino Cavalli, Maria Haglund, Vasso Kalaitzi, … Karen Vandevelde. (2018, November 19). A Vision for Open Science. Zenodo. http://doi.org/10.5281/zenodo.1491303

Expanding our Universe


THE ASTROPHYSICAL JOURNAL LETTERS
OPEN ACCESS
First M87 Event Horizon Telescope Results. I. The Shadow of the Supermassive Black Hole
The Event Horizon Telescope Collaboration, Kazunori Akiyama[1,2,3,4], Antxon Alberdi[5], Walter Alef[6], Keiichi Asada[7], Rebecca Azulay[8,9,6], Anne-Kathrin Baczko[6], David Ball[10], Mislav Baloković[4,11], John Barrett[2], Dan Bintley[12], Lindy Blackburn[4,11], Wilfred Boland[13], Katherine L. Bouman[4,11,14], Geoffrey C. Bower[15], Michael Bremer[16], Christiaan D. Brinkerink[17], Roger Brissenden[4,11], Silke Britzen[6], Avery E. Broderick[18,19,20], Dominique Broguiere[16], Thomas Bronzwaer[17], Do-Young Byun[21,22], John E. Carlstrom[23,24,25,26], Andrew Chael[4,11], Chi-kwan Chan[10,27], Shami Chatterjee[28], Koushik Chatterjee[29], Ming-Tang Chen[15], Yongjun Chen (陈永军)[30,31], Ilje Cho[21,22], Pierre Christian[10,11], John E. Conway[32], James M. Cordes[28], Geoffrey B. Crew[2], Yuzhu Cui[33,34], Jordy Davelaar[17], Mariafelicia De Laurentis[35,36,37], Roger Deane[38,39], Jessica Dempsey[12], Gregory
Ralph P. Eatough[6], Heino Fa
William T. Freeman[41,42], Per Fr
Charles F. Gammie[45,46], Ro
Roman Gold[36], Minfeng Gu
Michael H. Hecht[2], Ronald Hes
Chih-Wei L. Huang[7], Lei Hua
Sara Issaoun[17], David J. Jan
DOI
https://doi.org/10.3847/2041-8213/ab0ec7
237627 Total downloads
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[10] Steward Observatory and Department of Astronomy, University of Arizona, 933 N. Cherry Ave., Tucson, AZ 85721, USA
[11] Center for Astrophysics | Harvard & Smithsonian, 60 Garden Street, Cambridge, MA 02138, USA
[12] East Asian Observatory, 660 N. A'ohoku Pl., Hilo, HI 96720, USA
[13] Nederlandse Onderzoekschool voor Astronomie (NOVA), PO Box 9513, 2300 RA Leiden, The Netherlands
[14] California Institute of Technology, 1200 East California Boulevard, Pasadena, CA 91125, USA
[15] Institute of Astronomy and Astrophysics, Academia Sinica, 645 N. A'ohoku Place, Hilo, HI 96720, USA
[16] Institut de Radioastronomie Millimétrique, 300 rue de la Piscine, F-38406 Saint Martin d'Hères, France

Evolution & transformation

- The citation index made it clear that identifiers—**unique keys for articles**—were essential to enable the coding of connections between articles and citing articles.
- In turn, this led to the understanding that these unique keys needed to follow some shared standard to be useful in a database of objects from many sources.

Haak, L., Meadows, A. and Brown, J. (2018). Using ORCID, DOI, and Other Open Identifiers in Research Evaluation. Frontiers in Research Metrics and Analytics, 3.

Evolution & transformation (2)

- Eventually, with advances in computing power, digitization, and the creation of the Internet, we saw the launch of the Handle system (Arms and Ely, 1995) to **uniquely and persistently identify digital objects.**
- This enabled organizations like Crossref (https://crossref.org) and DataCite (https://www.datacite.org) to provide an open infrastructure to uniquely identify research articles and datasets **across multiple sources and domains.**

Haak, L., Meadows, A. and Brown, J. (2018). Using ORCID, DOI, and Other Open Identifiers in Research Evaluation. Frontiers in Research Metrics and Analytics, 3.

Evolution & transformation (3)

- The ability to uniquely identify and persistently access research articles transformed evaluation. Use of the publication citation index to study research blossomed. New, publication-derived metrics were developed and applied; entire national research evaluation frameworks were created that depended, wholly or in part, on these metrics.
- **Increasingly, however, it is becoming clear that a new perspective is needed.** There is some progress in this direction, with tools that harvest research information and connections across multiple sources to **enable real-time portfolio analysis**.

Haak, L., Meadows, A. and Brown, J. (2018). Using ORCID, DOI, and Other Open Identifiers in Research Evaluation. Frontiers in Research Metrics and Analytics, 3.

Not without challenges

- Clarity on participant names
- Information about participants affiliation and interests
- Variance in policy
- Lack of trust in data quality
- Policy regarding data exchange
- Missing indicators

Haak, L., Meadows, A. and Brown, J. (2018). Using ORCID, DOI, and Other Open Identifiers in Research Evaluation. Frontiers in Research Metrics and Analytics, 3.

What's in a Name?

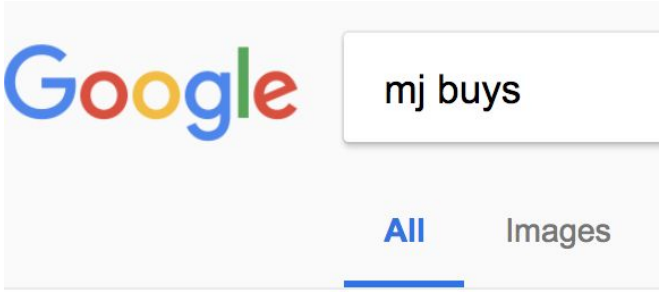
Most names are not unique

Many people have the same name

Names may change through marriage or other circumstances

People use different versions of their name during their career

Individuals use different alphabets, abbreviations, or naming conventions



People also ask

- Who owns Michael Jackson's rights?
- Does Michael Jackson own the Beatles music?
- What percentage of Sony did Michael Jackson own?
- How much did Michael Jackson buy the Beatles catalog for?

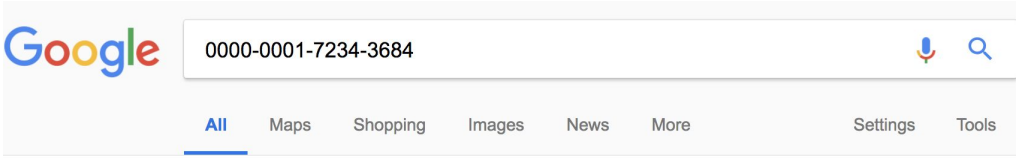
Feedback

How Michael Jackson Bought the Publishing Rights to The Beatles ...
mentalfloss.com/.../how-michael-jackson-bought-publishing-rights-beatles-catalogue
Aug 29, 2016 - **Michael Jackson** and Paul McCartney first met and became friendly in ... With the help of his attorney John Branca, Jackson started **buying** the ...

Sony buys Michael Jackson's music catalog for $750M - USA Today
https://www.usatoday.com/story/life/music/...buys-michael-jacksons.../81800298/
Mar 15, 2016 - LOS ANGELES — **Michael Jackson's** estate has agreed to sell its remaining stake in a lucrative music catalog to Sony Corp. for $750 million, ...

Sony buys out Michael Jackson's ATV Music Publishing for $750m ...
https://www.theguardian.com/.../sony-michael-jackson-atv-music-publishing-750m
Mar 15, 2016 - Company will now control all of Sony/ATV, the largest music publishing company in the world, having bought the dead singer's 50% share.

Michael Jackson???



About 118 results (0,25 seconds)

Matthew Buys (0000-0001-7234-3684) - ORCID | Connecting ...
https://orcid.org/0000-0001-7234-3684 - ...
Matthew is responsible for leading and managing the global adoption of ORCID across our communities and sectors. Based in Amsterdam, Matthew manages ...

[PDF] career and person tracking with orcid - UK ORCID Support - Jisc
https://ukorcidsupport.jisc.ac.uk/.../Cultivating-ORCID_PM_Breakout-2_ORCID-Care... - ...
... AND PERSON. TRACKING WITH ORCID. JISC Workshop, 16 June 2017. MATT BUYS orcid.org/**0000-0001-7234-3684**. REGIONAL DIRECTOR, EMEA ...

Why, What & How: The role of ORCID in Research Management (M ...
https://www.slideshare.net/.../why-what-how-the-role-of-orcid-in-research-manageme... - ...
Mar 7, 2016 - ... ORCID allows for simple searching of a specific iD and creates an authority record i.e. http://orcid.org/**0000-0001-7234-3684** First challenge 4 ...

GitHub - ORCID-CASRAI-2015/Elastic-ORCID-Prototype: Elastic Orci…
https://github.com/ORCID-CASRAI-2015/Elastic-ORCID-Prototype - ...
... curl -XPUT http://localhost:9200/record/orcid_v1.2/**0000-0001-7234-3684** --upload-file sample_profiles/**0000-0001-7234-3684**.orcid.json curl -XPUT ...

Unique identifiers provide trusted connections to professional activities

Researchers are mobile!

For example,

30% OF THE SCIENTISTS WHO GOT THEIR PhD IN THE UNITED KINGDOM NOW LIVE ELSEWHERE

Source: Science Magazine

Research institutions and organizations therefore find it hard to

- Benchmark their organization against others
- Identify, track, and report on researchers' affiliations and contributions (publications, peer reviews, grants, and more)

Institutions Face a Rising Tide of Research

OVER 3 MILLION

scholarly articles published per year

Source: The STM Report, October 2018

42,500 ACTIVE SCHOLARLY PEER-REVIEWED JOURNALS

Source: The STM Report, October 2018

Institutions must increasingly recognize and demonstrate the impact of all types of research contributions

Naming authority challenges

"No naming authority was imposed on the file, so entities have a variety of names. For instance, the American Chemical Society is referred to in a number of ways — ACS, ACS Publications, American Chemical Society, and The American Chemical Society, among others. PLOS ONE is listed in a similar variety of ways, as are most of the publishers and journals with multiple entries.....**By allowing authors to freestyle the name of the payee, we are creating a very loose data source for analysis."**

Source:
https://scholarlykitchen.sspnet.org/2014/03/21/wellcome-money-in-this-example-of-open-access-funding-the-matthew-effect-dominates/

Unique researcher identifiers have the potential to bring efficiency and transparency to the creation and re-use of information for research evaluation.

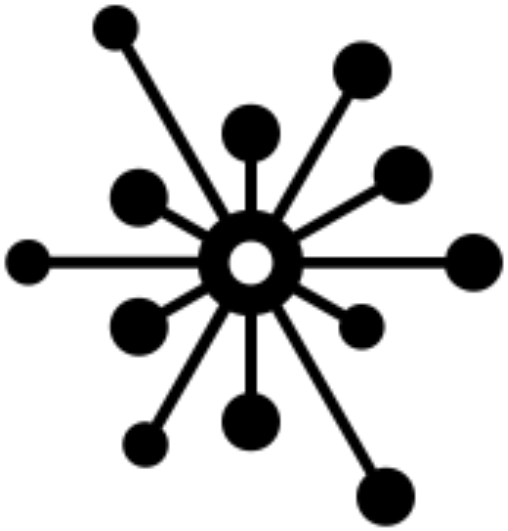
To address this issue, the global research community is adopting **digital names**

Globally unique persistent identifiers that specify the person, organization, activity, or research asset to which a name refers

Identifiers for contribution

- the persons carrying out the project
- the project
- the resources and facilities used
- the organization educating or employing researchers
- the funders supporting the project
- the research papers, data, and other products

Data in research evaluation



Research evaluation is hampered by a lack of data that clearly connect a research program with its outcomes and, in particular, by ambiguity about who has participated in the program and what contributions they have made.

Haak, L., Meadows, A. and Brown, J. (2018). Using ORCID, DOI, and Other Open Identifiers in Research Evaluation. Frontiers in Research Metrics and Analytics, 3.

Administrative burden

Manually making these connections is very labor-intensive, and algorithmic matching introduces errors and assumptions that can distort results.

Haak, L., Meadows, A. and Brown, J. (2018). Using ORCID, DOI, and Other Open Identifiers in Research Evaluation. Frontiers in Research Metrics and Analytics, 3.

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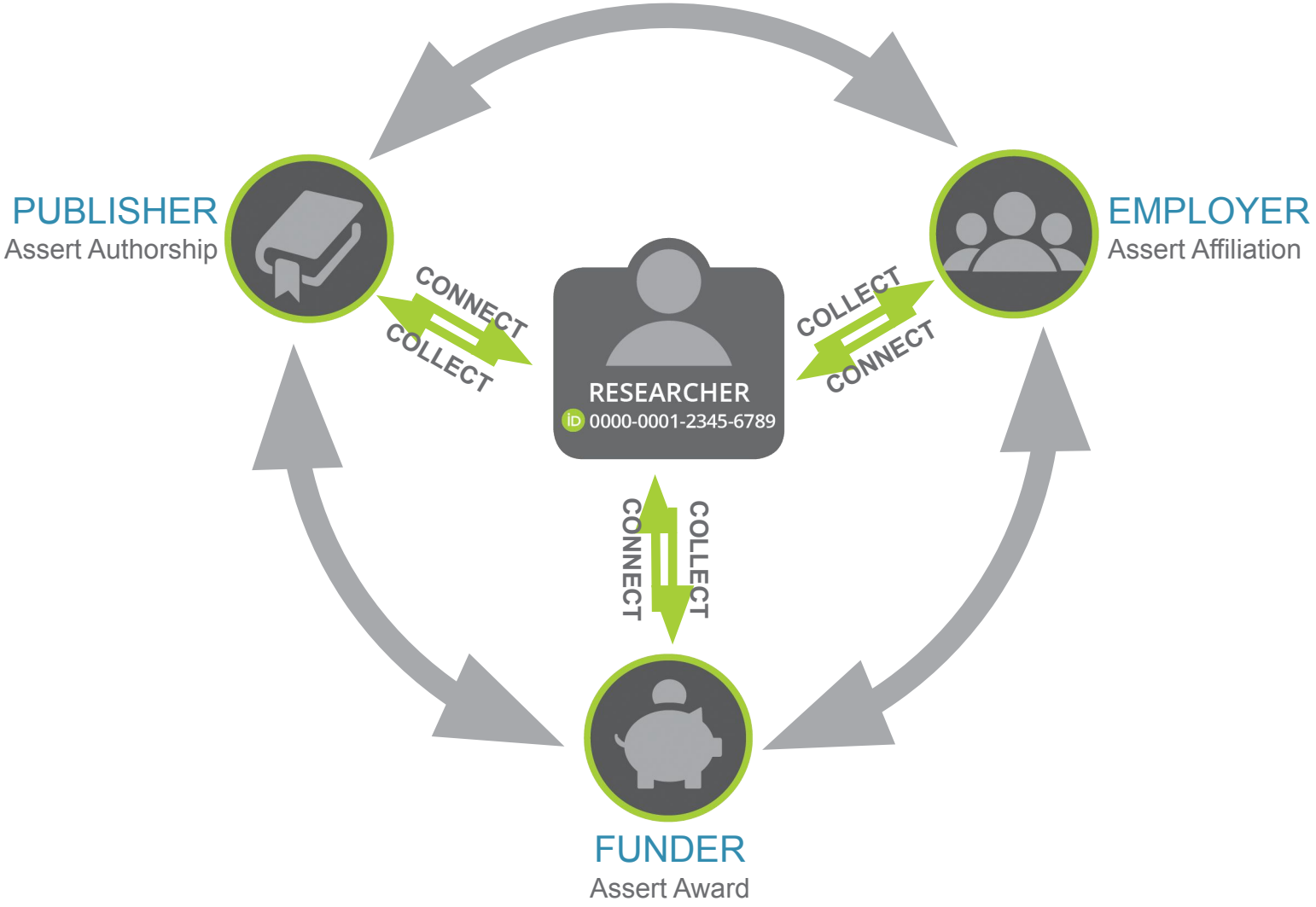
Connecting Research and Researchers

Interoperability



Exploring PIDs in evaluation

- The use of identifiers in research evaluation—for individuals, their contributions, and the organizations that sponsor them and fund their work.
- Global identifier systems are uniquely positioned to capture global mobility and collaboration.

Changing our world

- We need to start using direct measurement techniques in our evaluation processes.
- Garfield's citation index is an excellent foundation. It shows that building infrastructure is not only possible, but also has direct benefits. But it reflects only a part of the evaluation process.

Tools and infrastructure

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

Report of the European Commission Expert Group on Altmetrics

3.2.3 Developing research infrastructures for open science

RECOMMENDATION #7:
Realising the vision for the European Open Science Cloud (EOSC) will rely on linked meta-data that can become the basis for open, publicly available data infrastructure. We endorse the October 2016 proposals of the High Level Expert Group on the European Open Science Cloud, and agree with its observations that: "the majority of the challenges to reach a functional EOSC are social rather than technical" (EC High Level Expert Group on EOSC, 2016). How underlying data are collected and processed – and the extent to which they are open to interrogation – is crucial to addressing these challenges. Without the right identifiers, standards and semantics, we risk developing metrics that are not contextually robust or properly understood. The systems used across EU funding bodies, higher education institutions (HEIs) and other actors in the research system need to interoperate better, and definitions of research-related concepts need to be harmonised. The EOSC should also provide infrastructure that enables scientists to more easily cite datasets, for example by coupling to Datacite.

https://ec.europa.eu/research/openscience/pdf/report.pdf#view=fit&pagemode=none

RECOMMENDATION #8:
The European research system and Open Science Cloud should adopt ORCID as its preferred system of unique identifiers, and an ORCID iD should be mandatory for all applicants and participants in FP9. Unique identifiers for individuals and research works will gradually improve the robustness of metrics and reduce administrative burden. ORCID provides researchers with a unique ID and associates this ID with a regularly updated list of publications. It is already backed by a growing number of funders across Europe (http://about.orcid.org/). The EC and ERC should utilise ORCID IDs for grant applications, management and reporting platforms, and the benefits of ORCID need to be better communicated to researchers and other stakeholders (Galsworthy & McKee, 2013).

RECOMMENDATION #9:
The EC should encourage scholarly publishers across Europe to reduce emphasis on journal impact factors as a promotional tool, and only use them in the context of a variety of metrics that provide a richer view of performance. This broader indicator set could include 5-year impact factor, EigenFactor, SCImago, editorial and publication times. Publishers, with the aid of Committee on Publication Ethics (COPE), should encourage responsible authorship practices and the provision of more detailed information about the specific contributions of each author. Publishers should also make available a range of article-level metrics to encourage a shift toward broader assessment based on the academic quality of an article.

Infrastructure

By leveraging connections between local infrastructures and global information resources, evaluators can map data sources that were previously either unavailable or prohibitively labor-intensive.

Collaboration

Open Science Projects Collaborate on Joint Roadmap

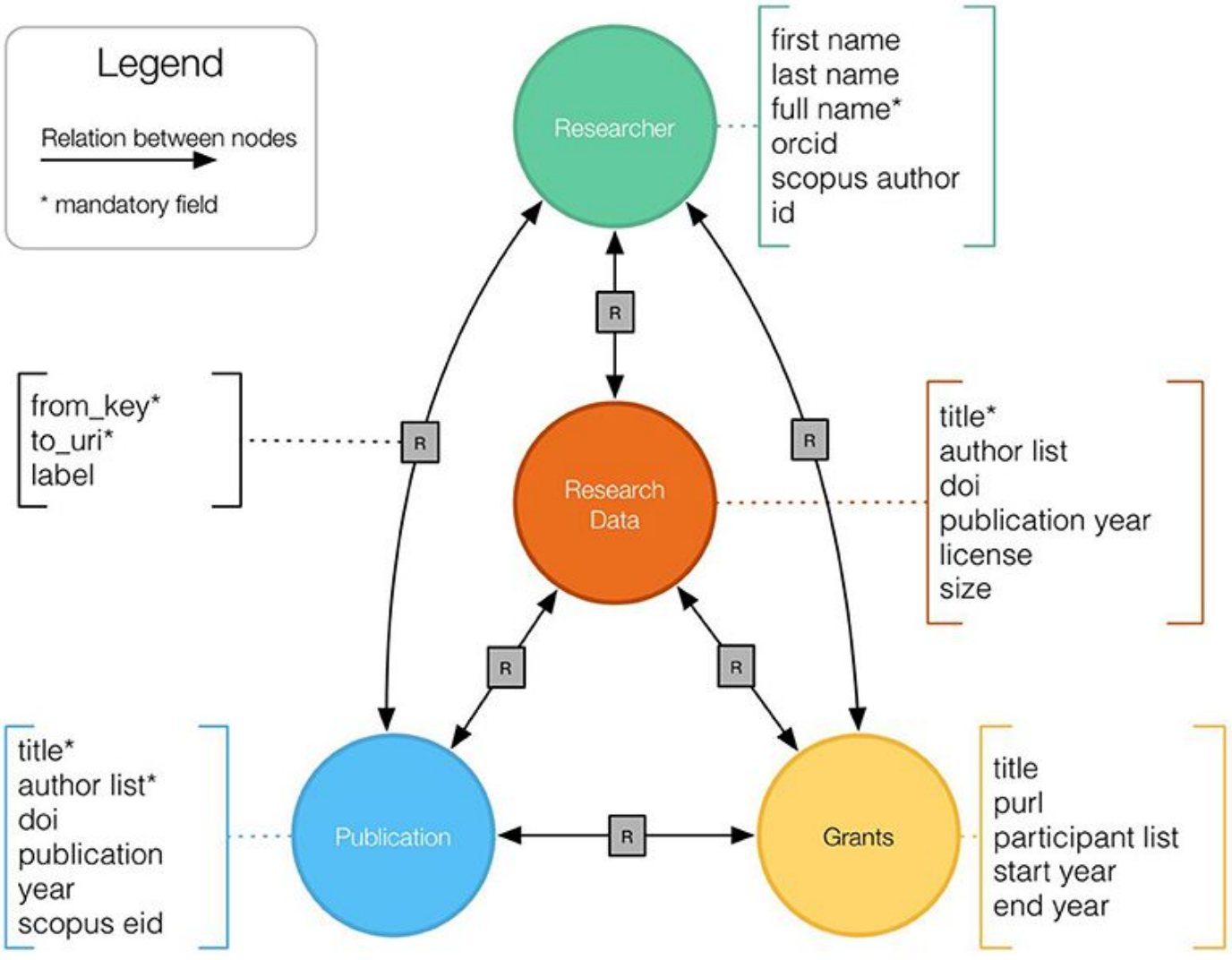
Submitted by Nate Angell on Wed, 2018-05-16 14:02

This is a slightly updated version of a post that first appeared on the JROST and Hypothes.is blogs. Our thanks to them for allowing us to republish here under the licensing terms of the original (JROST) post.

ORCID is delighted to be part of a group of organizations building nonprofit, open-source tools for scholarship and publication that has joined with open science researchers in a new collaboration to develop a Joint Roadmap for Open Science Tools (JROST).

While open technologies and services are becoming essential in science practices, so far, there has been no holistic effort to align these tools into a coherent ecosystem that can support the

https://orcid.org/blog/2018/05/15/open-science-projects-collaborate-joint-roadmap



Research Graph Meta Model

Version 2.0 (Aug 2016)

Devaraju, Anusuriya; Aryani, Amir (2016): Research Graph Metamodel Version 2.0. figshare. Journal contribution.

Indicators for impact

We care about more than just papers: other forms of publication, employment history (Way et al., 2017), migration (Sugimoto et al., 2017), resource availability (Wagner and Jonkers, 2017), patents (Jefferson et al., 2015), and many other factors are critical components of the research graph.

Haak, L., Meadows, A. and Brown, J. (2018). Using ORCID, DOI, and Other Open Identifiers in Research Evaluation. Frontiers in Research Metrics and Analytics, 3.

How can we surface this information to improve the richness of our understanding?

Identifier for People, Places and Objects

ORCID iD	First/given name	Last/family name	Other names	Affiliations
https://orcid.org/0000-0002-1701-6370	Matt	Buys		Scion, South African National Biodiversity Institute, North-West University, University of Stellenbosch Faculty of Science
https://orcid.org/0000-0001-7234-3684	Matt	Buys	Matthew Buys, MJ Buys, M Buys, Matthew J Buys	ORCID, University of the Witwatersrand, Wits Business School

Note ORCID is only one component in the broader ecosystem

Researcher

Registers & manages ORCID record

Controls visibility

Gives permission to **COLLECT** iD and access the record

university

CONNECTS affiliation

funder

CONNECTS grant

publisher

CONNECTS publication

ORCID record

Researcher Name

ORCID ID

orcid.org/xxxx-xxxx-xxxx-xxxx

Basic information
- Other names
- Email addresses
- Biography

Account settings

Activities & affiliations

Employment:
XXX University
Source: XXX University (ID139)

Funding:
YYY Foundation, Grant #123
Source: YYY Foundation (ID45)

Works:
Journal ZZZ, vol. 45, 2016
Source: ZZZ Publishing (ID675)

Policy

Community change

Making connections

Researchers should be part of the process.

Connections can be made using a electronic “handshake” with researchers as they interact with research systems.

API: Application programming interface. Think of it as a translator service that allows databases to exchange information

These connections matter because research progress is based on the communication of ideas.

Reputation and careers are built on the quality and success of those communications.

Contribution types

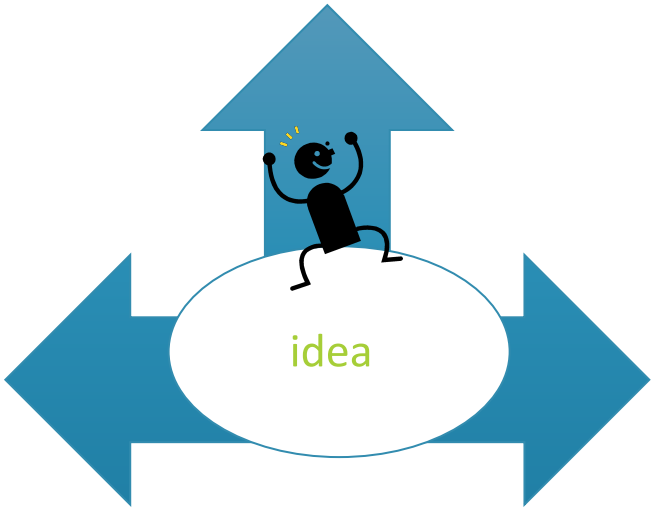
Funding
Grants
Contracts
Seed Funding
Coop Agreements

Publications
Journal Articles
Books
Patents
Legal Briefs
Algorithms
Software Code

Service Activities
Peer Review
Working Groups
Leadership Positions
Training and Mentoring
Extension Activities

Affiliations
Employer
Professional Associations
Education

People
Team
Collaborations



Datasets
Physical Objects
Electronic Files
Protein Structures
Genetic Sequences

Impacts
Policy
Legal
Health
Environment
Education
Product Development
Spin Off
Workforce

Opportunity & challenges

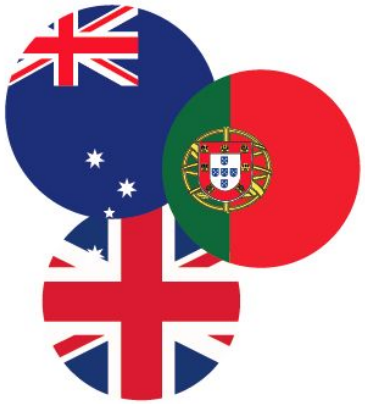

TO REALIZE THE OPEN
RESEARCH VISION,
EVERY STAKEHOLDER
MUST TAKE ACTION

A way forwards

The identifier infrastructure covers endpoints from **multiple domains**. In addition, the identifier infrastructure requires **action on the part of the entire community to build it** — we still don't (quite) have a registry for organization identifiers.

Evidence of Institutional Value

Examples of time/staff savings achieved by implementing ORCID from around the world



UK: 0.2 – 0.4 FTEs per institution[1]

Portugal: 100,000 researcher hours per year[2]

Australia: 15-30 minutes per grant application[3]

1. Jisc/ARMA Institutional ORCID Implementation and Cost Benefit Analysis Report 2015
2. Cátia Laranjeira, FCT - Fundação para a Ciência e a Tecnologia 2017
3. Australian Research Council governance meeting, September 2018

"Having ORCID iDs for most of our researchers has helped in providing authoritative accounts in our various databases, ensuring accuracy in reviewer identities, and helping editors find reviewers and check expertise."

—Brooks Hanson, Executive Vice President, Science, American Geophysical Union

How Organizations and Researchers Benefit

INSTITUTIONS

- Save time and reduce errors with automated information-sharing and cross-system interoperability
- Manage your organization name and your researchers' connections with it
- Maintain links with your researchers - past, present, and future

RESEARCHERS

- Improve recognition and discoverability of their research
- Spend more time doing research, less time managing it
- Control and manage a trusted and easily shareable record of their research activities and affiliations – for free

Open Science Indicators

Principles for evaluating impact

- Indicators should be transparent
- Remember that not all stakeholders have the resources
- Potential of open web and linked open data

Monitoring Open Science Policy

- Consideration to costs implied by policies
- Uptake and adoption
- Benchmarking and impact

https://www.slideshare.net/OpenAIRE_eu/20190527marc-vanholsbeeckopen-science-monitoring-and-the-notion-of-research-impact

Some thoughts about defining impact

- Dissemination of research
- Impact
  - Scientific
  - Beyond academia
    - direct economic effect
    - broader societal impact
- Measurable impact that we can demonstrate

https://www.slideshare.net/OpenAIRE_eu/20190527marc-vanholsbeeckopen-science-monitoring-and-the-notion-of-research-impact

Community change

Knowledge brokers and/or skills in science communication are needed

Simply having discoverable information is not enough to allow us to effectively measure impact

https://www.slideshare.net/OpenAIRE_eu/20190527marc-vanholsbeeckopen-science-monitoring-and-the-notion-of-research-impact

Thinking about indicators

Scientific impact: bibliometrics

Beyond academia: altmetrics, economic indicators, IP

General: awards, influence, membership, review

https://www.slideshare.net/OpenAIRE_eu/20190527marc-vanholsbeeckopen-science-monitoring-and-the-notion-of-research-impact

Trends and iterative processes

Concept of core metrics

- aligns policy and impact
- inspires culture of experimentation

Use indicators that show trends

Indicators form part of an iterative cycle

Some final thoughts…

- Parameters for evaluation need to be clear aligned with policy
- Research data must be trusted
- Transparent, reuse of data is critical
- Benchmarking for open science, draw a line in the sand
- Policies should be comparable across regions/stakeholders

THANK YOU…

Register at https://orcid.org/register

Email m.buys@orcid.org

Twitter @ORCID_Org / @mjbuys

Appendix

ORCID Funder Survey

Challenges

"Manual clean-up of information (e.g. duplicate, erroneous tagging under a program ID, etc.) is time-consuming"

"Researchers have many competing demands on their time and are likely to dedicate a limited amount of time"

Challenges (2)

“The main challenges that we encounter are: mapping data between systems and absence of unique ID of people and organisations.”

“The most significant problem is linking any outputs back to the original investment.”

Requests

“Funders, publishers, ORCID and DOI registration agencies need to work together to develop, implement and socialize workflows that create these connections…”

“In order to support the work of funders, ORCID would need to ensure that there are linkages to specific grant awards”