



cross **ref**

crossref

CrossRef: Using metadata and identifiers to improve scholarly communications

Ed Pentz

Executive Director, CrossRef

Chair, ORCID Board

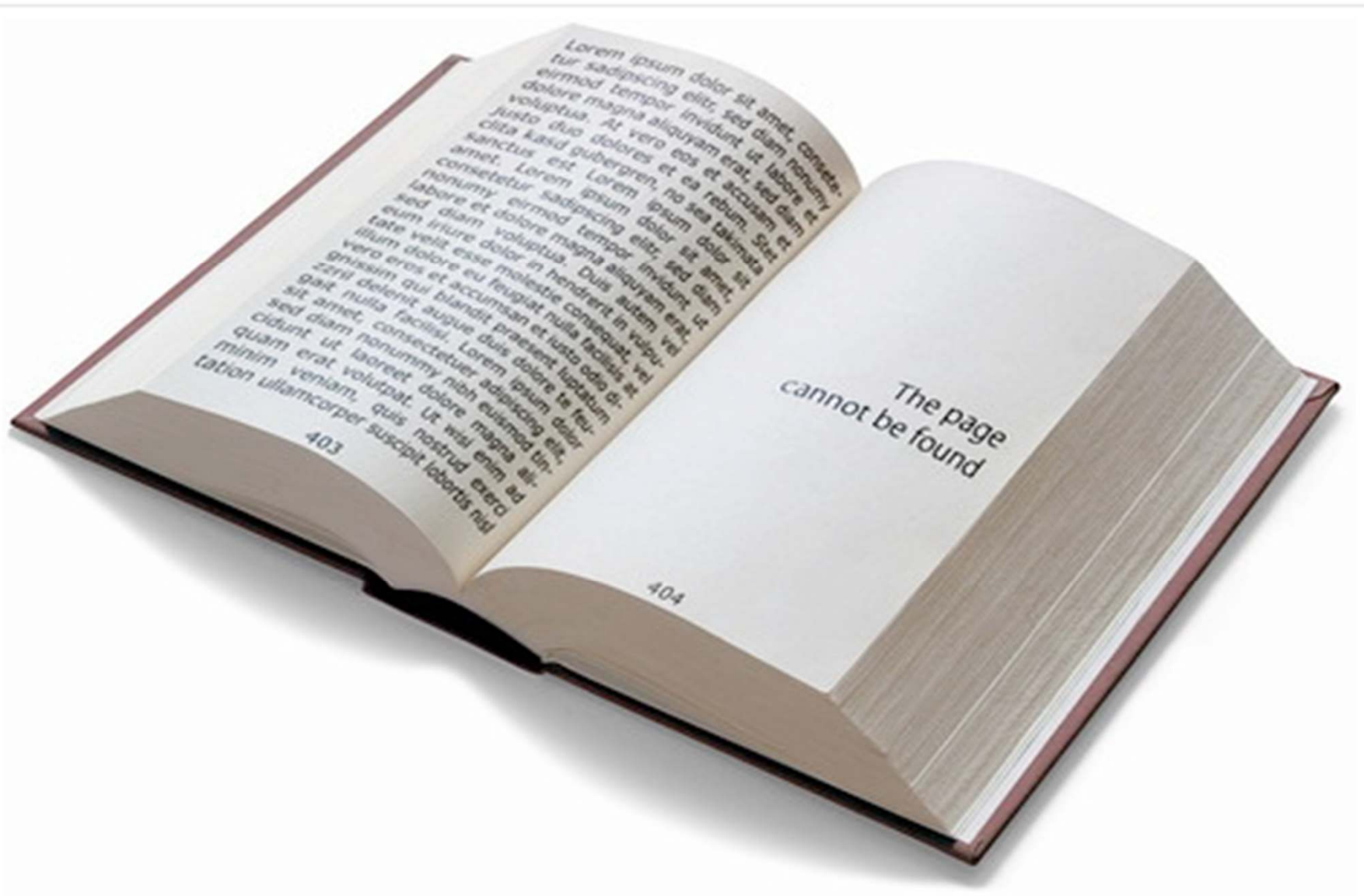
Board Member, International DOI Foundation



References

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Strategic . org

- CrossRef: membership association of publishers
- Founded for strategic reasons: services best achieved collaboratively
- 16 member board of directors from membership
- Broad church: Commercial, societies, non-profits, university presses, OA publishers – 66% non-profit
- All subjects: STM, humanities, social science, professional
- A powerful NETWORK



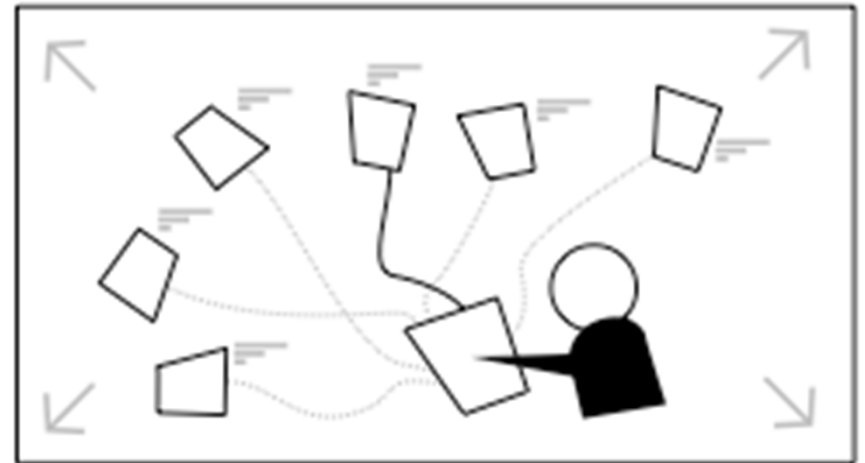
Technical Infrastructure

- Unique identification
- Persistent citation and linking – DOIs
- Managed system – no broken links
- Content discoverable



Provides an *organizational* foundation for widespread linking

- One agreement with CrossRef is a linking agreement with all other CrossRef participants
- Membership association for cooperative development of a digital linking infrastructure
- Business model neutral

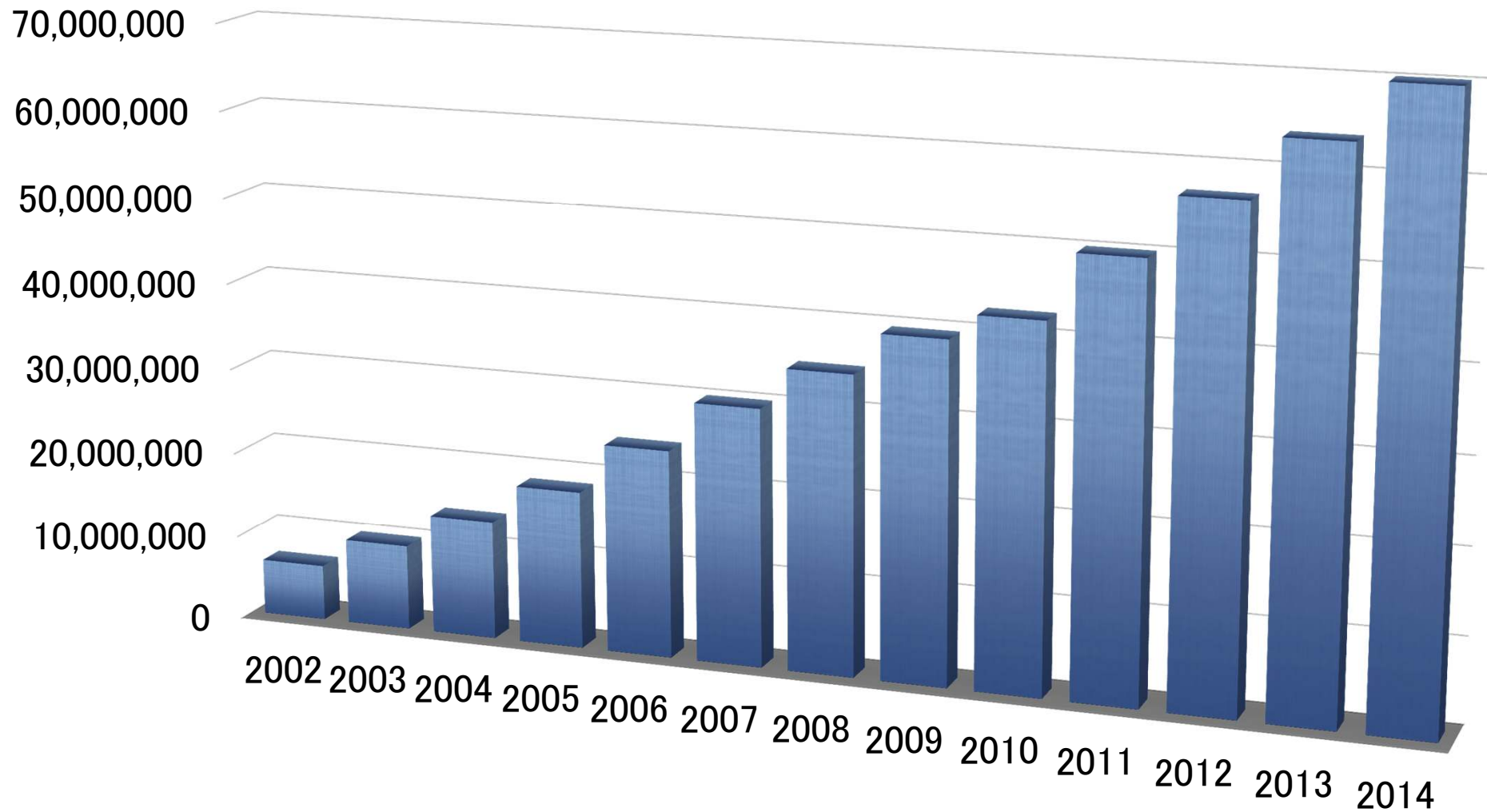


crossref Services

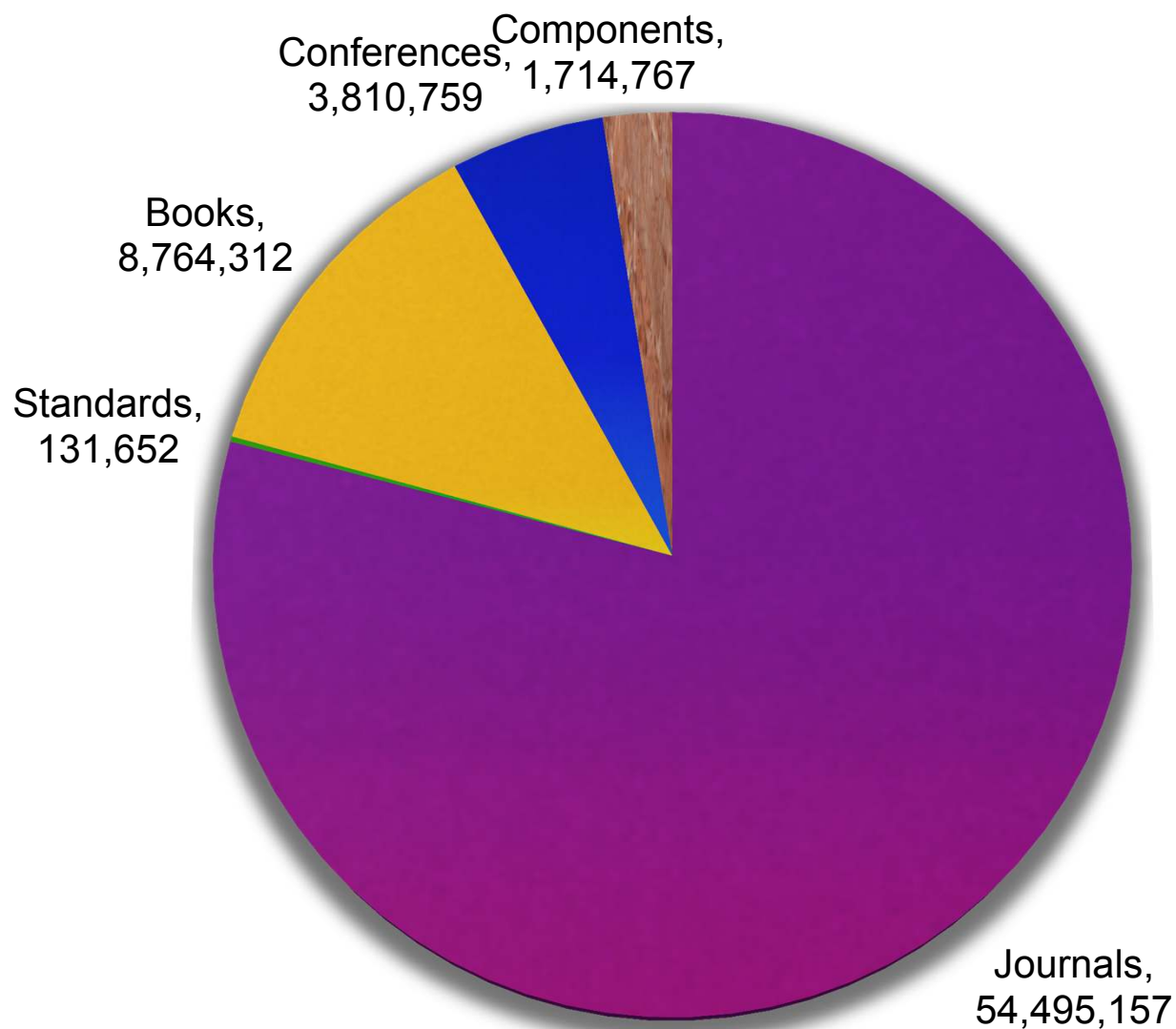


- Cross-publisher **reference linking**
- Cross-publisher **Cited-by linking**
- Cross-publisher **metadata feeds**
- Cross-publisher **plagiarism screening**
- Cross-publisher **update identification**
- Cross-publisher **funder identification**
- Cross-publisher **text and data mining**

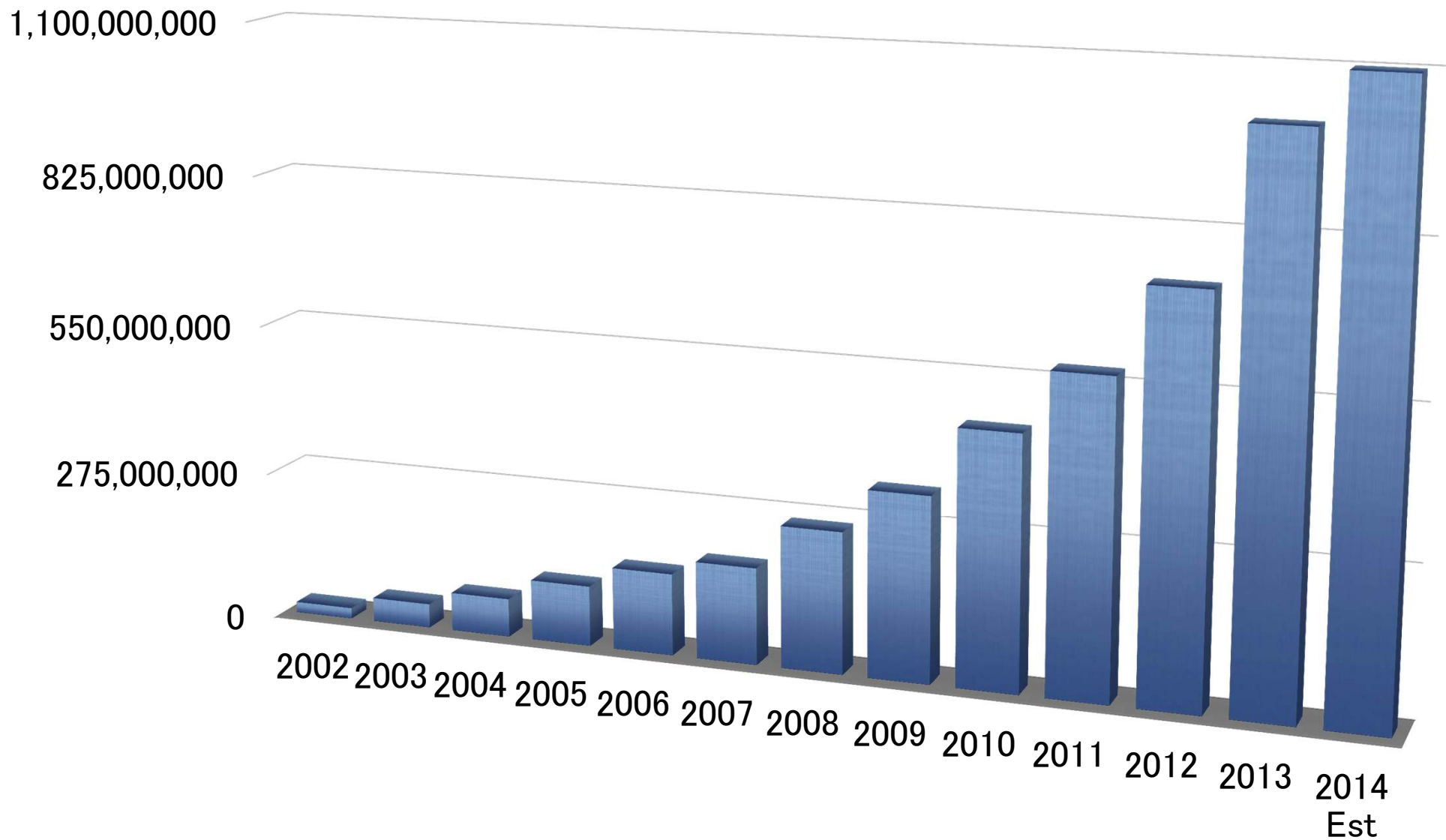
Lots of content



More than journals



Lots of users getting to content





5,375 participating organizations



1,906 libraries





Identifiers + Metadata

Services + Community

=

Powerful system for collaboration: persistent linking,
discoverability, trust



A standard way of reporting funding sources for published scholarly research



Bone Marrow Research
Volume 2012 (2012), Article ID 406796, 18 pages
doi:10.1155/2012/406796

Review Article

Lineage Switching in Acute Leukemias: A Consequence of Stem Cell Plasticity?

Elisa Dorantes-Acosta^{1,2,3} and Rosana Pelayo²

¹Leukemia Clinic, Mexican Children's Hospital Federico Gómez, 06720 Mexico City, DF, Mexico

²Oncology Research Unit, Oncology Hospital, Mexican Institute of Social Security, 06720 Mexico City, DF, Mexico

³Medical Sciences Program, National Autonomous University of Mexico, 04510 Mexico City, DF, Mexico

[Abstract](#)

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Acknowledgments

The authors apologize to investigators whose work could not be discussed due to space limitation. The authors thank the members of the Lymphopoiesis Lab from UIMEO, Dr. Aurora Medina, and Dr. Onofre Muñoz for critical input and academic support. R. Pelayo is recipient of funding from the National Council of Science and Technology, CONACYT (Grant CB-2010-01-152695) and the Mexican Institute for Social Security, IMSS (Grants 2008-785-044 and FIS/IMSS/852). E. Dorantes-Acosta is a scholarship holder from CONACYT.



- National Institutes of Health
 - NIH? N.I.H.? National Institute of Health?
- Abbreviations, misspellings, translations...

Why does this matter?

- Funding bodies cannot easily track the published output of funding
- Publishers cannot easily report which articles result from research supported by specific funders or grants
- Institutions cannot easily link funding received to published output
- Lack of standard metadata for funding sources makes it difficult to analyse or data mine

Funders

Established award
systems and research
management processes

Relationship with
researchers funded by
agencies



Publishers

Established publishing
and peer-review
systems

Relationship with
authors submitting
manuscripts

FundRef Registry

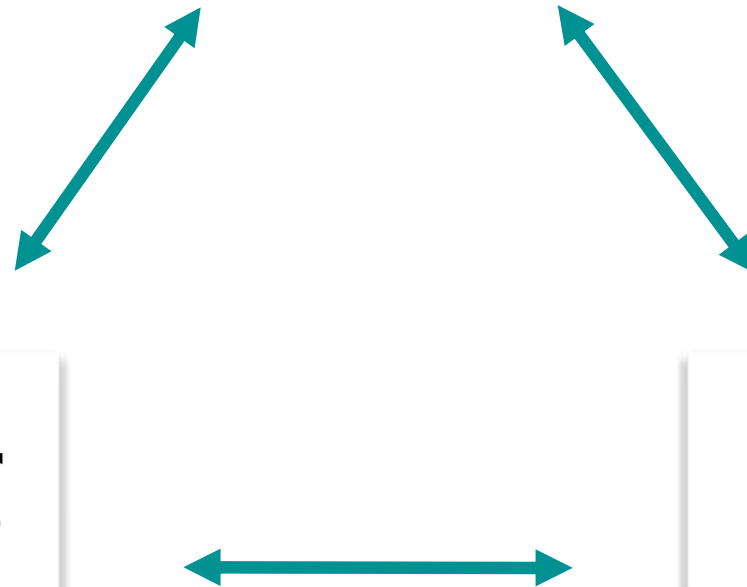
- 8,000 funder names and ID numbers from curated Elsevier SciVal registry, donated to FundRef
- Hosted by CrossRef, available under CC0
- Will be added to and updated
- Publishers to use this list to ensure consistency

www.crossref.org/fundref/fundref_registry.html

DOI

Funding
Source

Award
Number



ORCID

DOI

Funding
Source

Award
Number

Look up funding data

Metadata Search  Sign in with ORCID

fundref^{beta}
search

 Funder name

[Help! - Example Queries](#)

fundref^{beta} search

Q NIH

National Institutes of Health United States

NIHR Health Services and Delivery Research (HS&DR) programme United Kingdom

NIH Office of the Director United States

National Institute of Mental Health United States

NIH Blueprint for Neuroscience Research United States

NIH Clinical Center United States

National Institute for Health Research Trainees Coordinating Centre United Kingdom

☐ Include funding from sub-organizations

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES

Administration for Children and Families

Centers for Disease Control and Prevention +

Office of Public Health and Science

The Office of the National Coordinator for Health Information Technology

U.S. Administration on Aging

Agency for Healthcare Research and Quality

Centers for Medicare & Medicaid Services

National Institutes of Health

Office of AIDS Research

Office of Disease Prevention

Office of Strategic Coordination

National Institute of Biomedical Imaging and Bioengineering

U.S. National Library of Medicine

National Institute of Child Health and Human Development

Center for Information Technology

National Institute of Allergy and Infectious Diseases

National Institute of Dental and Craniofacial Research

Center for Scientific Review

National Heart, Lung, and Blood Institute

SORT BY: RELEVANCE PUBLICATION YEAR

[DOWNLOAD AS CSV](#)

PAGE 1 OF 269 RESULTS

Heat-Shock Proteins in Autoimmunity

Journal Article published 2013 in **Autoimmune Diseases** volume 2013 on pages 1 to 3

Research funded by National Institutes of Health

Authors: Kamal D. Moudgil, Stephen J. Thompson, Fabiana Geraci, Boel De Paepe, Yehuda Shoenfeld

<http://dx.doi.org/10.1155/2013/621417> [Actions](#)

Force-dependent mobility and entropic rectification in tubes of periodically varying geometry

Journal Article published 2012 in **The Journal of Chemical Physics** volume 136 issue 21 on page 214110

Research funded by National Institutes of Health (10-03-00393)

Authors: Leonardo Dagdug, Alexander M. Berezhkovskii, Yuri A. Makhnovskii, Vladimir Yu. Zitserman, Sergey M. Bezrukov

<http://dx.doi.org/10.1063/1.4726193> [Actions](#)

Elastic network normal modes provide a basis for protein structure refinement

Journal Article published 2012 in **The Journal of Chemical Physics** volume 136 issue 19 on page 195101

Research funded by National Institutes of Health (R01GM072014, R01GM073095, R01GM081680, R01GM081680-S1)

Authors: Pawel Gniewek, Andrzej Kolinski, Robert L. Jernigan, Andrzej Kloczkowski

<http://dx.doi.org/10.1063/1.4710986> [Actions](#)

Tunable optical tweezers for wavelength-dependent measurements

Journal Article published 2012 in **Review of Scientific Instruments** volume 83 issue 4 on page 043114

Research funded by Air Force Office of Scientific Research (FA9550-10-1-0469) | National Institutes of Health (5R01 CA151962-02, U01 CA151886-01) | Office of Naval Research (N00014081P20087, N00014-10-1-0989)

Authors: Brooke Hester, Gretchen K. Campbell, Carlos López-Mariscal, Carly Levin Filgueira, Ryan Huschka, Naomi J. Halas, Kristian Helmerson

<http://dx.doi.org/10.1063/1.4704373> [Actions](#)

[FundRef](#) [Status](#) [API](#) [Help](#)  [Sign in with ORCID](#)

CrossRef^{beta} metadata search



[Help! - Example Queries](#) ▼

TYPE

☐ Journal Article (1)

YEAR

☐ 2012 (1)

OA STATUS

☐ Other (1)

PUBLICATION

☐ Appl. Phys. Lett. (1)

☐ Applied Physics Letters
(1)

CATEGORY

☐ Physics and Astronomy
(miscellaneous) (1)

FUNDER NAME

☐ National Institutes of
Health (1)

SORT BY: **RELEVANCE** PUBLICATION YEAR

PAGE 1 OF 1 RESULTS

Journal Article Near-field enhanced ultraviolet resonance Raman spectroscopy using aluminum bow-tie nano-antenna

Published 2012 in **Applied Physics Letters** volume 101 issue 11 on page 113116

Research funded by National Institutes of Health (R21CA132075)

Authors: Ling Li, Shuang Fang Lim, Alexander A. Puretzky, Robert Riehn, H. D. Hallen

<http://dx.doi.org/10.1063/1.4746747> [More](#)

TYPE

☐ Journal Article (1)

YEAR

☐ 2012 (1)

OA STATUS

☐ Other (1)

PUBLICATION

☐ Phys. Fluids (1)

☐ Physics of Fluids (1)

CATEGORY

☐ Condensed Matter
Physics (1)

FUNDER NAME

☐ National Institutes of
Health (1)

SORT BY: **RELEVANCE** PUBLICATION YEAR

PAGE 1 OF 1 RESULTS

Showing DOI matching 10.1063/1.4744984

Journal Article Characterization of the transport topology in patient-specific abdominal aortic aneurysm models


Published 2012 in **Physics of Fluids** volume 24 issue 8 on page 081901

Research funded by National Institutes of Health (5R21HL108272)

Authors: Amirhossein Arzani, Shawn C. Shadden

<http://dx.doi.org/10.1063/1.4744984> [More](#)

ORCID

 <http://orcid.org/0000-0002-5993-8592>

Live ORCID iDs - 964,638

Works with unique DOIs - 2,222,880

ORCID iDs in CrossRef - 134,386

TYPE

☐ Journal Article (2)

YEAR

☐ 2008 (1)

☐ 2013 (1)

OA STATUS

☐ Other (2)

PUBLICATION

☐ Annals Psychoceramics B (1)

☐ Annals of Psychoceramics B (1)

☐ Journal of Psychoceramics (1)

CATEGORY

FUNDER NAME

☐ Basic Energy Sciences, Office of Science, U.S. Department of Energy (2)

☐ National Science Foundation (2)

SOURCE

☐ CrossRef (2)

SORT BY: **RELEVANCE** PUBLICATION YEAR

PAGE 1 OF 2 RESULTS

Showing results for ORCID matching 0000-0002-1825-0097

Journal Article Toward a Unified Theory of High-Energy Metaphysics: Silly String Theory

Published **14 Aug 2008** in **Journal of Psychoceramics** volume **5** issue **11** on pages **1** to **3**

Research funded by Basic Energy Sciences, Office of Science, U.S. Department of Energy (DE-SC0001091) | National Science Foundation (CHE-1152342)

Authors: Josiah Carberry

<http://dx.doi.org/10.5555/12345678> [More](#)

Journal Article The Global State of Psychoceramics Research

Published **3 Feb 2013** in **Annals of Psychoceramics B** volume **2013** on pages **1** to **8**

Research funded by Basic Energy Sciences, Office of Science, U.S. Department of Energy (high-energy-metaphysics-SC0001091) | National Science Foundation (psychoceramics-1152342)

Authors: Josiah Carberry

<http://dx.doi.org/10.5555/515151> [More](#)

Data



DataCite

Helping you to find,
access, and reuse data

Data



Linking data and publications

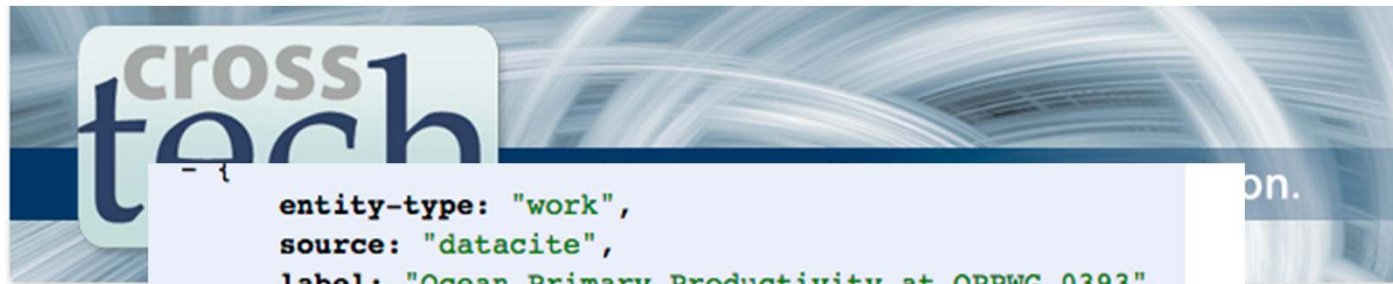
Do you want to see if a CrossRef DOI (typically assigned to publications) refers to DataCite DOIs (typically assigned to data)? Here you go:

<http://api.labs.crossref.org/graph/doi/10.4319/lo.1997.42.1.0001>

Conversely, do you want to see if a DataCite DOI refers to CrossRef DOIs? Voilà:

<http://api.labs.crossref.org/graph/doi/10.1594/pangaea.185321>

Data



Linking

Do you want
(typically a

<http://api.labs.crossref.org/graph/doi/10.1594/pangaea.108713>

Conversely, do you want to see if a DataCite DOI refers to CrossRef DOIs? Voilà:

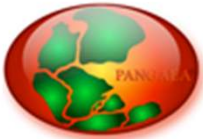
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  urn: "http://dx.doi.org/10.1594/pangaea.108714"  
}
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DOIs

Data



PANGAEA®

Data Publisher for Earth & Environmental Science

Data Description

Citation:

Morel, André (2003): Ocean Primary Productivity at OPPWG_0393. doi:10.1594/PANGAEA.108713

Behrenfeld, Michael J; Falkowski, Paul (1997): Photosynthetic rates derived from satellite-based chlorophyll concentration. *Limnology and Oceanography*, 42(1), 1-20, doi:10.4319/lo.1997.42.1.0001 🔍

Further details:

Behrenfeld, Michael J; Falkowski, Paul (1997): Ocean Primary Productivity Working Group (OPPWG) Data. *Ocean Primary Productivity Study, Rutgers, The State University of New Jersey, Institute of Marine and Coastal Sciences*, <http://marine.rutgers.edu/opp/Database/Database2.html> 🔍

Project(s):


Origin and Fate of Biogenic Particle Fluxes in the Ocean (ORFOIS) 🔍

Link: <http://api.labs.crossref.org/graph/doi/10.1594/pangaea.108714> ,
urn: "http://dx.doi.org/10.1594/pangaea.108714"

Conversely, do you want to see if a DataCite DOI refers to CrossRef DOIs? Voilà:

<http://api.labs.crossref.org/graph/doi/10.1594/pangaea.185321>



 OPEN ACCESS

PERSPECTIVE

Recommendations for the Role of Publishers in Access to Data

Jennifer Lin , Carly Strasser

Published: October 28, 2014 • DOI: 10.1371/journal.pbio.1001975

<http://dx.doi.org/10.1371/journal.pbio.1001975>

Collaboration: DOI Community



Welcome to Japan Link Center, JaLC!



[Airiti, Inc.](#)



[CrossRef](#)



[China National Knowledge Infrastructure \(CNKI\)](#)



[DataCite](#)



[EIDR \(Entertainment Identifier Registry\)](#)



[ISTIC \(The Institute of Scientific and Technical Information of China\)](#)



[JaLC \(Japan Link Center\)](#)



[mEDRA \(Multilingual European DOI Registration Agency\)](#)



Publications Office

[OP \(Publications Office of the European Union\)](#)



Multiple IDs & Orgs

- CrossRef DOIs
- DataCite DOIs
- Japan Link Center DOIs
- Other DOI Registration Agencies
- Funder IDs
- ORCID IDs
- [License metadata]

APIs essential

- Combination of free and “for fee” APIs
- Charge for services – not data
- <http://api.crossref.org/>

```

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        }
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    }
  ]
}

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<http://api.crossref.org/works?filter=has-orcid:true>



Identifiers + Metadata

Services + Community

=

Powerful system for collaboration: persistent linking,
discoverability, trust