FundRef

Pilot Project Final Report

March 2013

This report summarizes work of the FundRef Pilot Project Working Group, presents their findings, and recommends a path forward for the FundRef initiative. The CrossRef Board approved the project in March 2012, and the Pilot work officially began shortly thereafter. The Working Group consisted of representatives from seven journal publishers, four funding organizations, and CrossRef. From those organizations, over 35 individuals (see list in Appendix A) contributed to work carried out March 2012 - February 2013.

The FundRef Pilot

Purpose

FundRef is a collaborative pilot project of scholarly publishers and funding agencies, facilitated by CrossRef, to provide a standard way of reporting funding sources for published scholarly research.

Government and other research funders who are accountable for reporting the research and development outcomes they support lack the means to easily track scholarly publications that result from their funding, yet scholarly publications are an important measure of the output from specific grants or other financial support. A combined solution that would work for all funders would eliminate the need for each to architect its own solution to the problem.

Similarly, many journals and other publications include the author's acknowledgement of the funding source, but these statements vary widely in practice from journal to journal and publisher to publisher. Standard bibliographic metadata for scholarly publications do not typically include funding source information, making it difficult to track funding sources by mining publication data.

The FundRef Pilot Project offered funders and scholarly publishers a unique opportunity to collaborate on a solution to this common problem.

Scope

The FundRef Working Group carried out a proof-of-concept pilot to demonstrate how to systematically connect funding information with publications. For the purposes of demonstrating the workflow involved, the scope of the Pilot was limited to journals from participating publishers and articles sponsored by participating funders through research grants.

The FundRef Pilot Project looked at each step of the workflow, from manuscript submission to end-user query. The Working Group explored the ability of publishers to create and submit standard metadata consisting of the funder name and grant number. Publishers tested the inclusion of FundRef metadata as part of the journal citation records deposited to CrossRef. Participants tested use of a standard taxonomy of funding agencies, both the practical and technical aspects of publishers using a standardized vocabulary

and funders reviewing names in a centrally compiled taxonomy. Some publishers began working with manuscript tracking system vendors to test the controlled vocabulary of funders in the publication submission processes. Test records containing the funding metadata which were deposited were then made available from CrossRef in a standard format so that funders could conduct test queries.

During the Pilot, the Working Group observed procedures, dependencies or interactions that needed to be defined or redefined and pioneered a workflow that would support the required processes. A set of best practices also began to be formulated. The result is a recommended cross-industry method for capturing and displaying funding sources to connect scholarly publications to research funders. Those findings and recommendations are presented in this report.

Participants

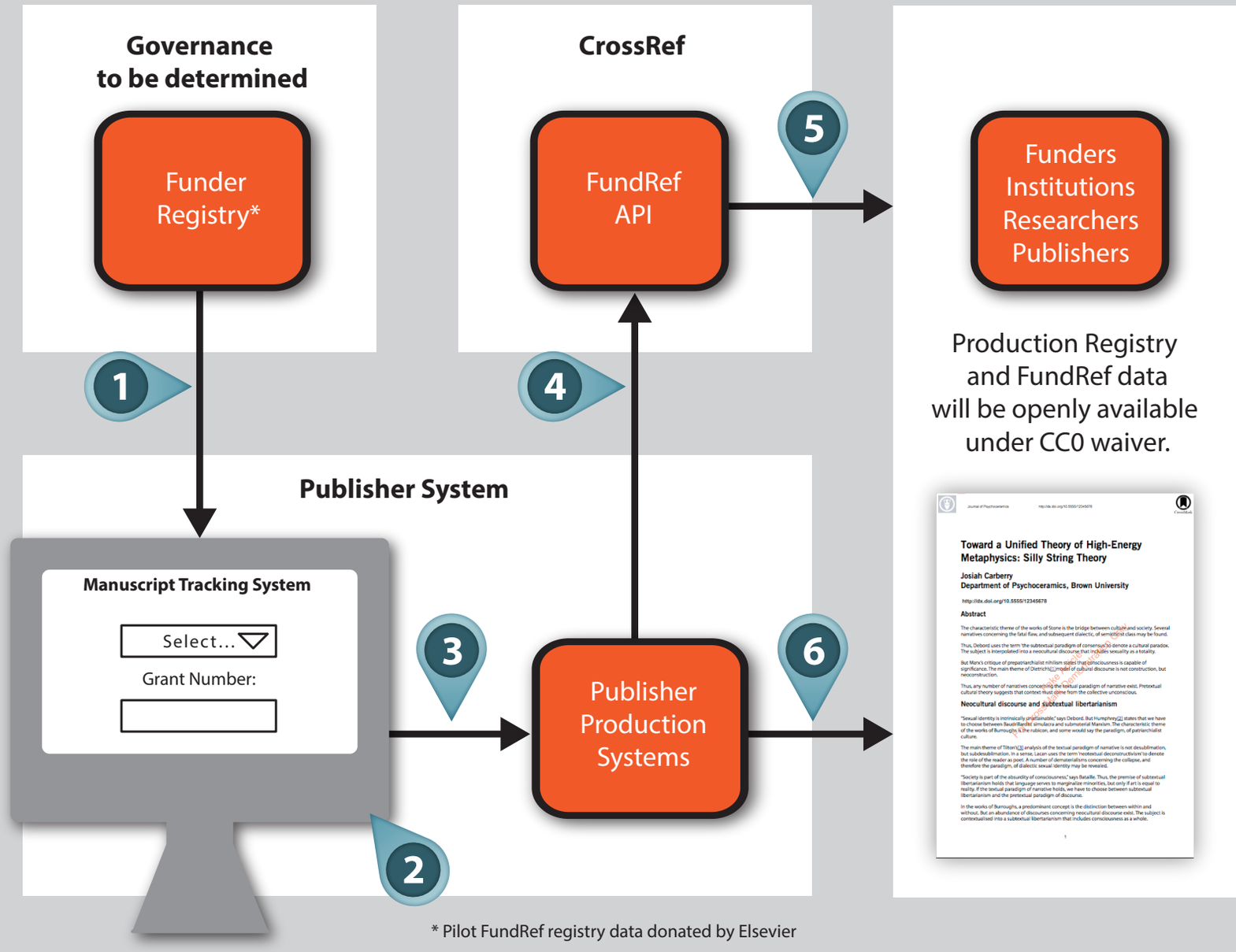
Publishers	**Funders**
American Institute of Physics	U.S. Department of Energy
American Psychological Association	U.S. National Aeronautics and Space Administration
Elsevier	U.S. National Science Foundation
Institute of Electrical and Electronics Engineers (IEEE)	Wellcome Trust
Nature Publishing Group	
Oxford University Press	
John Wiley & Sons	

FundRef Envisioned

The Working Group created a conceptual FundRef workflow that gives a visual overview of the project, the players involved, and how their roles interact. This workflow vision was shared with various stakeholders during the course of the Pilot and is how the Working Group envisions a production system to function.

The FundRef Workflow

1. FundRef Registry provides standard funder names to publisher manuscript tracking systems.
2. Publishers ask authors to select correct funders and provide grant numbers upon manuscript submission.
3. Funder information transferred to publisher production systems.
4. Publishers send collected funder information in their CrossRef deposits.
5. Funders and other stakeholders query FundRef API:
   A: Given funder & grant number, return DOIs of publications funded
   B: Given DOI, return funder identifiers and grant numbers associated with DOI
6. Funding information displayed on publisher PDFs and websites using standard CrossMark UI.



* Pilot FundRef registry data donated by Elsevier

FundRef Pilot Participants

- American Institute of Physics (AIP)
- American Psychological Association (APA)
- Elsevier
- US National Science Foundation
- IEEE
- Nature Publishing Group
- Oxford University Press
- John Wiley & Sons
- US Department of Energy
- US National Aeronautics and Space Administration (NASA)
- Wellcome Trust

crossref

Desired Benefits

The FundRef model was conceived to benefit a range of scholarly publication stakeholders:

- Researchers, by aiding their compliance with funders' requirements for acknowledgement of funding
- Publishers, who will be able to analyze the sources of funding for their published content
- Funding organizations, who will be able to better track the results of their funding policies
- The larger public, supported by a greater transparency into the results of R&D funding.

As an outgrowth of the FundRef collaboration, publishers and funders will all benefit from having a cross-industry method for capturing and displaying funding sources to connect scholarly publications to research funders, which eliminates the need for each to architect its own solution.

Goals of the Pilot Project

The Working Group focused on achieving two main goals during the Pilot:

- To create a standard nomenclature for the capture, display, and use of funding agency metadata (funder names and award numbers)
- To demonstrate an industry-wide methodology for connecting scholarly publications to research funders, whereby:
    - Funder names and award numbers will become standard metadata collected by publishers for journal articles
    - A taxonomy of funder names will be tested as the basis for a registry of funder names
    - Publishers will submit funder metadata to CrossRef as part of regular metadata deposits
    - CrossRef will make data available for funders, publishers, others

Activities of the Working Group and various subgroups achieved a number of milestones that had been established as measures of success for the FundRef Pilot Project.

Outcomes and Accomplishments of the FundRef Pilot

- Publishers created records with funder names in a standard format and grant numbers as part of the standard metadata for journal articles.
- Elsevier provided an online taxonomy of funder names for publishers to experiment with during the Pilot to verify funder names.
- Publishers tested integration of the funder taxonomy data with manuscript tracking systems (either internal systems or those from external suppliers).
- Publishers deposited funder names and grant numbers, if available, to CrossRef as part of regular deposits.
- CrossRef linked DOIs with the appropriate FundRef data.
- Publishers and funders queried FundRef data in CrossRef's system.

- Working Group members created a visual workflow to show key steps, players, and interactions.
- Working Group identified key technical developments required and established subgroup to tackle specific topics.
- Group defined specifications for publishers' systems and CrossRef deposit schema.
- Members tested systems by creating, depositing, and viewing FundRef data.
- Working Group developed a demonstrable proof-of-concept.
- Funders reviewed the taxonomy and identified naming and hierarchy preferences.
- A subgroup defined functional requirements for a funder taxonomy or registry.
- CrossRef issued a press release and flyers to promote awareness and education.
- CrossRef created a FundRef webpage with area to sign up for notifications or updates.
- Members presented FundRef at several venues in the U.S. and Europe (STM, CENDI, CrossRef, UK; see list of presentations in Appendix B).
- Funders defined useful data queries from FundRef.
- Publishers worked with major manuscript system vendors on feasibility of standard input using a taxonomy and practicality of implementation.
- Working Group obtained buy-in by principal stakeholder groups (publishers, funders).
- Pilot demonstrated the entire workflow, from providing funder data on publisher site to query capability at CrossRef.

The key technical challenges were addressed by subgroups within the Working Group, resulting in well-defined recommendations or requirements documents, as described in the next sections.

FundRef Funder Taxonomy and Registry

The FundRef Pilot Working Group identified the need to standardize funder names when they are included in manuscripts submitted for publication. The best place for this to happen is in the manuscript submission systems, so the Working Group agreed to test a method for funder names to be normalized. While it was recognized as desirable to also verify grant/funding numbers, this was deemed too complicated to accomplish as part of the Pilot.

As part of the Pilot, Elsevier agreed to make available a funding body registry that provides a standardized taxonomy of 4,000 international funding agencies, including unique IDs for each. The registry is available as Linked Data and is based on Elsevier's existing SciVal Funding content that includes a comprehensive database of funding opportunities from Australia, Canada, the European Commission, India, Ireland, New Zealand, Singapore, South Africa, United Kingdom and the United States. More details on the Elsevier Linked Data Repository are available (http://data.elsevier.com/documentation/index.html). An HTML list of the funders is available (http://labs.crossref.org/fundref/funders.html). Funders in the Pilot provided feedback on how their organizations were listed in the taxonomy, and Elsevier then updated the taxonomy.

During the Pilot publishers worked with manuscript submission system vendors to test using the registry to normalize names. This process worked well. Integration of FundRef was done by ScholarOne, eJournal Press, and Aries. One sample input screen is shown below:

Funding Body Archiving Mandates

Please enter Funding Body Archiving Mandates

Funder(s)	Grant Reference Number	Authors	
National Science Foundation	CHE0342829	Cheuk-Yiu Ng Yuntao Xu Zhou Lu Hong Xu Yih Chung Chang	Clear
National Aeronautics and Space Administration	07-PATM07-0012	Cheuk-Yiu Ng Yuntao Xu Zhou Lu Hong Xu Yih Chung Chang	Clear
U.S. Department of Energy Basic Energy Sciences	DE-FG02-02ER15306	Cheuk-Yiu Ng Yuntao Xu Zhou Lu Hong Xu Yih Chung Chang	Clear

FundRef Funder Registry Post-Pilot

The Funder Registry process worked well during the Pilot. The FundRef Working Group recognized that a permanent solution was necessary after the completion of the Pilot. Therefore, a subgroup was set up to discuss the requirements for a Funder Registry. The resulting FundRef Funder Registry Requirements document is available at http://www.crossref.org/fundref/FundRef_registry_sep28.pdf.

Both CrossRef and Elsevier reviewed the requirements for the Funder Registry and agreed on a solution for providing a Registry after the Pilot was completed. Elsevier will continue to make the taxonomy available and maintain and update it, and CrossRef will use it to create an openly available Funder Registry. CrossRef will incorporate all updates into the Funder Registry. At its November 2012 meeting the CrossRef Board approved CrossRef taking on the role of running and maintaining the Funder Registry as an openly available CrossRef service on a long-term basis. CrossRef and Elsevier have reached mutual agreement on how the data will be updated and maintained.

Award Numbers

Part of the scope of the Pilot was to explore the ability of publishers to create standard metadata that included the award or grant number and to test inclusion of the number in metadata records deposited to CrossRef. While it was recognized as desirable to verify grant/funding numbers, this was deemed to be too complicated to accomplish as part of the Pilot and so was ruled out. A future enhancement that may be feasible is to compare the format of a number with standard formats provided by funding organizations, but ensuring the accuracy of a given number is beyond the scope of FundRef.

Due to the variability of award numbers and the past practices of authors and publishers, it was determined that submission of the award number will be “optional” for records deposited to CrossRef. This will allow existing records to be deposited and thus grow the number of records with funder names. Inclusion of the award number will be encouraged. The Working Group envisions manuscript submission systems being developed that include the award number initially as a suggested but optional field and later as a required field, once the concept is appropriately socialized across the research community.

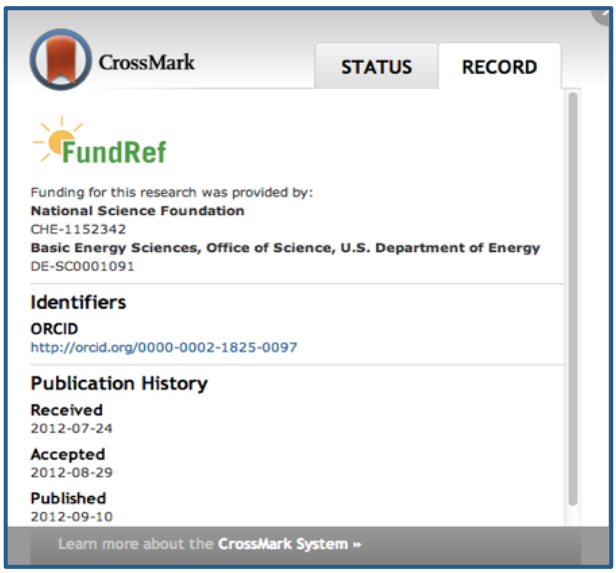
Access to FundRef Data

FundRef data will be available through a number of different CrossRef interfaces and services. As part of the Pilot, CrossRef created a search interface specifically to search on funder names and award/grant numbers (http://doi.crossref.org/fundrefSearch).

FundRef data will be available via CrossRef's other open and for-fee metadata retrieval services and interfaces. More information on the FundRef API is available at http://help.crossref.org/#fundref-api.

Where CrossRef member publishers participate in CrossMark, FundRef data will be available in the CrossMark service. CrossMark data is openly available under a CC0 waiver[1]. More information on CrossMark is available here http://www.crossref.org/crossmark/index.html.

An example of FundRef data in CrossMark is shown below:



Technical Specifications

Metadata Deposit

As part of the FundRef Pilot, CrossRef updated its XML deposit schema to include a funder name and funding identifier (i.e., grant number), which enables publishers to submit this data with their regular metadata deposits to CrossRef. The preferred way to submit the FundRef data to CrossRef is via the CrossMark service since this will enable the consistent display of metadata on publisher websites. Full technical details are available on the CrossRef website at http://help.crossref.org/#fundref.

[1] Creative Commons Zero is a way to put data in the public domain as completely as possible by waiving copyright and database protection. More information is available - http://creativecommons.org/about/cc0

CrossRef will also use the Funder Registry data in its system to verify funder names included in metadata deposits.

Journal Articles and Citations

The Working Group did not address the impacts to publishers XML document formats or requirements for the display of FundRef metadata. However it was acknowledged that JATS (the Journal Article Tag Suite, ANSI/NISO Z 39.96-2012) and the article DTD would be relevant. Information about JATS is available at http://www.niso.org/workrooms/journalmarkup. Notably the tag suite includes data elements for "Funding Source" and "Award Identifier."

FundRef Working Group Recommendations for Going Forward

The FundRef Pilot successfully tested all aspects of the workflow, and a set of recommendations for implementing a FundRef production system were identified. The Working Group's recommendations for FundRef going forward are presented below.

FundRef

- Institutionalize FundRef as a cross-industry initiative. FundRef is defined as the systematic capture of metadata for identifying funding source (funder name and award number) to be included in bibliographic metadata deposited with CrossRef. Implement FundRef as soon as practical in various stakeholders' systems/processes. The goal is to have a significant amount of FundRef data deposited by the end of year 2013.

Understandably such a broad initiative will require a phased-in approach to modify existing systems, policies, and processes; however, it is recommended that the specific actions below for each stakeholder group be part of the implementation.

Publishers

- Work with the suppliers of their manuscript tracking systems to incorporate the FundRef Funder Registry into their publication submission processes.
  - The submission process should mandate the collection of **Funder Name** from the controlled list available through the Registry, although there should always be the option for 'No Funder.' The process should also support input of "Other" funder names, which would then be reviewed and added to the taxonomy as a means of collecting and adding new organizations.
  - Additionally, the submission process should enable, and encourage, the collection of **Award/Grant Number(s)**; this should be optional information.
- Collect the metadata supplied through this publication submission process and supply it to CrossRef as part of the regular metadata deposits.
- Display the funder information with other bibliographic data on the abstract page and with article.
- Display a FundRef icon to indicate participation.

CrossRef

- Collect FundRef metadata from publishers.
- Maintain FundRef Funder Registry and provide means for funders to request updates/changes.
- Provide query capability for funders.
- Include FundRef data in various APIs and interfaces.
- Create terms and conditions for FundRef participation by CrossRef members.
- Create a FundRef icon/image and coordinate "branding" of FundRef by publishers that collect and submit FundRef metadata and by funders or others who display FundRef query results or use FundRef metadata.
- Continue to coordinate and manage FundRef, both for implementation purposes and for socializing the concept across stakeholders (e.g., funders, publishers, and researchers).

Funders

- Encourage their grant recipients to acknowledge funding source and grant numbers (where possible) on all published outputs of their research.
- Provide information to grant recipients about FundRef and publishers involved.
- Establish systems or applications for querying CrossRef for FundRef data, such as lists of publications linked to their grant numbers, and make this information publicly available, where possible, using CrossRef DOIs to link to publisher full text.
- Sign up as CrossRef Affiliates where appropriate to make use of CrossRef APIs and services.

Authors

- Supply as complete and accurate grant information as possible during the submission process of publishers participating in FundRef.
- Be aware of the relevant funding awarded to all co-authors and also supply this information as part of the submission process.

Future Governance

- Establish an advisory group of funders and CrossRef publishers to monitor progress/uptake of FundRef and continue promotion of the project. Membership of this group is likely to be based upon, but not necessarily limited to, the existing membership of the FundRef Pilot Working Group.

Next Steps

This report was presented to the CrossRef Board at its March 2013 meeting. The board agreed to accept and publicly release this Pilot report and specifically agreed to follow the recommendations for CrossRef in this report. FundRef will be implemented by CrossRef beginning in May 2013.

Acknowledgements

CrossRef appreciates the many and various contributions of the Working Group members and their corporate sponsors who invested human and technical resources into this Pilot, as well as other

participants of subgroups and contributing reviewers who helped the Working Group accomplish its goals during the Pilot. (A list of individuals and their affiliations appears in Appendix A.)

Appendices

A. **List of Participants**
B. **FundRef Communications**

Appendix A

Participants in the FundRef Pilot (contributors to various aspects of the project)

Allen, Liz (WEL)
Beebe, Linda (APA, ret.)
Betz, Brie (ELS)
Bilder, Geoffrey (CR)
Cusworth, Colleen (OUP)
Daniel, Ronald (ELS)
Dolby, Kevin (WEL)
Dylla, Fred (AIP)
Feeney, Patricia (CR)
Forge, Sophie (ELS)
Gischlar, Doug (IEEE)
Grenier, Gerry (IEEE)
Hitson, Brian (DOE)
Hulbert, Terry (AIP)
Huerga, Iker (ELS)
Hunter, Karen (ELS)
Jamison, Beverly (APA)
Jordan, Sharon (Cons)
Koscher, Chuck (CR)
Martin, Mark (DOE)
McMahon, Christopher (AIP)
Meyer, Carol (CR)
O'Beirne, Richard (OUP)
O'Keefe, Rich (AIP)
Owens, Evan (AIP)
Packer, Tara (NPG)
Pennington, Rob (NSF)
Pentz, Ed (CR)
Ratner, Howard (NPG)
Rawson, K. (IEEE)
Rous, Bernie (ACM)
Shillum, Chris (ELS)
Steeman, Gerald (NASA)
Statler, Thomas (NSF)
Tolwinska, Anna (CR)
Van Dyck, Craig (Wiley)
Vowell, Lance (DOE)
Walker, Alvin (APA)
Walker, John (Wiley)
Ward, Karl (CR)
Wates, Edward (Wiley)
Wortzman, Stuart (AIP)
Key:
bold = primary working group members
italics = not on a specific group or subgroup but had been on an email exchange or a call

Manuscript system vendors

Thomson Reuters, ScholarOne
Christopher Heid
Keith Macgregor
Tiffany Pillifant
Jasper Simon

EJournal Press
Joel Plotkin

Aries
Tony Alves
Lyndon Holmes
Caroline Webber
Richard Wynne

Appendix B

FundRef Communications

Presentations

1. FundRef: connecting funding and publications, Ed Pentz, International Council for Scientific and Technical Information (ICSTI), Paris, France, March 12, 2012.
2. Herding LOLCats, Or, Influencing the Community through CrossRef, CrossMark, and FundRef: An update on the CrossMark version identification service and introduction to a project to identify research funding, Wiley Executive Seminar, Washington, DC, March 24, 2012.
3. FundRef Overview, Fred Dylla, International Workshop on Contributorship and Scholarly Attribution, Harvard University, Cambridge, MA, May 16, 2012.
4. FundRef Overview, Kevin Dolby, STM Roundtable, Brussels, Oct 16, 2012.
5. FundRef: getting better funder attribution, Kevin Dolby, Europe PubMed Central AGM, London, Nov. 19, 2012.
6. FundRef, Chuck Koscher, CrossRef Annual Member Meeting Workshop, London, UK, Nov. 13, 2012.
7. Progress Report on the FundRef Initiative, Fred Dylla and Kevin Dolby, CrossRef Annual Member Meeting, London, UK, Nov. 14, 2012.
8. Status of the FundRef Pilot, Sharon Jordan, CENDI meeting, Arlington, VA, Jan. 9, 2013.

Other

1. CrossRef Announces FundRef Pilot to Standardize Funding Source Information for Scholarly Publications, Press Release, May 2, 2012, http://www.crossref.org/01company/pr/news050212.html.
2. FundRef Factsheet, October 5, 2012, http://www.crossref.org/08downloads/handouts/fundref.pdf.
3. The FundRef Workflow, October 5, 2012, http://www.crossref.org/08downloads/handouts/FundRef_Workflow.pdf