What is Open Science, and How Can Radical Collaboration Facilitate It?

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Open science is a multi-faceted movement serving as a goal and a motivation for many stakeholders, from researchers to information professionals and from funders to the general public. Aspects of open science include: open sharing of research materials such as data and code, collaborative research platforms, crowdsourcing platforms, blogs, open peer review, open educational resources, altmetrics, and more. These diverse aspects can be classified into schools of thought and are emphasized by members of various open-focused communities to different degrees (from intense belief to neutral to opposition in some cases). Regardless of the differences in views between diverse communities and differences in aspects or approaches, each of these forms of open science allows for additional levels of understanding, participation, or both by people external to the group producing the science.

In my work as a data services librarian, I serve the current needs of the research community, specific individual researchers, and students, and I support the anticipated needs of future researchers. In this way I must intersect between traditional "librarianship" and "archives" as well as balance the various needs of the university at large. This work includes supporting researchers and students who need to find, manage, share, and/or preserve data. Additionally, data librarianship includes supporting the development of workflows at the university or college level that will support or facilitate better practices in research data management and

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improving open access to data and other non-traditional research products. In all of these interactions, I must stay aware of the different motivations and needs of the people I am supporting in my work as well as the new developments/cultural norms in the open science communities on which my work touches. When done well, research data management and stewardship leads to success from multiple sides—a researcher shares their data or software and receives credit for their work while others learn from and even build on the work already completed by that initial researcher.

When working on a project designed to support a heterogeneous community, such as you often find in open science, each collaborator's expertise and knowledge contributes a small piece of the puzzle until the final product is developed or the goals of the initiative are achieved. For example:

- Without the funder perspective, perhaps there would be no one in the room to incentivize open practices.
- Without the perspective of certain tool builders, developing a format compatible with citation managers might be forgotten.
- Without the librarian perspective, discovery for re-use or re-purposing might be undervalued.
- Without archivist representation, the complexity of preservation could be disregarded.
- Without researcher collaboration, test cases and pain points may be overlooked.

Two specific examples follow.

Example 1. Radical Collaboration in Support of Open Science: Software Citation

The Software Citation Principles[1] published in 2016 by FORCE11 came out of a multi-part need observed by the research community and

likely were informed by many simultaneous projects. For many users of these principles, they might appear to simply be filling a need: to cite one of their sources for a publication. However, citing software serves the community in many ways, such as increasing the recognition of software as a research product, allowing for more representation of various forms of research contribution, and amplifying the vital contribution of developers to the scholarly community. These principles were developed by a working group including researchers from diverse disciplines, information professionals, and tool builders coming together with a common purpose. These different perspectives were necessary for a robust outcome. In order to fully meet the needs of the range of communities, the authors of the FORCE11 citation principles needed to first learn what these needs were. In my experience, individual contributors to the work of supporting open practices in the scientific software ecosystem have multiple motivations and perspectives as to how to support research software in this ecosystem, the different roles that software plays, and how to best support the researchers creating and/or using/re-using software.

Implementing the Software Citation Principles remains a complex endeavor; although, it is arguably not as complex as implementing good software preservation practices. At least now that this precedent has been established, outreach to researchers about publication and preservation of software can be more easily tied to the system of academic credit. When approaching a researcher as a potential "donor" of their scholarly work to the open science ecosystem, leaning on the citability of software improves the alignment of this conversation with traditional motivations—"Publish or perish;" "Cite it or it didn't happen."

Example 2. Radical Collaboration to Preserve Informal Astronomical Communications

A few years ago, several astronomers from the blog *Astrobites*,[2] and other social, online, astronomy and astrophysics communities,

noticed how much information they communicated via these informal platforms and the significance of these communications to their research discipline at large. Recognizing that these communications serve the same purpose now as letters did in the past, these researchers reached out to special librarians with a variety of skills, myself included, for help preserving these communications for posterity. In order for this project to start up successfully, we needed to understand the researchers' desires and vision for the preserved material. Questions such as "How important is the look and feel of the original?" and "Are comments part of a work?" were workshopped collaboratively by information professionals and researchers. This led to a general formation of an ideal output and workflow. The curation of the material ingested into the preservation platform would be carried out by expert domain researchers, and facilitating this curation was a key requirement for success. Considerations such as supporting either an "opt out" or "opt in" option, as well as the writing of a disclaimer, were considered as alternatives to a formal donor agreement, because of the challenges inherent in establishing consent, terms, and conditions for automatically ingested digital media.

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As these conversations continued, the librarians researched options for capturing, curating, documenting, and preserving this material. From this research they connected with several tool builders and service providers who could help with the development of webhooks to deliver content to different social platforms and development of automated description for preservation platforms. After making some initial decisions as a group, the researchers and the librarians separately put together ideas and proposals for possible workflows.

As an unfunded, complex project, the development of this project continues slowly, but the work remains collaborative, allowing for the

voices of a number of partners. In this case, astronomy librarians and information science graduate students needed to refer to the work of archivists in order to learn necessary considerations to bring to the researchers for feedback and decision-making.

Conclusion

In both of these examples, the central requirements of sharing openly without attachment to a single perspective, inviting many voices to participate in the discussion, and of focusing on the common goals, facilitated a successful solution. Each individual's expertise and perspective was needed in order to develop a successful radical collaboration.

Endnotes

1. Arfon M. Smith, Daniel S. Katz, Kyle E. Niemeyer, and the FORCE11 Software Citation Working Group, "Software Citation Principles," *PeerJ Computer Science* 2:e86 (September 2016), https://doi.org/10.7717/peerj-cs.86.

2. *Astrobites* blog, accessed December 5, 2018, https://astrobites.org/.

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