SBP Review RRIDs

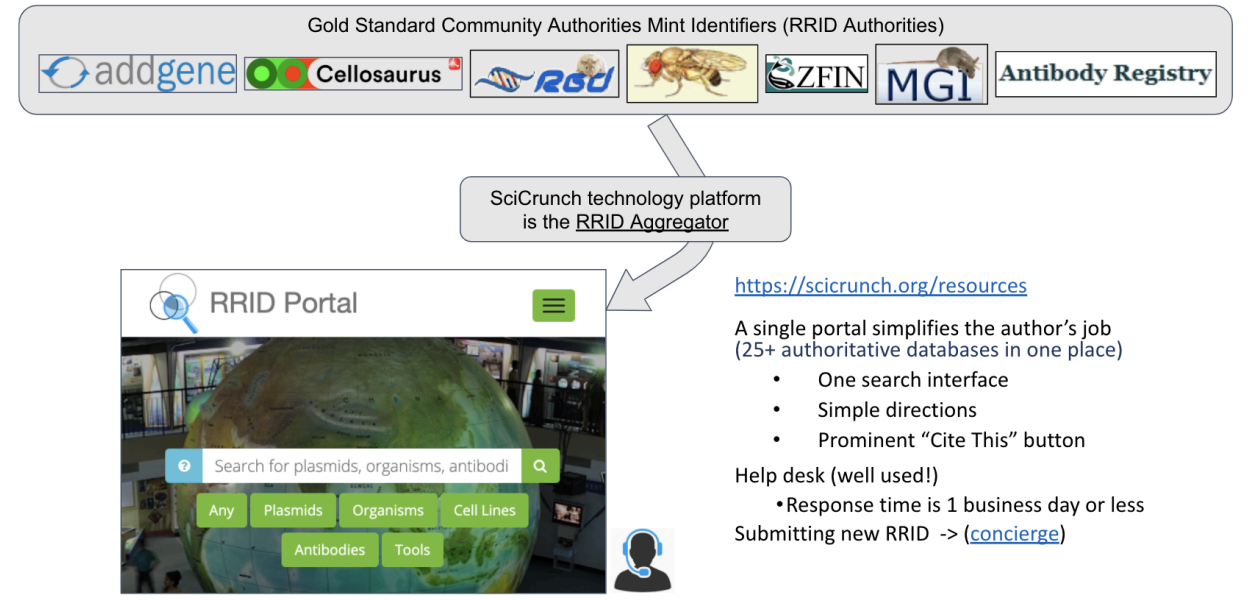
Submitted for consideration: 14 April 2020
Initial review: 18 September 2020
Reviewers: Thomas Wachtler and Wojtek Goscinski
Authors: Anita Bandrowski and the INCF SBP Committee

Basic metadata:

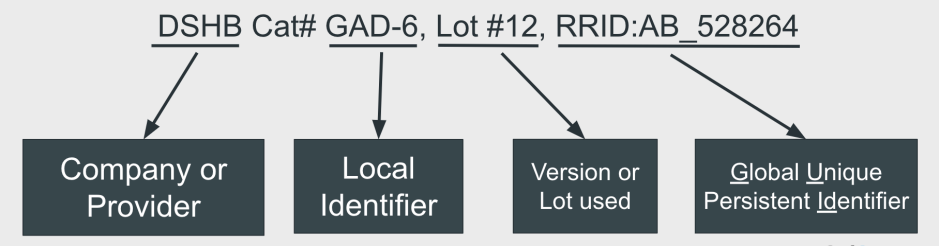
Title: Research Resource Identifiers (RRIDs)

Description: The RRID is a Persistent Unique Identifier assigned to help researchers cite key resources (antibodies, model organisms and software projects) in the biomedical literature to improve transparency of research methods. They are machine readable, free to generate and access, and consistent across publishers and journals. They are meant as a tool to improve scholarly communication and scientific reproducibility.

RRIDs are created by authoritative databases such as the Antibody Registry, Addgene, or Cellosaurus and their aggregation is supported by SciCrunch (http://scicrunch.org/resource). This aggregation provides one place for journals to send authors and there are clear instructions, a “cite this” button next to each resource that contains proper citation text for the methods section of a manuscript and a help desk. Over 100 journals have guides on how to use RRIDs and over 1000 have published RRIDs at the time of this document.



The full RRID syntax includes the unique identifier as well as pertinent information about the resource. For software, this includes the version or date accessed.



URL: www.rrids.org about the project / how to implement RRIDs
URL: http://SciCrunch.org/resources authors' website

Steward: Dr. Anita Brandowski, SciCrunch, University of California, San Diego, La Jolla, CA, USA

Relevant publications:

Bandrowski et al. (2015) The Resource Identification Initiative: A cultural shift in publishing. Co-Published: Journal of Comparative Neurology [10.1002/cne.23913], Brain and Behavior [10.1002/brb3.417], F1000 Research [10.12688/f1000research.6555.2], and Neuroinformatics [10.1007/s12021-015-9284-3].

Babic et al (2019) Incidences of problematic cell lines are lower in papers that use RRIDs to identify cell lines. Elife. [10.7554/eLife.41676]

Bandrowski & Martone (2016) RRIDs: A Simple Step toward Improving Reproducibility through Rigor and Transparency of Experimental Methods. Neuron. [10.1016/j.neuron.2016.04.030]

Summary of Discussion:

Overall, the committee felt that RRIDs are a strong candidate for INCF endorsement and should be put forward to the community for public review. It is open, has strong documentation, is well conceived and executed, supports FAIR reasonably well, has evidence of widespread community support and use outside of the core group involved in its specification and development. At present, there are approximately 1000 journals endorsing and 3000 utilizing RRIDs. The delay between the initial review and community review was due to the need to establish a governance framework for RRIDs. The INCF Standards and Best Practices (SBP) Committee commends the steward's efforts to implement the governance recommendations provided. Below, you will find the SBP Committee's report on how RRIDs address and fulfill INCF's criteria for endorsement as a standard/best practice.

Recommendation

The committee unanimously recommended that RRIDs be put forward for community comment.

Conflicts of Interest

The reviewers declared no conflicts of interest, but the committee wishes to note that RRIDs were developed by an active member of the INCF community.

Open criteria:

It is essential that a FAIR supporting standard is open and allows free use by the community. Open development practices are also strongly encouraged to facilitate transparency and adoption. If questions do not apply, leave them blank or mark N/A.

1. **Is the SBP covered under an open license so that it is free to implement and reuse by all interested parties (including commercial)? (List of open source licenses)**
   RRIDs are covered under a **CC0** license

   RRIDs may be looked up by searching the source "gold standard" databases (e.g. MGI, Antibody Registry, MMRRC, Cellosaurus, NCBI BioSamples) for each type of resource. They're also reflected by companies and stock centers e.g. Thermo Fisher, BioLegend, ImmunoStar, MMRRC, and BDSC. They may also be accessed using the aggregated index maintained by SciCrunch.

2. **What license is used?**
   Many open licenses govern RRIDs (many providers share their data under various open licenses), but the RRIDs themselves are under a CC0 license.

3. **Does the SBP follow open development practices?**
   SciCrunch is an open source project (github.com/scicrunch under a standard non commercial open source license), however the ~25 different providers that create RRIDs are independent, but they all make RRIDs available under an open license.

4. **Where and how are the code/documents managed?**
   RRIDs are only served by SciCrunch, they are not SciCrunch.

5. **Any additional comments on the openness of the SBP?**
   If all technology fails or is insufficient, RRIDs, under the CC0 license, can become a single PDF file where authors can look up their numbers. SciCrunch is working with the California Digital Library to be the backup source for RRIDs.

FAIR criteria

Considers the SBP from the point of view of some (not all) of the FAIR criteria (Wilkinson et al. 2016). Is the SBP itself FAIR? Does it result in the production of FAIR research objects? Note that many of these may not apply. If so, leave blank or mark N/A.

1. **SBP uses/permits persistent identifiers where appropriate (F1)**
   RRIDs are persistent identifiers

2. **SBP allows addition of rich metadata to research objects (F2)**
   Enriches metadata

3. **SBP uses/permits addition of appropriate PIDs to metadata (F3)**
   Yes

4. **The protocol allows for an authentication and authorization when required (A1.2)**
   NA

5. **SBP uses or allows the use of vocabularies that follow the FAIR principles (I2)**
   NA

6. **SBP includes/allows qualified links to other identifiers (I3)**
   NA

7. **Does the standard interoperate with other relevant standards in the same domain? (I1)**
   RRIDs.org works with repositories within a domain to register with an established provider of RRIDs from that domain

8. **Does the SBP provide citation metadata so its use can be documented and tracked? (R1.2)**
   RRIDs make it possible to document and track a resource in publications

9. **Does the SBP have a clear versioning scheme and appropriate documentation?**

10. **Any additional comments on aspects of FAIR?**
    As RRIDs are handled by many different providers, there were concerns by the reviewers about how one becomes an authoritative source, and how well these multiple sources adhere to best practices for creating and managing RRIDs. The reviewers were satisfied with their concerns after a discussion with Anita Bandrowski, but requested more transparency on the SciCrunch web-site about this process.

Design, Testing, and Implementation

These may not all apply, if so, leave blank or mark N/A. Proper design, testing, and implementation, in addition to supporting tools greatly aid in adoption of a standard.

1. **What is the technical expertise level required to implement this? Even if it is quite difficult, should it be implemented anyway?**
   Little to no technical expertise is required. Authors have access to instructions, a button that allows them to “cite” a resource and a help desk at scicrunch.org/resources.

2. **Does the SBP provide an architectural concept to understand its implementation and relationships to external entities?**
   NA

3. **Does the SBP have a reference implementation?**
   scicrunch.org/resources

4. **What software artifacts (resources files/scripts/libraries/tools) are available to support the SBP?**

- Each RRID provider has their own database
- scicrunch.org/resources is linked to by ~500 journals at all major publishers.
- SciBot is a tool that curators use to verify published RRIDs
- SciBot - modified by eLife is used by the publisher to verify RRIDs before publication

- SciScore.com is an automated tool deployed at AACR to help authors and editors review RRIDs for accuracy before publication

5. **Are the supporting software resources covered under an open source license?** RRID providers -varies, Scicrunch.org -yes standard CC non-commercial (on web-site), SciBot -yes Apache-2.0
    a. **Are the supporting software resources well documented (documentation of I/O operations, programming interfaces, user interfaces, installation)?**
    b. **Were the supporting software resources validated?**
    c. **What is your assessment of the quality of the code/document?**
    d. **Have the supporting software resources been deployed, is there any experience or references to their use by the community?**
6. **Any additional comments on design, testing, and implementation?**

Governance

Ongoing governance is key to ensuring the transparency about how a standard was created, and ensuring the stewards are responsive to the needs of the community. Standards require transparent governance practices; however it is possible some of the following questions do not apply; if so, leave blank or mark N/A.

1. **Does the SBP have a clear description on who is maintaining the SBP and how decisions regarding its development are made?**
   Yes, SciCrunch is the organization that cares for and feeds the data indexes that form the RRID project and serves this data to individual authors via the website rrid.site as well as journals and software tools via the RRID resolution services. More information about the governance framework can be found at: https://www.rrids.org/current-project

2. **Is the governing model document for maintenance and updates compatible with the INCF project governing model document and the open standards principles?**
   NA

3. **Is the SBP actively supported by the community? If so, what is the evidence?**
   Yes, RRIDs have been adopted by a large number of journals, which ask authors to use them. ~25K authors have complied to date. The data is available in SciCrunch, Hypothes.is, and CrossRef's Event Data.

4. **Does the SBP provide tools for community feedback and support?**
   Yes, there is the RRID Portal that enables the community to search for resources based on the RRID and enables them to add their resources to get an RRID. There is also a help desk at scicrunch.org/resources. Nature Protocols authors rated the RRID helpdesk

4.75 of 5 stars and stated that the helpdesk was “very quick to respond” and “the registration process was very smooth” (https://www.nature.com/articles/s41596-020-0334-4).

5. **Any additional comments on governance?**

Adoption and Use

The standard must have substantive evidence of use outside of the group or individual that develops and maintains it. However, different levels of adoption and use will be taken into consideration depending on the purpose of the standard and the size/type of audience that might implement the standard. Because INCF represents organizations world-wide, evidence of international use is highly desirable.

1. **Is there evidence of community use beyond the group that developed the SBP?**
   Major standards organizations accepted RRIDs as a standard
   - NISO JATS 1.2
     https://jats.nlm.nih.gov/publishing/tag-library/1.2/element/resource-id.html
   - EQUATOR network
     https://www.equator-network.org/reporting-guidelines/unique-identification-of-research-resources-in-the-biomedical-literature-the-resource-identification-initiative/

   Publishers: About 100 journals have specific instructions to authors, tracked here, ~60 of these provide linked RRIDs (using mainly the scicrunch resolver service), see also https://www.rrids.org/journals

   Antibody companies have put RRIDs into their webpages
   - NeuroMab
   - Chromotek
   - Thermo Fisher
   - BioLegend
   - ImmunoStar
   - EnCor Biotechnology
   - Jackson ImmunoResearch
   - Phospho Solutions
   - Miltenyi

2. **Please provide some concrete examples of use, e.g., publications where the use of the SBP is cited; databases or other projects that have adopted the SBP**
   https://www.rrids.org/journals
   See above. Also, there are over 1 million RRIDs in the scientific literature at the time of this report.

3. **Is there evidence of international use?**
   Yes, a large number of journals (too many to list) request authors to use RRIDs and an even larger number of journals contain RRIDs. To view the full list, see: https://www.rrids.org/journals

4. **Any additional comments on use?**

   RRIDs are in the DataCite metadata schema and have a BioRxiv integration. In addition, RRID has established a relationship with the Research Organization Registry (ROR). ROR IDs help identify research organizations, defined as "any organization that is involved in research," including organizations that produce, fund, facilitate, manage, and publish research as well as organizations that educate or employ researchers

Stability and Support

1. **Who is responsible for maintaining the SBP?**
   Each of the authorities have their own support. SciCrunch maintains the aggregation services and resolvers and are working to provide the data to the California Digital Library so that they may serve it as a failover system.

2. **How is it currently supported?**
   Aggregation services are maintained by the dkNet.org (grant), and an NIH-OD contract with SciCrunch. Commercial antibody companies pay for membership. SciScore is a commercial tool, a service for journals, contributes to the support of RRIDs

3. **What is the plan for long term support?**
   RRIDs.org will determine how to support the organization long term, but it will likely involve some combination of contracts, grants and membership.

4. **Are training and other supporting materials available?**
   Materials “how to implement RRIDs in a journal” are available at rrids.org. FAQs are available at scicrunch.org/resources.

5. **Any additional comments on sustainability and support**

Extensibility:

1. **Can the SBP be extended to cover additional domains/use cases?**
   Yes, but it would require new providers in those domains

2. **If so, how is the process documented and managed?**
   Our last addition to the RRID portal was BioSamples data (IIDP project); this was requested by NIH and it was negotiated between NIH, BioSamples, EU BioSamples, the IIDP project and the SciCrunch team (See BioSamples FAQs and associated Blog). The process is not well documented at this point in time, but rrids.org will take the charge to make the process more transparent.

3. **Any additional comments on extensibility?**

Comparison

1. **Are there other similar SBP's available?**
   Not that we are aware of

2. **If yes, how do they compare on key INCF criteria?**

3. **What are the key advantages of the SBP when compared to other SBPs?**
4. **Any additional comments on comparison with other SBP's?**
   It is reasonable that RRIDs should be able to coexist with other unique IDs that fill a similar niche. At this time, we do not know of any competitors for the role of providing this type of service. The stewards of RRIDs are working to provide the data to the California Digital Library so that they may serve it as a failover system. The n2t.net and identifiers.org resolvers already resolve RRIDs, but these depend on the continual existence of SciCrunch; in principle, these services can be repointed to any resolver.