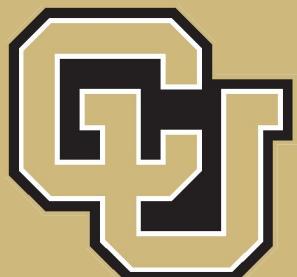


FAIR Facilities & Instruments

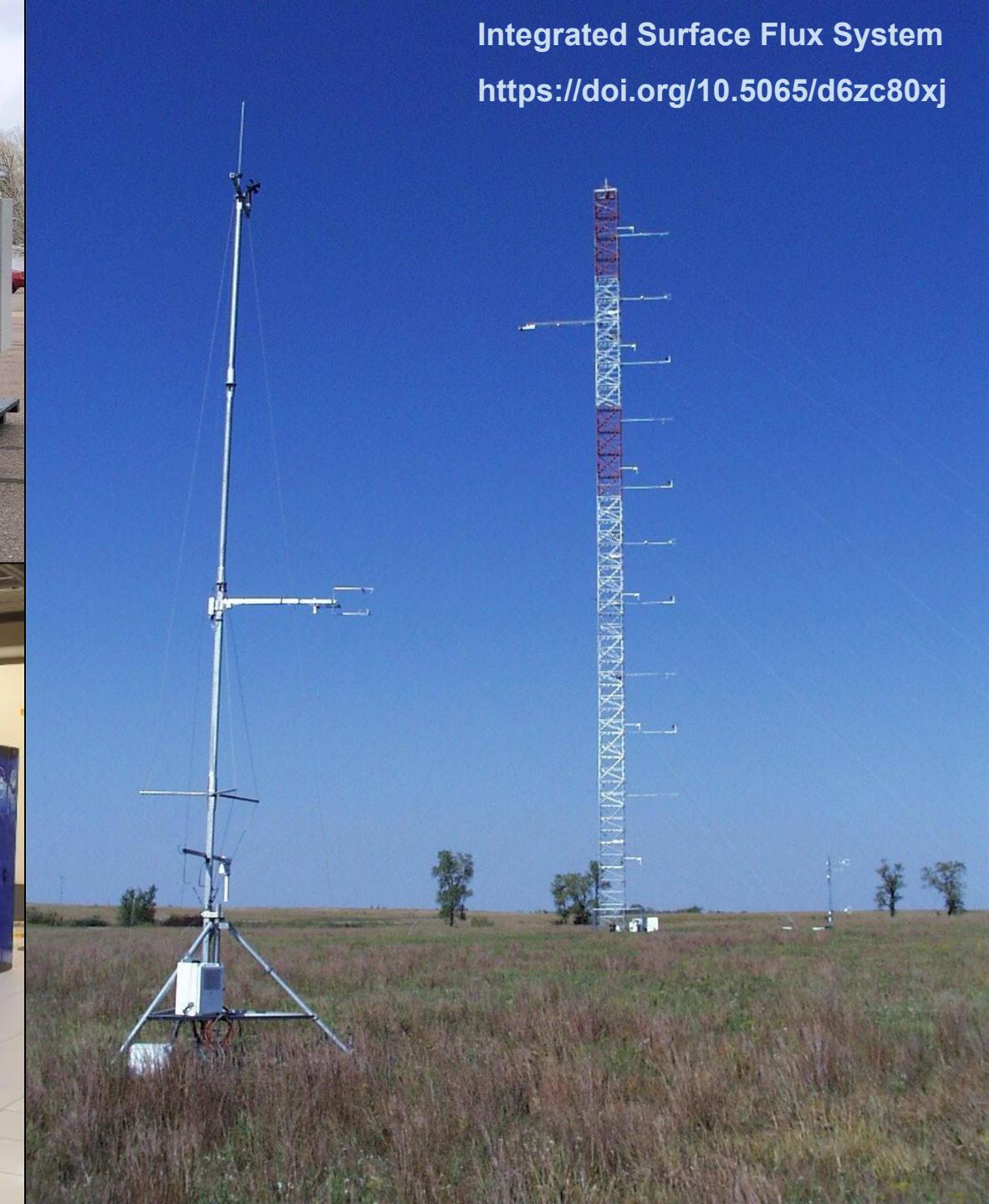
Workshop #3, Boulder, CO

Sept. 22-24, 2025

Matt Mayernik, Andrew Johnson, Renaine Julian,
Claudius Mundoma, Matthew Murray, and Adi Ranganath,







KEY LINKS

- [Zoom connection](#) for remote speakers and attendees
- Workshop [Code of Conduct](#)
- [Draft project recommendations](#) [please review prior to the workshop]
- [Collaborative notes document](#)
- [Breakout discussion notes](#)
- [Speaker slides](#)

WORKSHOP AGENDA - Note, all times are in [Mountain Daylight Time](#)

SEPT 22 - DAY 1 PM 12:30-5:00 PM : Introductions and High-Level Insights

- 12:30 - 1:00 Participants arrive and check-in
- 1:00 - 1:45 Workshop introduction & Project Progress
 - FAIR Facilities and Instruments (FAIR F&I) Project Overview
 - Discussion of key goals for the workshop
- 1:45 - 3:00 General Recommendations & PID Systems
 - Overview of general recommendations by FAIR F&I project team
 - (virtual) Maria Gould, DataCite
 - Amanda French, Research Organization Registry (ROR)
 - Anita Bandrowski, Research Resource Identification, RRID, initiative
- 3:00 - 3:30 Break
- 3:30 - 4:30 [Breakout groups sessions](#) - Topic: general recommendations
- 4:30 - 5:00 Breakout group reports and preview tomorrow

Project Organizations & Personnel



NATIONAL CENTER FOR
ATMOSPHERIC RESEARCH

Matt Mayernik
Greg Stossmeister



FLORIDA STATE UNIVERSITY

Renaine Julian



NSF Awards
2226396
2226397
2226398



University of Colorado **Boulder**

Andrew Johnson
Aditya Ranganath
Matthew Murray



Stanford University

Claudius Mundoma

Project website: <https://ncar.github.io/FAIR-Facilities-Instruments/>

Project Advisory Committee

- **Anita Bandrowski** - founder and CEO of SciCrunch
- **David Butcher** - FAIR data management specialist at the National High Magnetic Field Laboratory
- **Matthew Buys** and **Kelly Stathis** - Executive Director and Technical Community Manager at DataCite
- **Zach Chandler** - Director of Open Scholarship Strategy, Stanford University
- **Nate Herzog** - CoreMarketPlace project lead at Vermont Genetics Network
- **Kevin Knudtson** - President of the Association of Biomolecular Resource Facilities (ABRF)
- **Giri Prakash** - Section Head of the Earth System Informatics and Data Discovery section at Oak Ridge National Laboratory
- **Dylan Ruediger** - Senior Analyst at Ithaka S+R
- **Shawna Sadler** - Head of Outreach & Partnerships at ORCID
- **Shelley Stall** - Sr. Director for Data Leadership at American Geophysical Union (AGU)

Project Goals

Develop	Compile	Facilitate	Produce
Develop a Research Coordination Network (RCN) focused on the assignment of Persistent Identifiers (PIDs) to research facilities and instrumentation	Compile use cases for why and how PIDs might be assigned to facilities and instruments	Facilitate the generation of expertise and guidance on the key topics of interest	Produce & refine recommendations and lessons learned targeted toward the specific use cases

Key Questions for the Workshop

What are your main reasons for assigning PIDs to facilities and/or instruments?

What questions do you have? What guidance do you want/need?

What outcomes and products from the workshop and project overall would be most useful for you?

Note on Terminology

Definitions are important - but are not consistent

- a. What is a “facility”?
- b. What is an “instrument”?
- c. What other terms are used? (platform, site, core, device, ...)
- d. When does it matter?



Motivating Examples

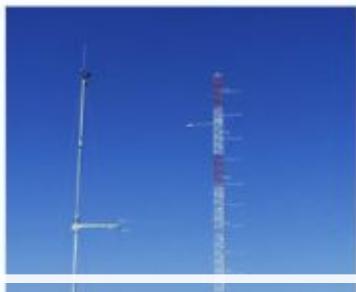


PIDs for Facilities and Instruments - NCAR



Integrated Surface Flux System

ISFS DESCRIPTION



NSF/NCAR C-130

Aircraft Overview

The Lockheed C-130 "Hercules" aircraft is a four-engine, medium-size utility aircraft that has proven to be one of the most well-known and versatile aircraft ever built. The NSF/NCAR aircraft is a model EC-130Q, similar to the more common model C-130H model except for electrical and air-conditioning modifications. The aircraft is an all-HO-30-ATR turboprop engines. It is equipped with dual-wheel, tricycle landing gear with the main gear wheels arranged in tandem and the nose gear arranged side-by-side. The C-130 maintained and

Example: doi Implementation

landing gear with the main gear wheels arranged in tandem and the nose gear arranged side-by-side. The C-130 maintained and



C-130

NSF/NCAR C-130

NSF/NCAR C-130 Investigator Handbook
Airborne Instrumentation

NSF/NCAR C-130 Request Guidance

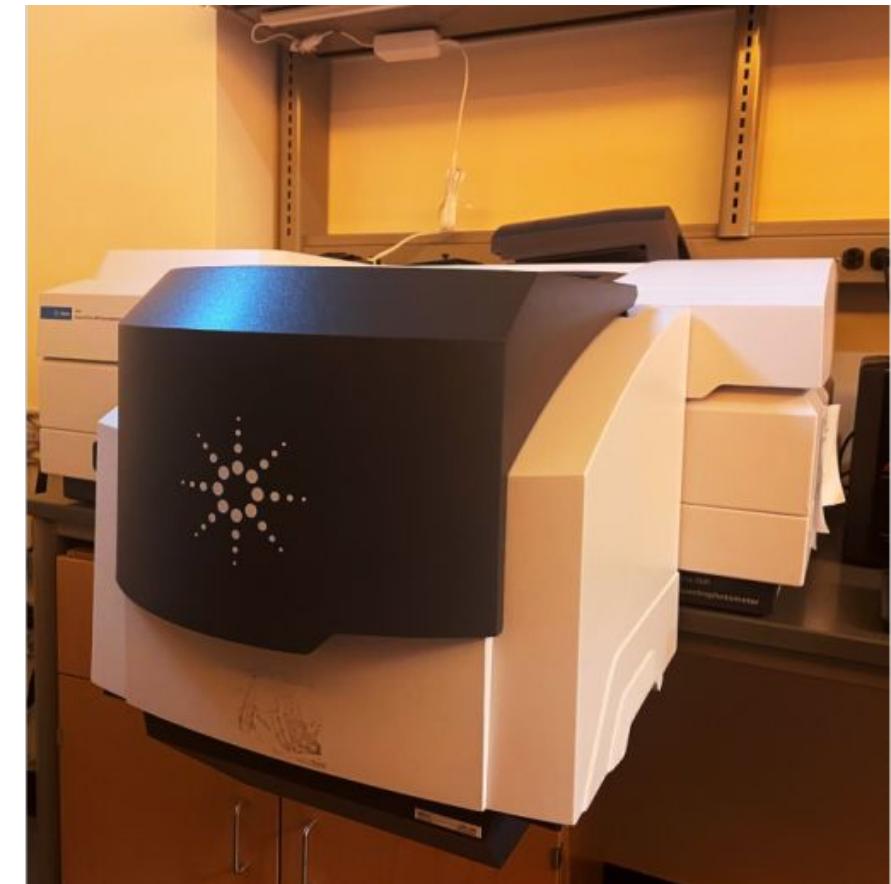
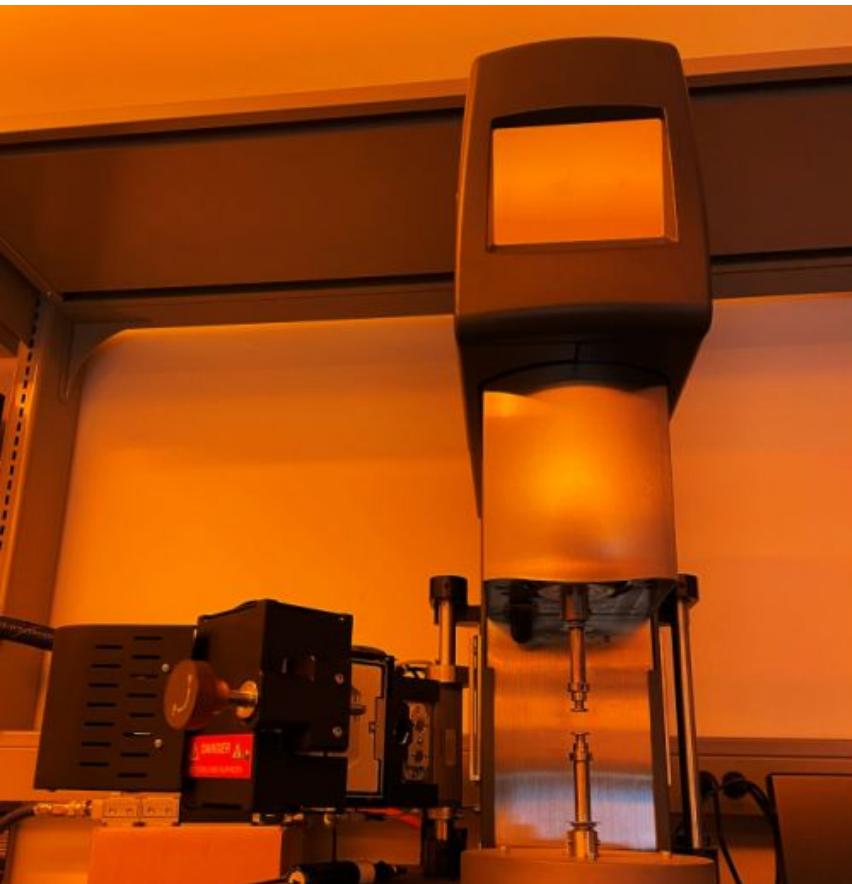
Aircraft Schedules
Request the NSF/NCAR C-130
Contact RAF

<https://doi.org/10.5065/D6ZC80XJ>

<https://doi.org/10.5065/D6WM1BG0>

University of Colorado Polymeric and Optical Materials Characterization Shared Facility

https://scicrunch.org/resolver/RRID:SCR_022288



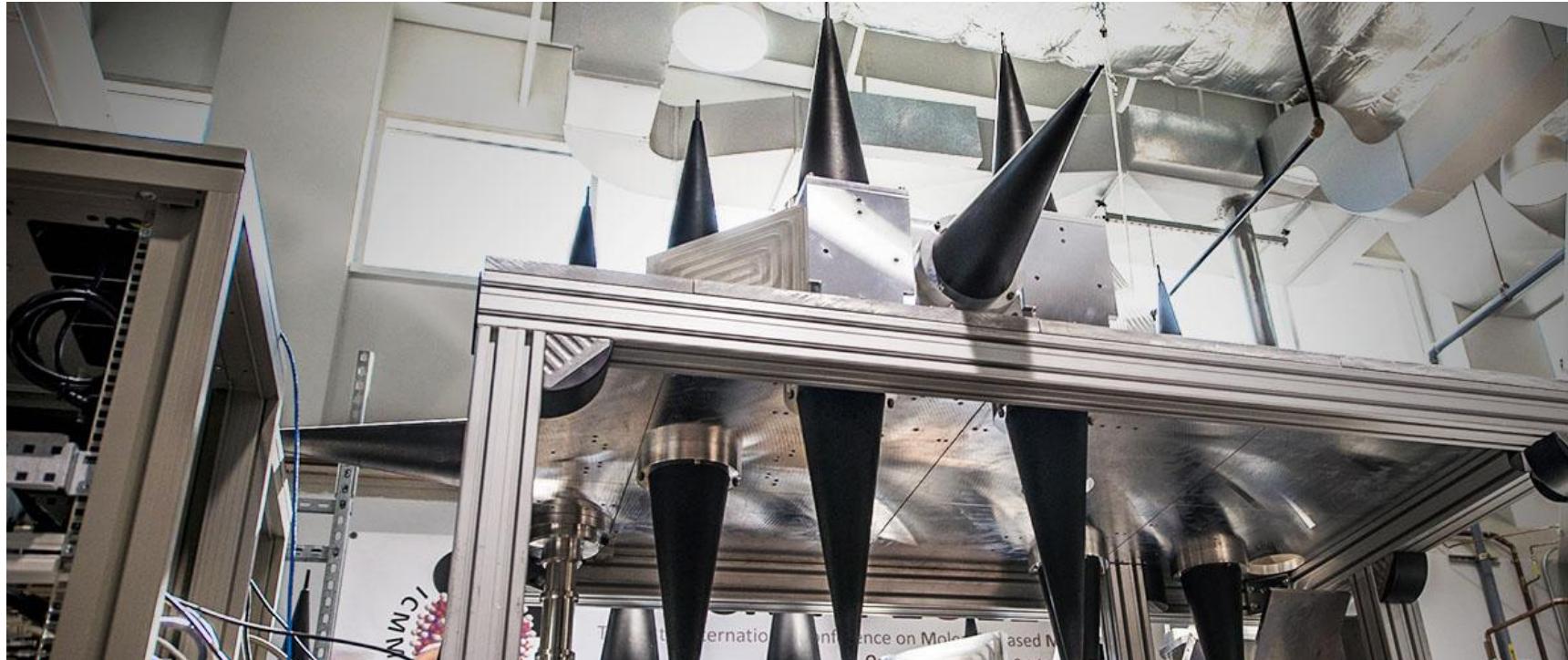
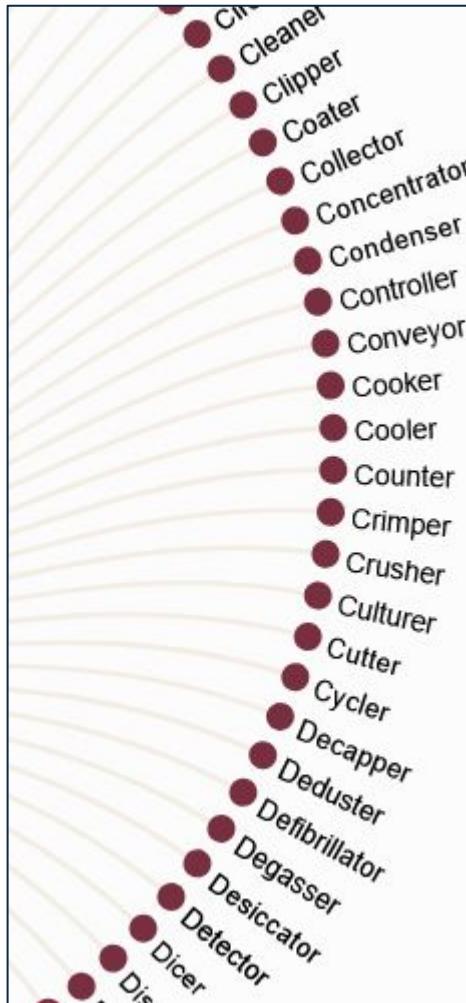
RRID Implementation at Stanford

Stanford
Microfluidics
Foundry

https://scicrunch.org/resolver/RRID:SCR_024527



Florida State University



National High Magnetic Field Laboratory Electron Magnetic Resonance Core Facility
https://www.scicrunch.org/resolver/RRID:SCR_017359

Connecting Facilities, Instruments, & Data



NSF NCAR HIAPER Gulfstream GV

<https://doi.org/10.5065/D6DR2SJP>

ACCLIP NSF/NCAR GV Instrument Data Merges - 10 Second
<https://doi.org/10.26023/2HAX-YPQB-GG0Q>

FAIRO-1 Ozone Data
<https://doi.org/10.26023/S3FA-R52G-ZS11>

HIAPER Atmospheric Radiation Package (HARP) CCD Actinic Flux Spectrometers Photolysis Frequencies
<https://doi.org/10.5065/D6MP51N7>

...

[686 datasets]

Research Computing

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Data storage supported by the University of Colorado Boulder "PetaLibrary"

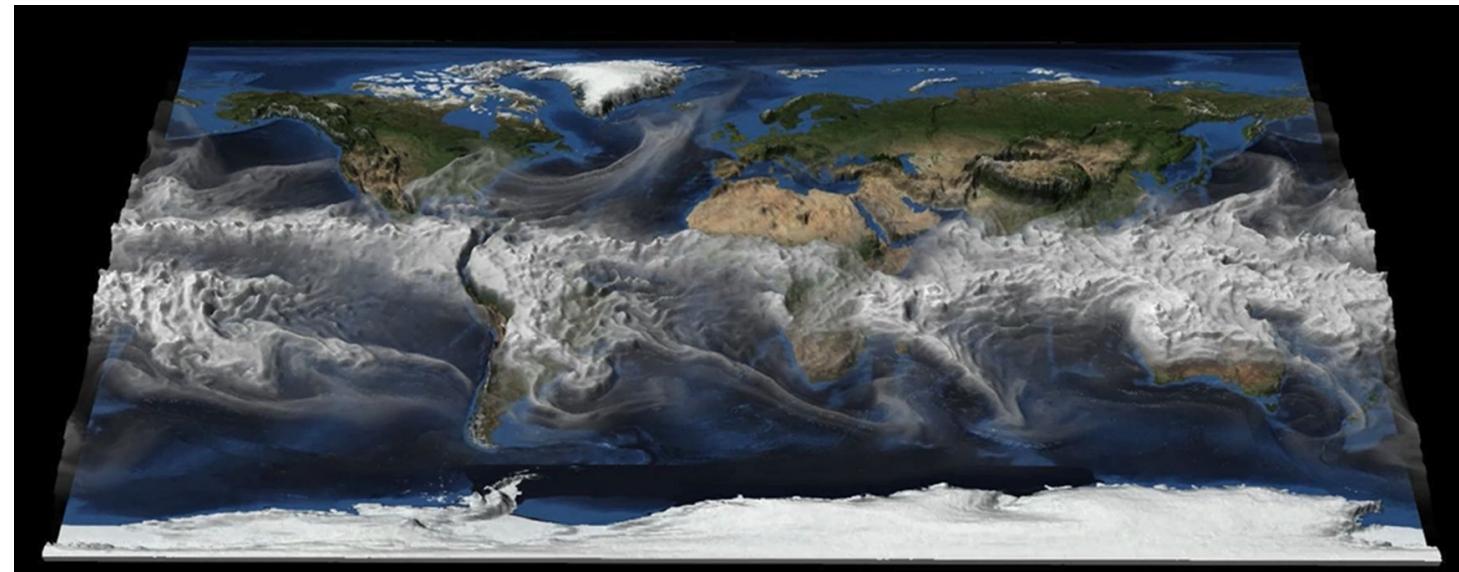
<https://doi.org/10.25811/81nc-wv41>

https://www.scicrunch.org/resolver/SCR_019299

NCAR - Community Earth System Model (CESM)

Community Earth System Model Developers And Affiliates. (2017). *Community Earth System Model - CESM2.0*. UCAR/NCAR - Climate and Global Dynamics Laboratory. <https://doi.org/10.5065/D67H1H0V>

Danabasoglu, Lamarque, Bacmeister, Bailey, DuVivier, Edwards, Emmons, Fasullo, Garcia, Gettelman, Hannay, Holland, Large, Lauritzen, Lawrence, Lenaerts, Lindsay, Lipscomb, Mills, ... Strand. (2020). CESM-release-cesm2.1.2 (release-cesm2.1.2). Zenodo. <https://doi.org/10.5281/zenodo.3895328>



Acknowledgements in CESM Papers

When you use CESM simulations in your publications, it is very important to acknowledge our primary sponsor, the U.S. National Science Foundation ([NSF](#)).

Appropriate acknowledgment of the NSF sponsorship:

The CESM project is supported primarily by the U.S. National Science Foundation.

Craig, C. A., Bacmeister, J., Callaghan, P., Eaton, B. E., Gettel, Herrington, A. R., Lauritzen, P. H., McInerney, J., Medeiros, B., Vertenstein, M., & Vitt, F. M. (2021). *CAM6.3 User's Guide*. [http://](#)

UC Davis/NIH NeuroMab Facility



[https://www.scicrunch.org/
resolver/RRID:SCR_003086](https://www.scicrunch.org/resolver/RRID:SCR_003086)



<https://neuromab.ucdavis.edu/>



<https://ror.org/00fyrp007>



University of Cape Town (UCT)

Published October 19, 2023 | Version v1

[Physical object](#) [Open](#)

UCT HPC Facility

University of Cape Town (Hosting institution) ; Carr, Timothy (Data manager)¹ ;

Lewis, Andrew (Data manager)¹

[Show affiliations](#)

The University of Cape Town's High Performance Computing Facility provides a multidisciplinary Linux-based SLURM cluster for UCT researchers. The UCT HPC Facility is being developed and maintained by Timothy Carr and Andrew Lewis, High Performance Computing Engineers at the University of Cape Town. See also <https://ucthpc.uct.ac.za>

Files

[README.txt](#)

The University of Cape Town's High Performance Computing Facility

UCT HPC provides a multidisciplinary Linux based SLURM cluster for UCT researchers.

See: <https://ucthpc.uct.ac.za>

<https://doi.org/10.5281/zenodo.10021613>

Key Questions

F

Findable - How do we enable people (both users and providers) to find information about facilities or instruments?

A

Accessibility - How do we enable facilities and instruments to be accessible by wider audiences?

I

Interoperability - How do we consistently capture relationships between persistent identifiers?

R

Reusability - How can we incorporate information about facilities and instruments into data set provenance metadata more consistently?

Project Activities

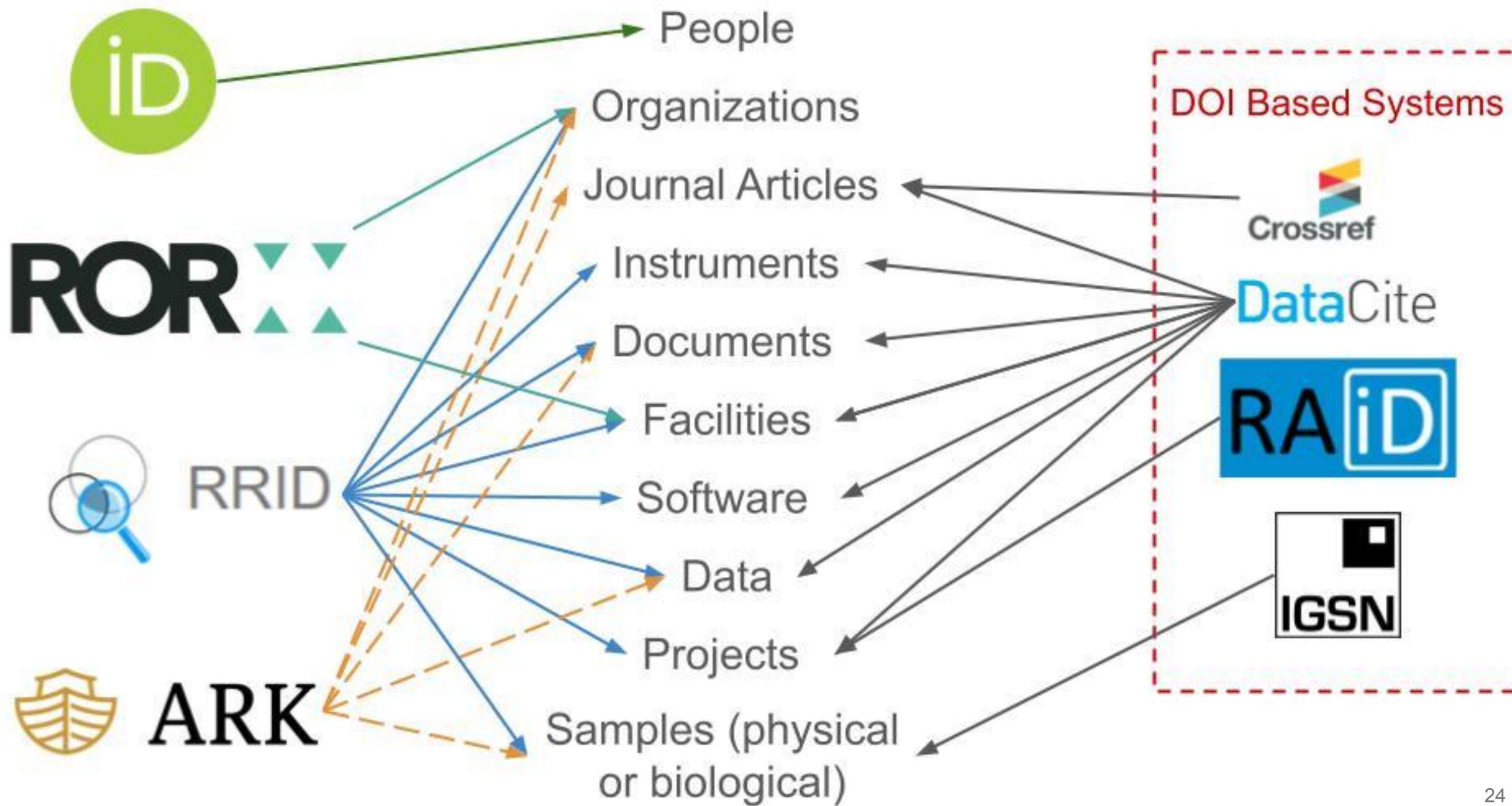
- Focus groups & presentations to relevant groups
 - NSF FAIR Open Science RCN project cohort
 - Earth science facility providers and users
 - FSU & CU campus facilities staff
 - CI Compass - FAIR Data Working Group
 - Data Curation Network
- Conference engagement - AMS, ABRF, ESIP, IASSIST, RDA, RDAP, Year of Open Science
- Sept 2023 Boulder Workshop - 35 participants
- Aug 2024 Tallahassee Workshop - 35 participants

Workshop #1: September, 2023 – Boulder, CO

- **Need:** PIDs are essential for scientific reproducibility, data provenance, and crediting instrument providers
- **PID Systems:** Current PID usage is scattered and inconsistent across different systems used for research instrumentation
- Adoption: The focus should be on lowering adoption barriers and communicating value rather than choosing specific PID systems
- Metadata: Consider metadata alongside PIDs - PIDs alone cannot solve all challenges
- Granularity: Start simple with granularity and evolution tracking, then increase complexity only as needed
- Resources: Instrument/facility providers face significant resource limitations in assigning and managing
- **PIDs Value:** Demonstrating clear value to users is critical for driving PID adoption and citation
- Incentives: Different stakeholders (researchers vs administrators) require different incentives for PID adoption

Workshop #1 report: <http://doi.org/10.5065/zgsx-2d06>





Workshop #2: August 2024- Tallahassee, FL

Emerging topics

- Need for facility and instrument PID recommendations as part of a national PID strategy
- Need for more robust infrastructure and services for facility and instrument PIDs
- Engagement needed with instrument manufacturers to adopt PID-supporting practices
- Engagement needed with journal publishers and editors on PID incorporation



Workshop #2 report:

<http://doi.org/10.5065/jea7-yf24>

Multiple Stakeholders - Distributed Responsibilities



Academic research
institutions



National
laboratories



Nonprofit
organizations



Instrument
manufacturers



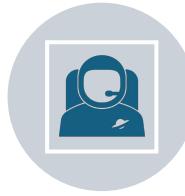
Facility and
instrument
operators



Research
scientists/users



Publishers and
editors



PID system
providers (RRID,
DOI, ROR)

Common Themes

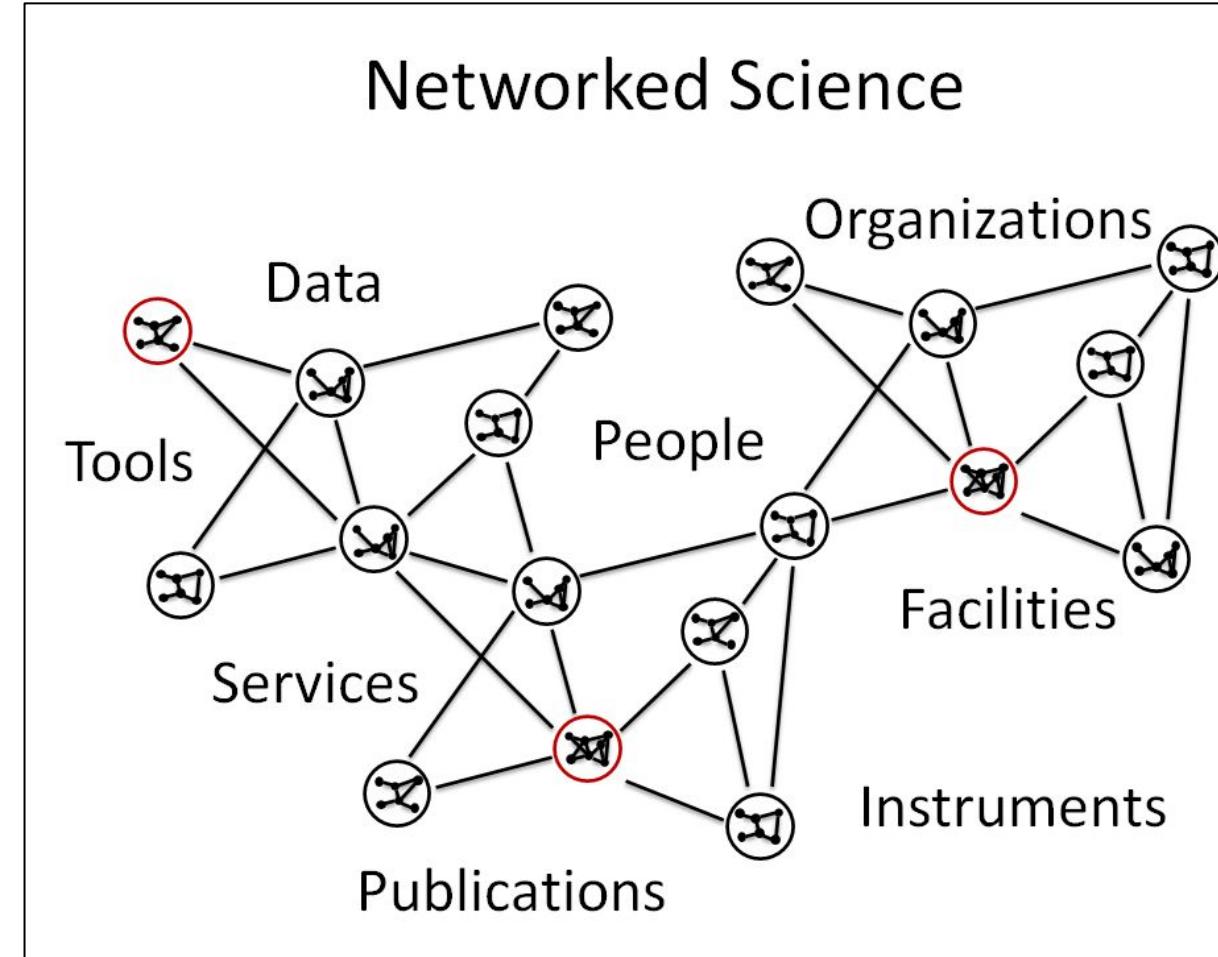
1. Use cases matter
 - a. Reproducibility and Replicability
 - b. Data provenance
 - c. Attribution: Track impact and citations
 - d. Discoverability and Collaboration: Find and share resources
2. PIDs are a starting point
 - a. Making PIDs and citations visible and actionable for researchers who use facilities and instruments is critical
 - b. Value from PIDs comes from integrating them into other systems (metadata systems, institutional systems, publishing systems)

Recurring questions

- What metadata needs to be included? Where should the metadata be collected and made available?
- At what granularity should PIDs be assigned?
 - Does every element/configuration of an instrument need it's own PID?
 - Do you need a general PID for the instrument or do you need a PID specifically for components?
- The Scientific Instrument of Theseus
 - Instruments and facilities evolve over time
 - When is a new PID issued vs. metadata updated?
 - New software? New hardware?

Creating and Maintaining PIDs?

- Instrument and facility providers often face significant resource limitations that make assigning, managing, and promoting PIDs challenging.
- How can we ensure PIDs are created and up to date?
- How are connections between PIDs to be created and maintained?
- Where is funding going to come from?





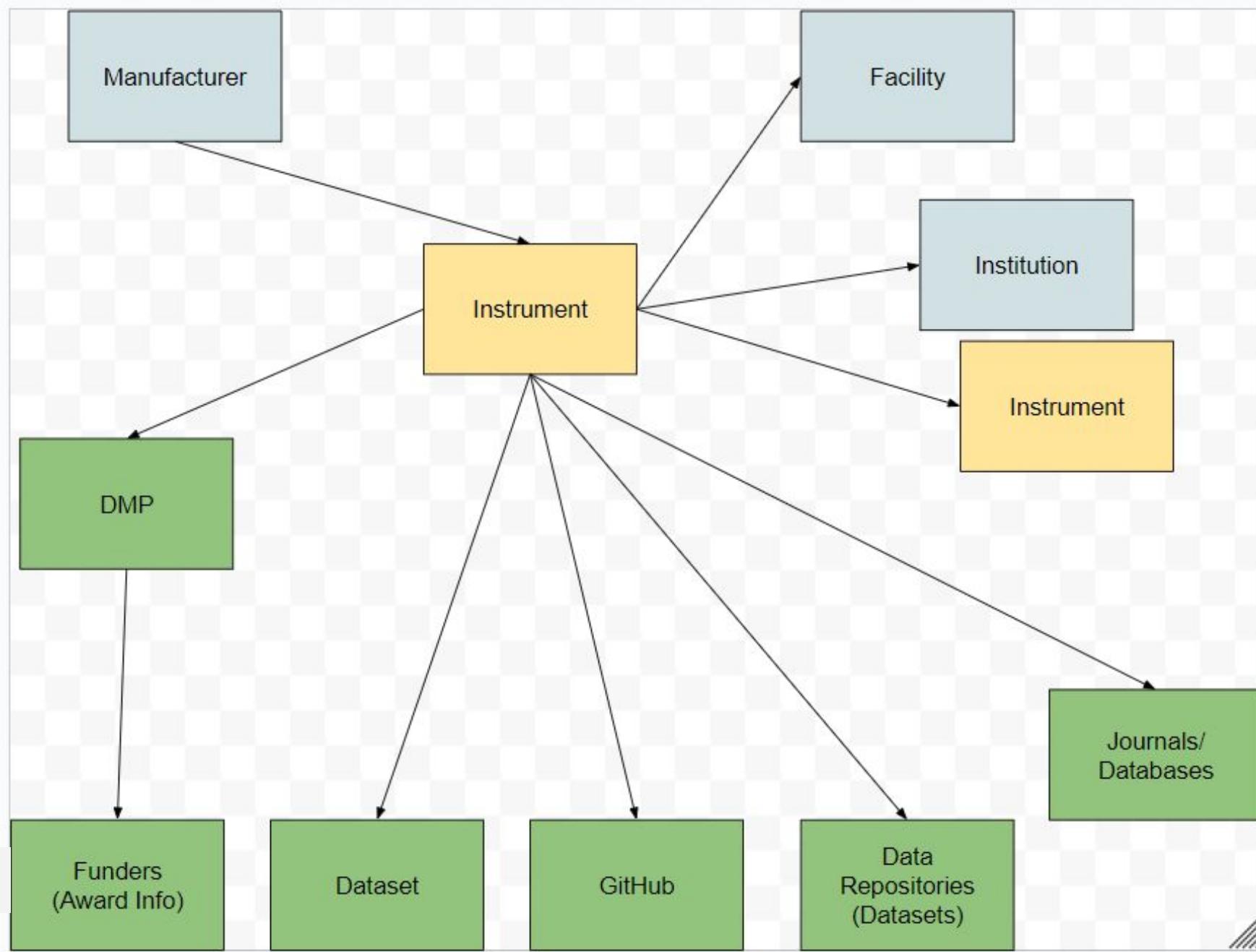
DataCite



ROR



Open Funder Registry (OFR)



Broader Community Initiatives

- Research Data Alliance - Working Group on Persistent Identifiers for Instruments (PIDINST)
 - Mar. 2022 [Metadata schema](#)
 - Aug. 2025 [White paper](#)
- Australasian Identifiers for Instruments Community of Practice (i4iOZ)
 - Mar. 2023 [Best Practices document](#)
- Instrument registries
 - NERC Vocabulary Server (UK) [SeaVoX Device Catalogue](#)
 - B2INST [Instrument Registry](#)

Beyond the Workshop

Finalizing

- Finalizing PID strategy recommendations for facilities and instruments

Creating

- Creating practical implementation guidelines

Building

- Building relationships with specific groups like publishers and manufacturers

Documenting

- Documenting cases of simple and complex instrument and facility PID implementations

Questions?

Draft Recommendations - Overview

- Trying to find a balance between general vs. specific guidance
- All comments, suggestions, edits are welcome
- Ideas for visuals?
- “Draft 4” - Calls with three groups before the workshop to revise and refine the draft

Pre-Workshop Calls

David Butcher

Karolien Denef

Moira Downey

Joe Dragovon

Maria Esteva

Adrian Gestos

Isabelle Girard

Matthew Harp

Nate Herzog

Kassidy Hof-Mahoney

Rebecca Hudak

Seonyoung Kim

Kevin Knudtson

Meghan Kraft

Ryan Leib

Sara Ostrowski

Mark Parsons

Lauren Phegley

Rebecca Ringuette

Sarah Siddiqui

Thayumanasamy Somasundaram

Caterina Strambio

Huajin Wang



Draft Recommendations