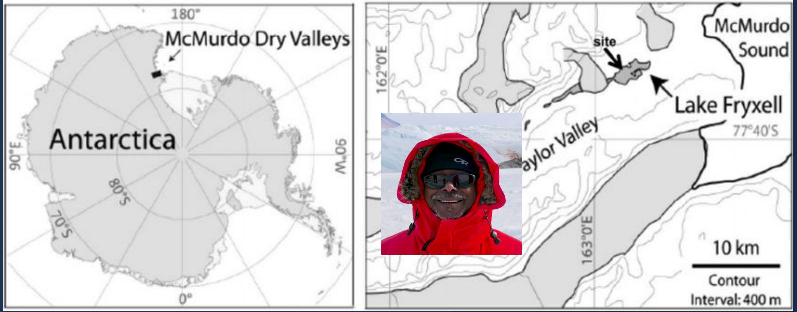
Data Schools

Research Data Management (RDM) and Open Science

Presented by Steve Diggs
Atlanta SoRDS: 2023-09-14
Adapted from original material by: S. Venkataraman

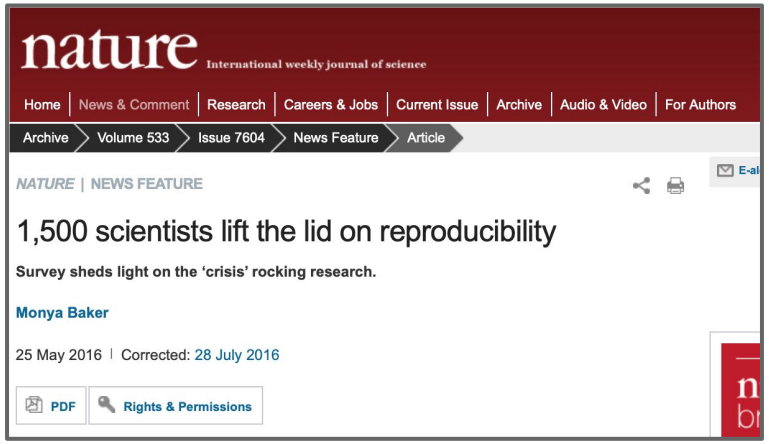
Who Am I?

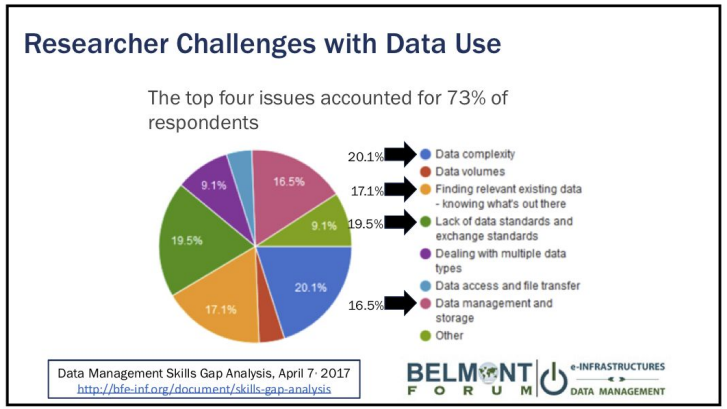

180°
McMurdo Dry Valleys
Antarctica
90°E
90°W
80°S
70°S
0°
162°0'E
site
McMurdo Sound
Lake Fryxell
77°40'S
aylor Valley
163°0'E
10 km
Contour Interval: 400 m

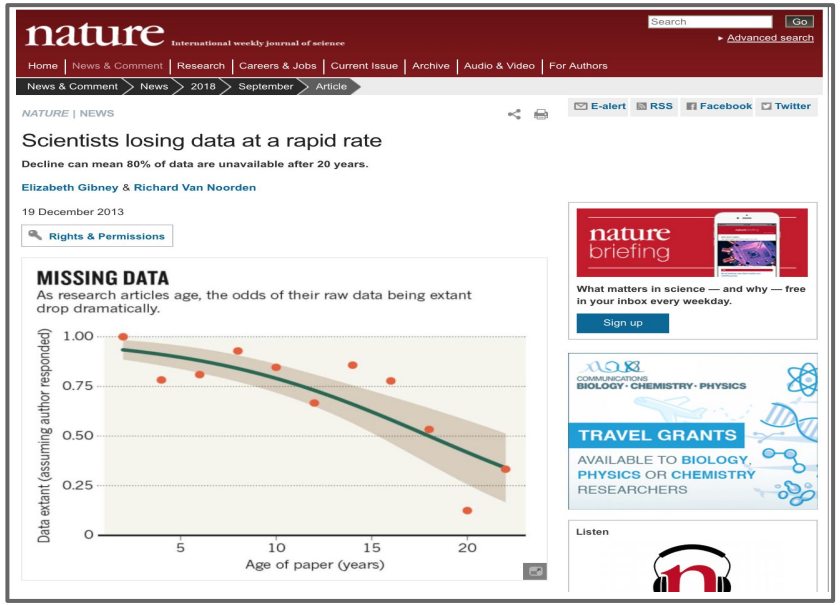

CREATEC

Scientific Data: Hard to Find, Hard to Use

Data Schools



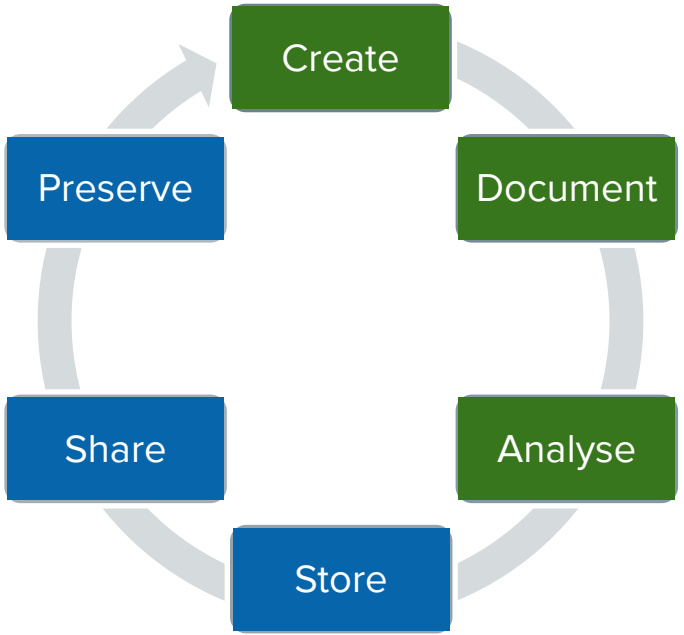




What is Research Data Management?

Data Schools

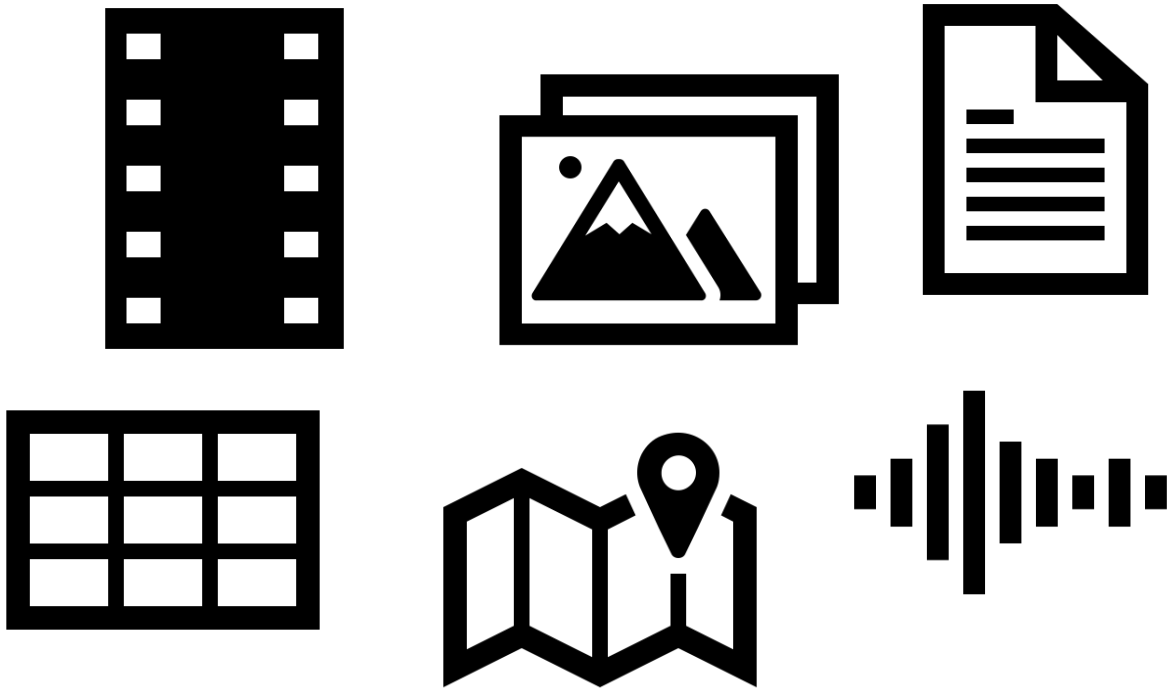
"the active management and appraisal of data (and related research outputs) over the lifecycle of scholarly and scientific interest"



Data management is part of good research practice.

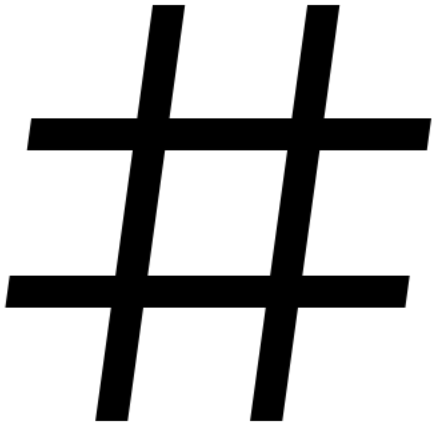
File formats

- Avoid **proprietary** and **lossy** formats
- Make sure **accessibility** ensured in long term preservation



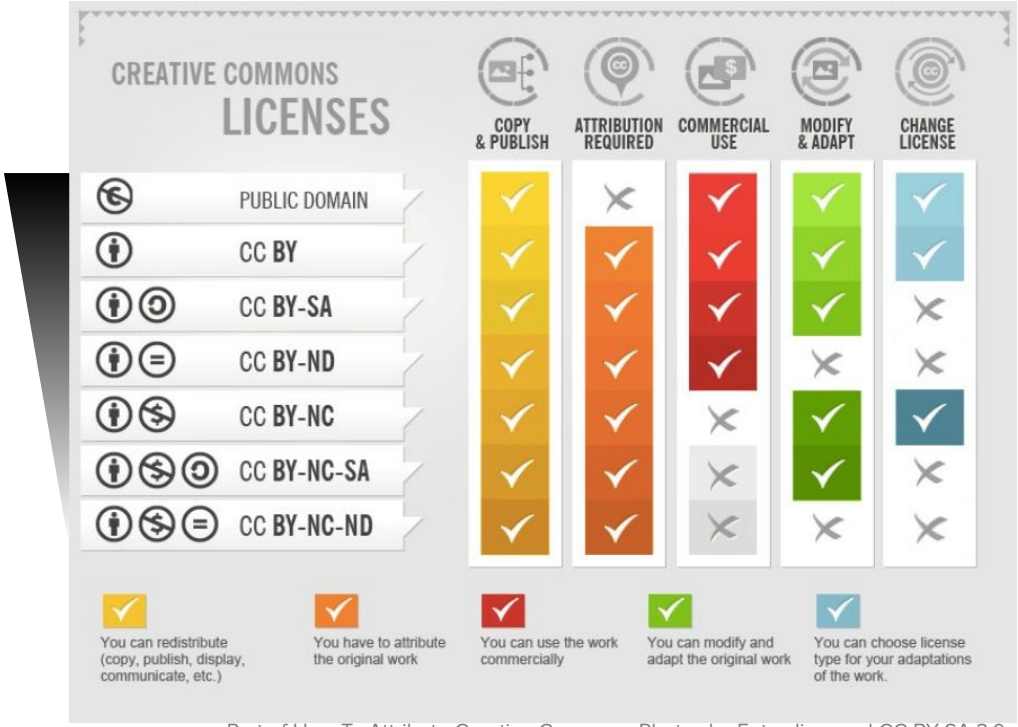
Metadata

- “data about data”
- Part of good documentation
- **Minimum information**
- Use common standards where possible to allow **interoperability**
- Reference: http://rd-alliance.github.io/metadata-directory/; https://rdamsc.dcc.ac.uk/



Licences

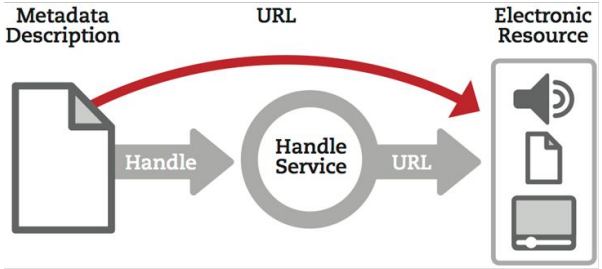
- Provide information to any potential data **reuser** of their rights
- Ensures clarity
- Creative commons (CC) licensing most used in research

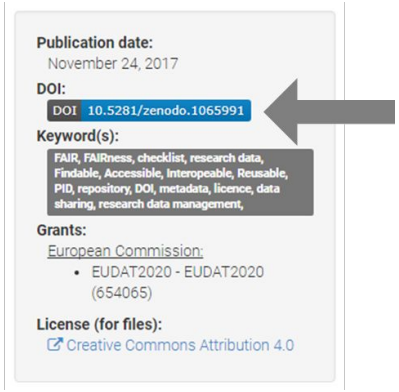


Part of How To Attribute Creative Commons Photos by Foter, licensed CC BY SA 3.0

PIDs

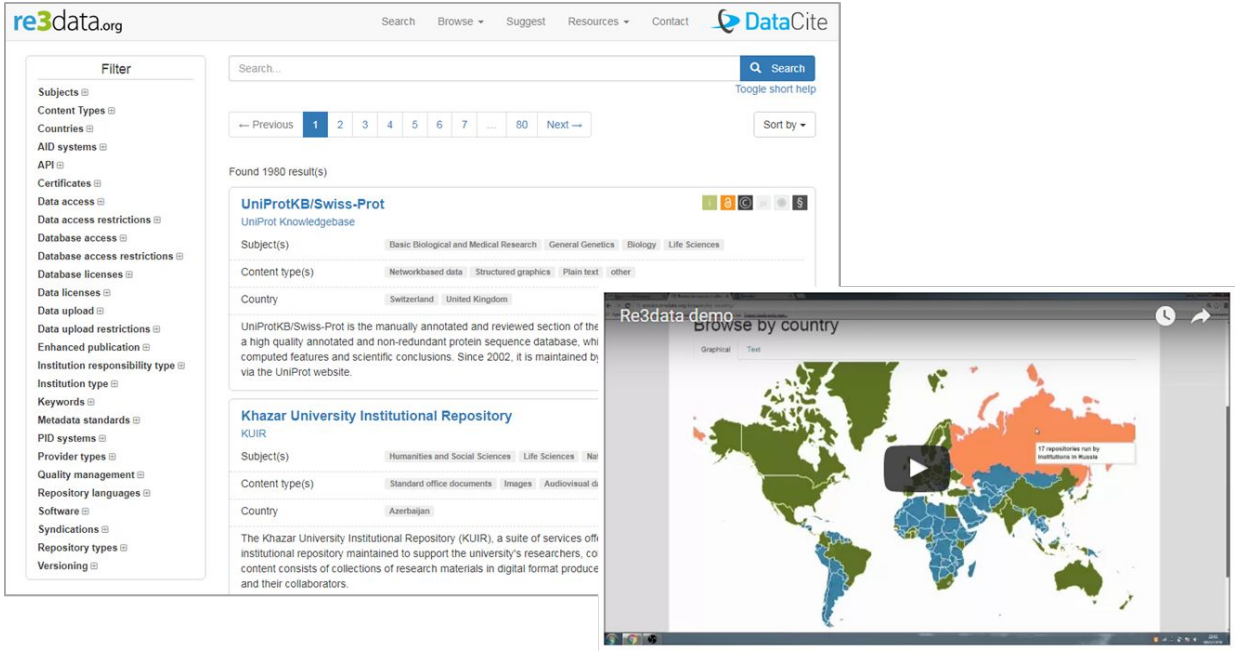
- Unique, persistent identifiers can be used for different types of objects
- Ensures **disambiguation** and **findability**
- e.g. DOIs, ORCIDs, ISBNs





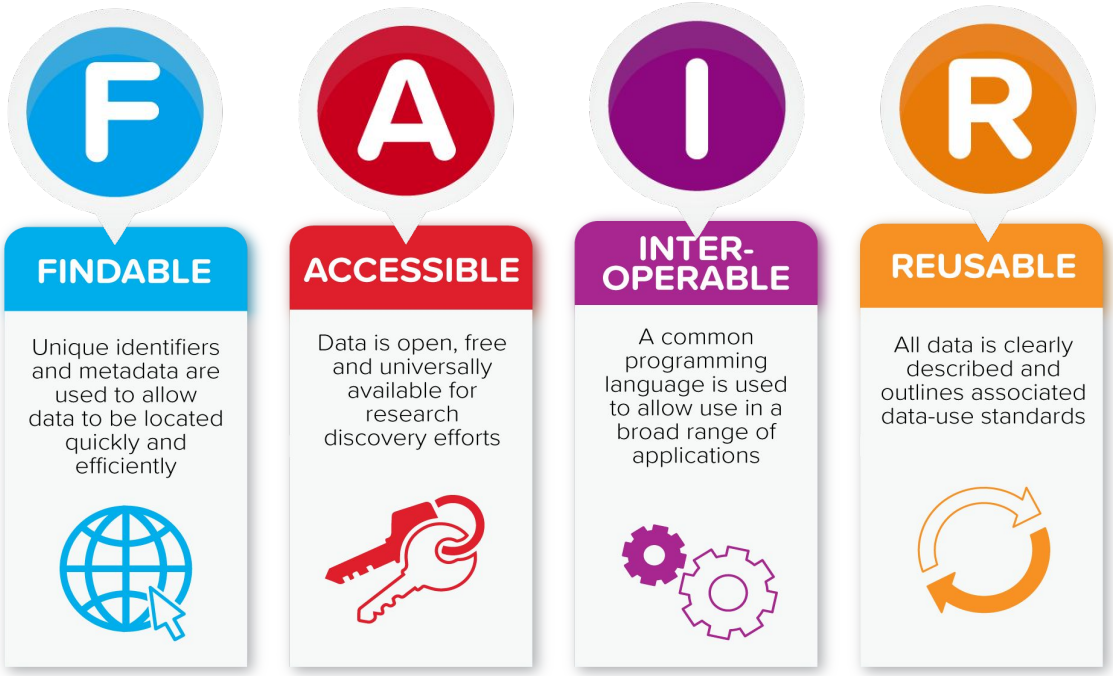
Repositories

- If possible, choose a suitable repository at the very start of a project
- Use re3data.org to search for repos
- ***Many*** data problems can be resolved by selecting and using the right data repository



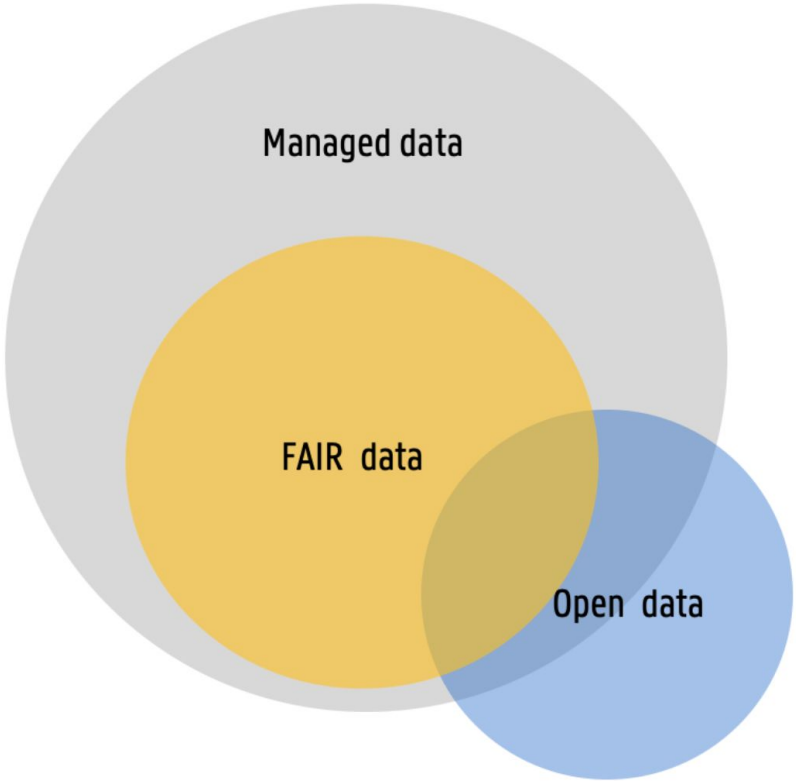
FAIR

- **F**indable, **A**ccessible, **I**nteroperable & **R**eusable
- Part of a growing movement to increase the value of data by ensuring their long term preservation
- A distillation of good RDM practices



Open Science

- Where possible, any publicly funded research outputs should be made publicly available
- **FAIR ≠ Open**
- **“As open as possible, as closed as necessary”**



Data Management Plans (DMPs)

- A document written before the start of a project
- A **“living document”**
- A way of neatly tying together all the info discussed previously
- Can also be helpful to the **current project** as well as **future users**
- Try the DCC’s DMPonline tool to get you started

A Quick Review:

Proper Data Management can …

- Increase **value**
- Increase **reproducibility**
- Increase **provenance**
- Increase **integrity**
- Increase **accountability**
- Reduce **risks**
- Reduce **costs**
- Reduce **fraud**

Five reasons why you should care about DMPs

1. **Your funder requires it** (or will very soon)
2. Good data management at the start saves you time and effort later by organizing data and metadata in standardized ways from the beginning of a project
3. Well-structured DMPs facilitate effective data sharing provide opportunities to broaden the impact of your work and get cited
4. Documenting data management in a DMP helps ensure consistency across teams and supports reproducible research
5. **Promotes transparency and public trust in research**

UC3
UC Curation Center

University of California
CDL
California Digital Library

Building institutional support

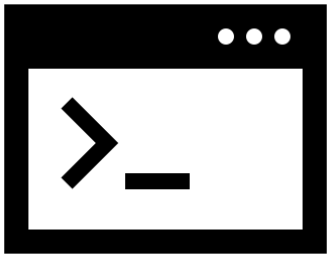
- There is a growing trend in institutions looking to provide the necessary tools for researchers
- Increase **ownership**
- Decrease use of third party (commercial) solutions
- Try the research infrastructure self evaluation (RISE) tool yourself to see how your institution fares

Sensitive data

- Increasing interest in how to align these data with wider research data
- New, specific rules need to be developed
- Doesn't only mean clinical data – geospatial, IPR, etc
- Some examples: Reproducible Health Data Services, Raising FAIRness in health data and health research performing organisations (HRPOs)

Software

- Growing movement to apply FAIR to software and code
- Still treated as a “data” object
- CURE-FAIR
- See also Lamprecht, Anna-Lena et al. ‘Towards FAIR Principles for Research Software’. Data Science, vol. 3, no. 1, pp. 37-59, 2020. DOI: 10.3233/DS-190026
- See also RSEs

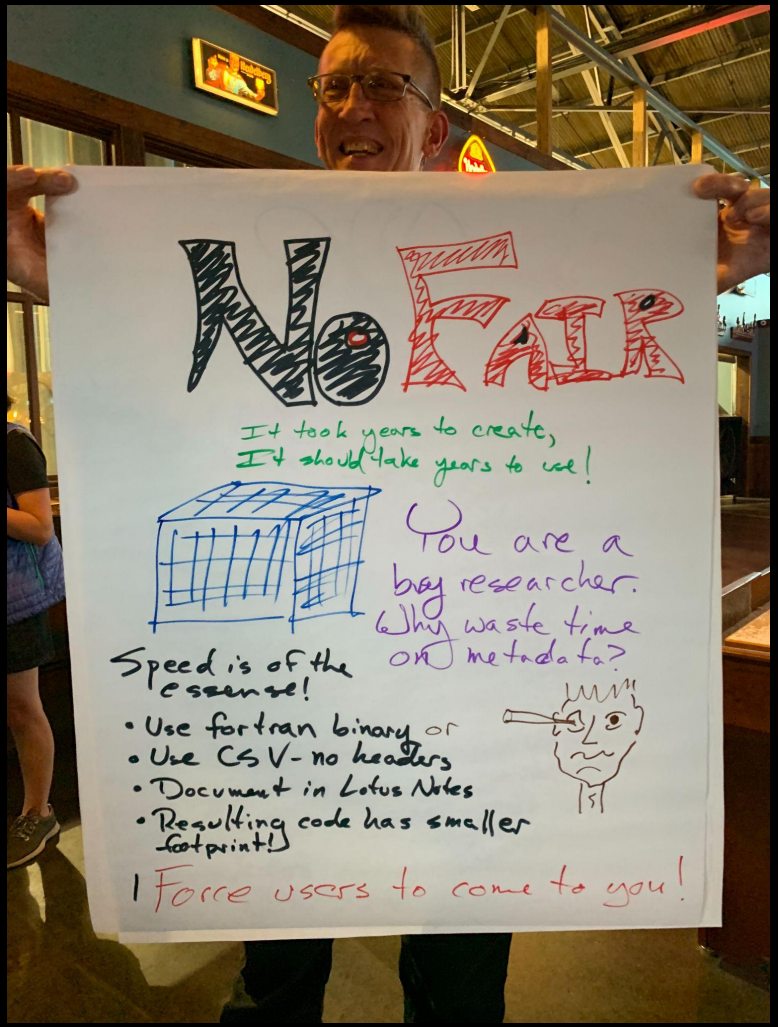


Online tools available to you

- FOSTER – especially their handbook – very useful!
- FAIR Cookbook – great resource for implementing and teaching FAIR!
- *How to be FAIR with your Data - A teaching and training handbook for higher education institutions* – expected to be published by Dec 2021 – check FAIRsFAIR for announcement!
- OpenAIRE – especially resources under the “support” category
- EOSC – also the huge number of tools that you can use in your research
- CESSDA – aimed at social sciences
- MOOCs – e.g. Coursera, Futurelearn, Open Science MOOC
- DCC – guides and other resources
- Join RDA!
- …and many, many more!

Data Stewardship

- Increasingly seen as important
- Dedicated FTE roles in many institutions internationally; some part-time while being researchers at the same time
- Role is to act as main contact for researchers looking for assistance in RDM workflow at their institution
- Many efforts underway to “professionalize” role

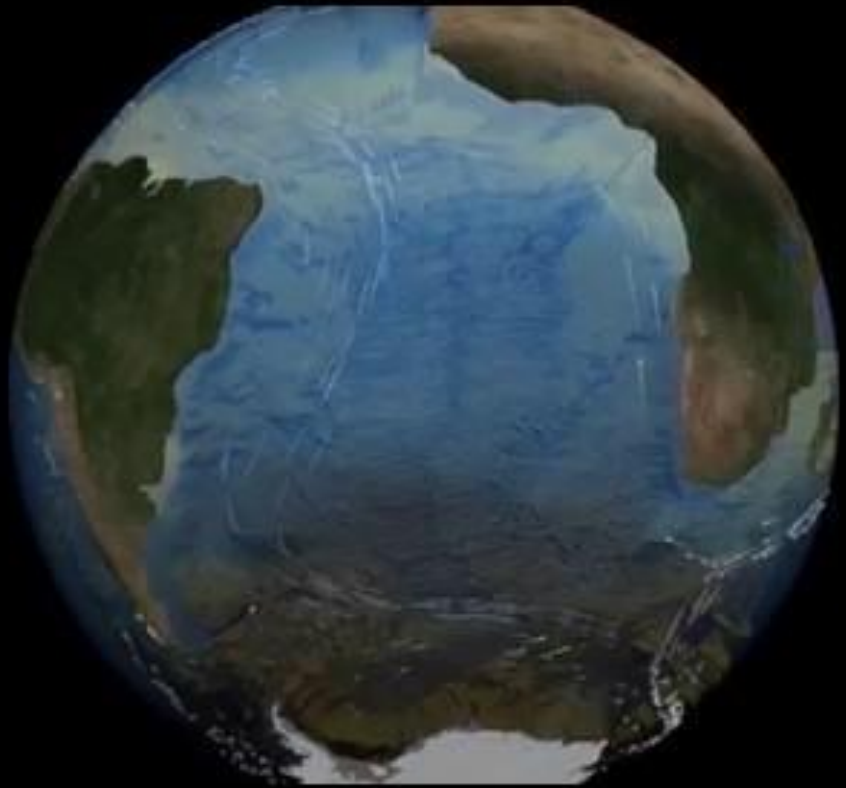

No FAIR
It took years to create,
It should take years to use!
You are a
big researcher.
Why waste time
on metadata?
Speed is of the
essense!
• Use fortran binary or
• Use CSV - no headers
• Document in Lotus Notes
• Resulting code has smaller
footprint!
Force users to come to you!

(Advice on writing for a scientist in another field)

Don't underestimate your readers' intelligence, but don't overestimate their knowledge of a particular field.

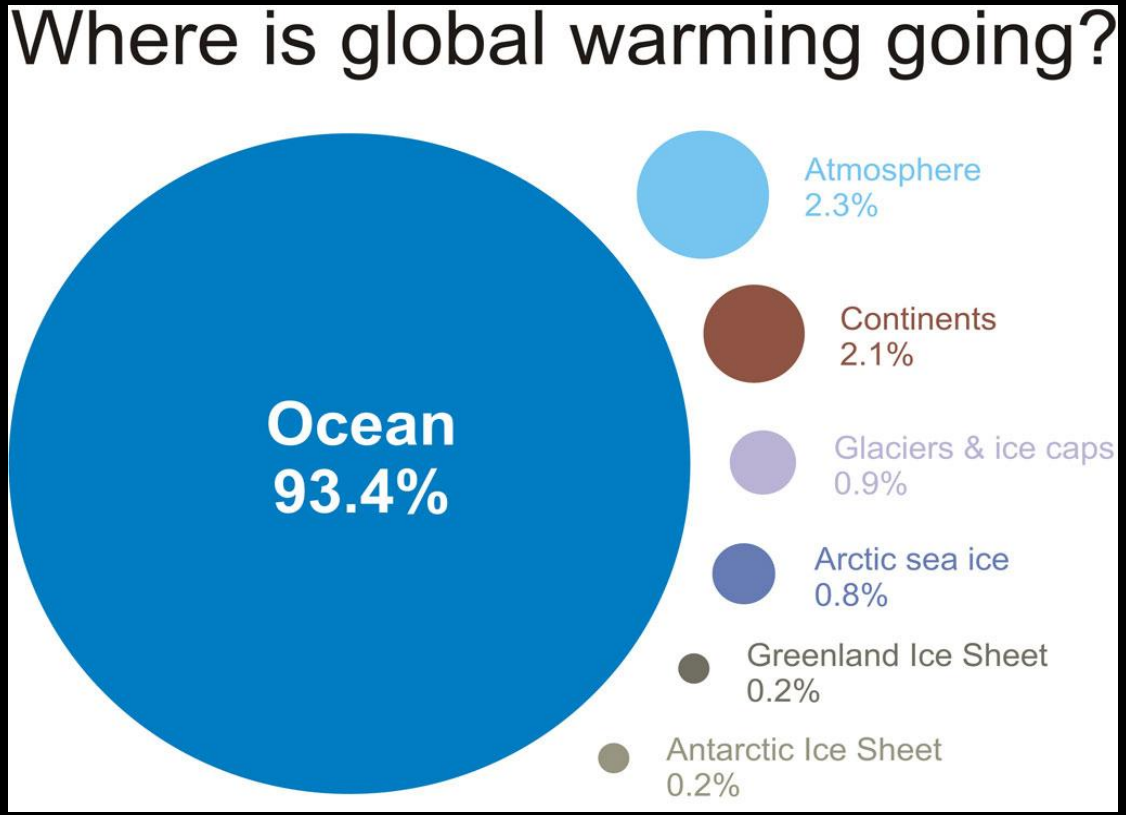
When writing about science, don't simplify the science; simplify the writing

Ocean Observations 101

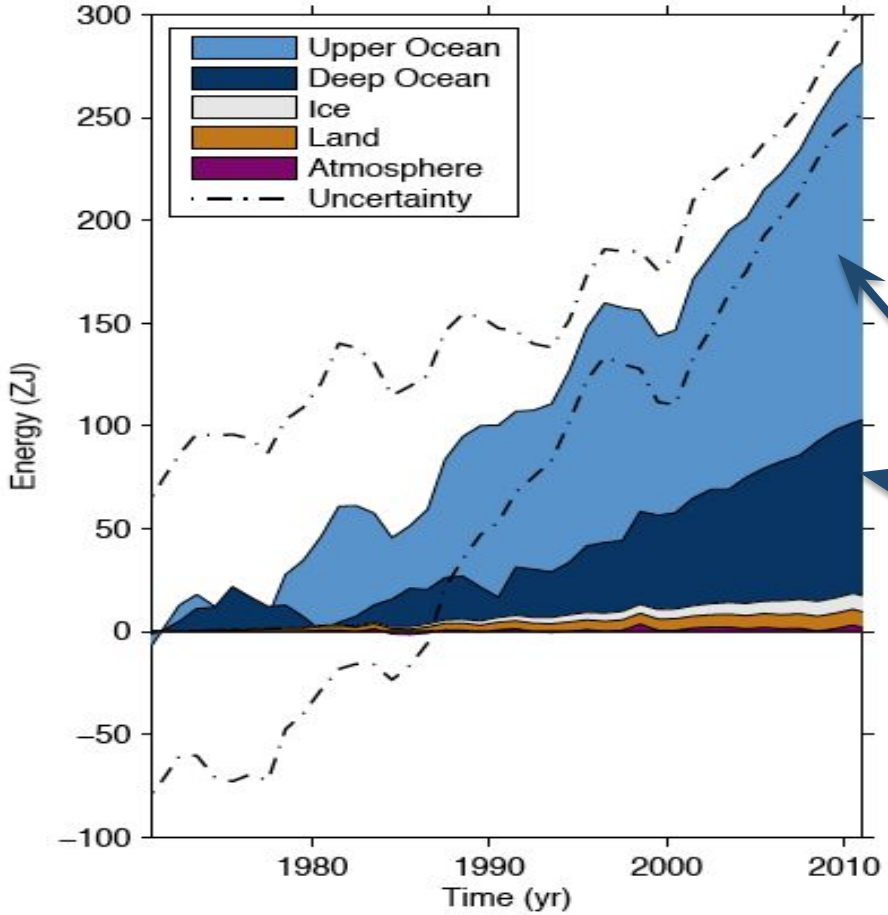


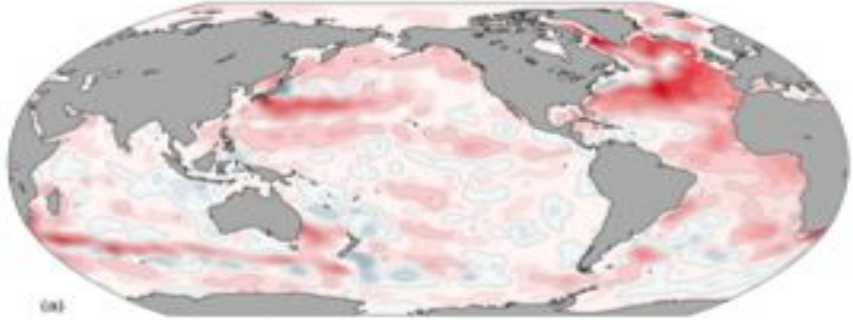

1.332 x 10^21 Liters of Water
~352 Quintillion Gallons

Oceans are the “flywheel of climate”



S. Levitus, J. I. Antonov, T. P. Boyer,O. K. Baranova,H. E. Garcia,R. A. Locarnini,A. V. Mishonov,J. R. Reagan,D. Seidov,E. S. Yarosh, and M. M. Zweng | published 17 May 2012



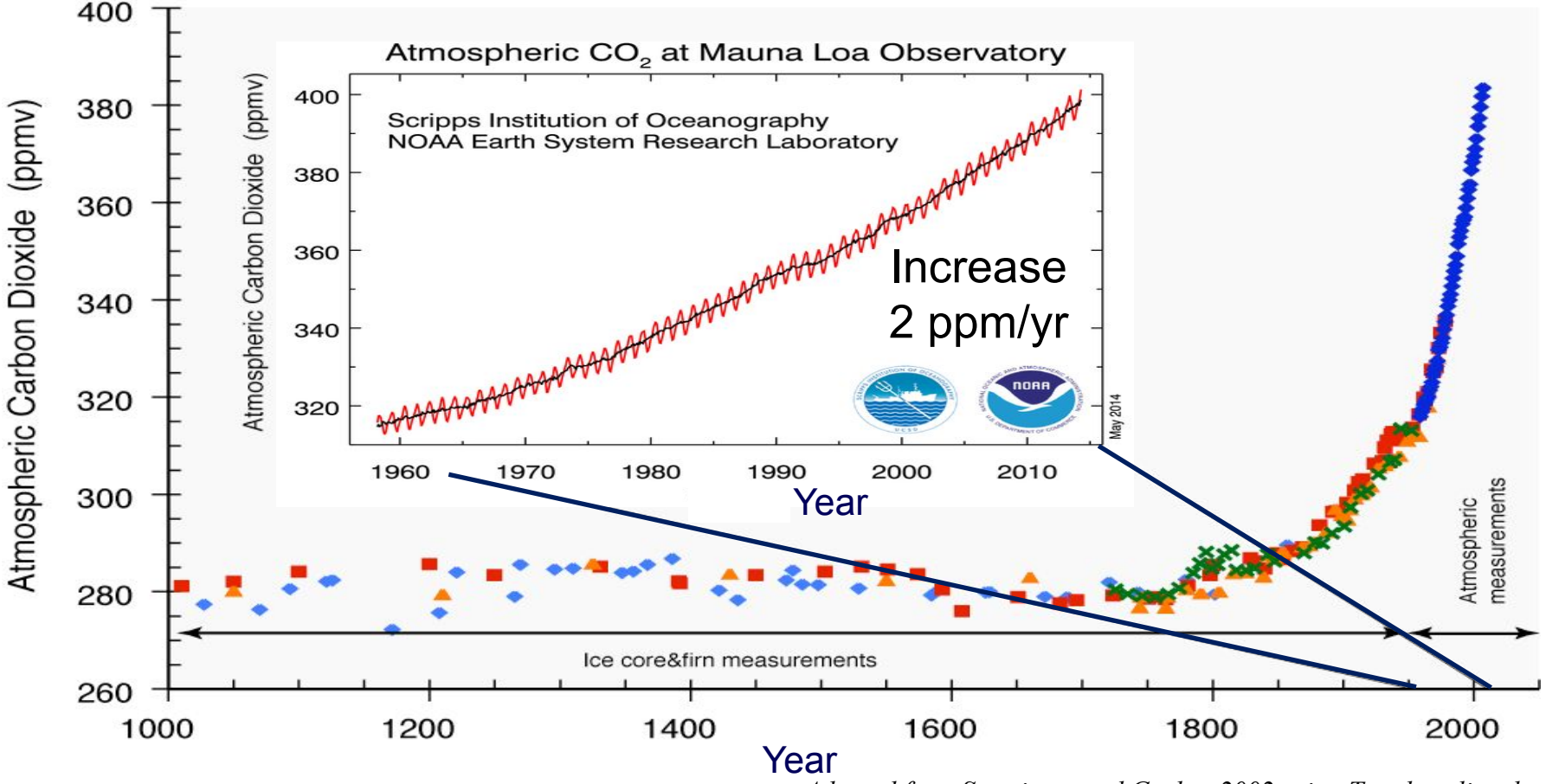


The global energy excess is mostly in the ocean

If the excess heat in the system that is now in the ocean were in the atmosphere, surface air would be 100°C warmer.

Atmospheric CO_2 was steady for at least 1,000 years

pre-industrial revolution



Adapted from Sarmiento and Gruber 2002 using Trends online data

Ocean Acidification

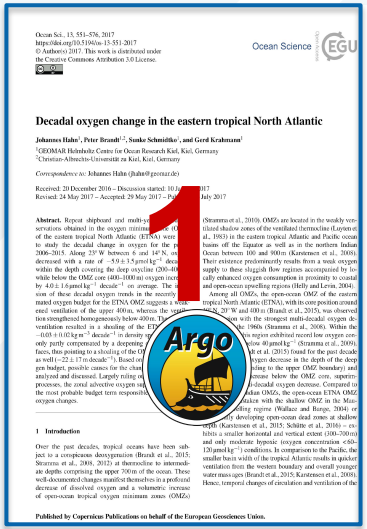
- Approximately 28% of the CO_2 generated by human activities since the mid-1700s has been absorbed by the oceans.
- Ocean acidity has increased 30% since the start of the industrial age.
- Ocean acidity is projected to increase 100-150% percent by 2100.
- Current rate of acidification is nearly 10x faster than any period over the past 50 million years.

Workshop Time

Problem Description: Teamwork!

Your interdisciplinary science team will quickly review one of these peer-reviewed papers

https://bit.ly/2022_SoRDS-ATL_papers



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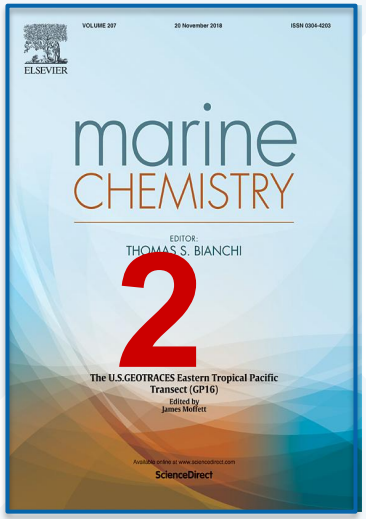

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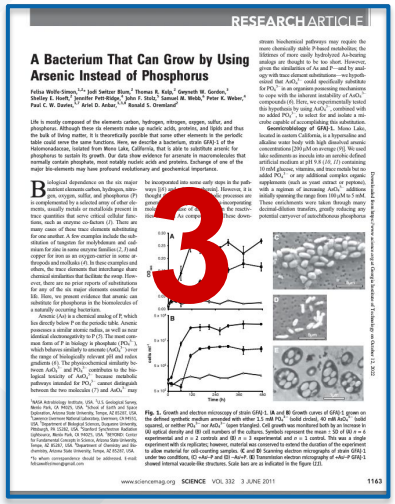


3

Problem Description

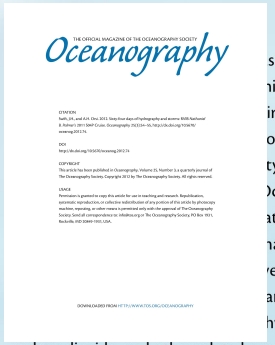
- Your group has decided to try to replicate the results from the research described in the paper
- Your assignment is as follows:
  1. Scan the paper, look for clues as to where the data used in this research might reside
  2. Find and *try* to download those data

  3. **Be mindful throughout of what makes the data easy/hard to:**
     - Locate
     - Download
     - READ/UNDERSTAND (possibly with other data)

Example

Sixty-Four Days of Hydrography and Storms: RVIB *Nathaniel B. Palmer's* 2011 S04P Cruise

BY JAMES H. SWIFT AND ALEJANDRO H. ORSI



s system-
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hwater,

carbon dioxide, and other related parameters.

In brilliant Antarctic weather and rarely seen open waters in McMurdo Sound, we set out on the icebreaking research vessel *Nathaniel B. Palmer* from the ice pier at the US Antarctic

In addition, we aimed to close off key CLIVAR meridional transects to the Antarctic shelf break, including completion of transects along 150°W and 170°W.

With nominal spacing of 30 nm, each station consisted of a full-depth deployment of a 36-place rosette/CTD equipped with dual temperature/conductivity channels, pressure and dissolved oxygen instruments, a reference thermometer, a transmissometer, a fluorometer, an altimeter, and an acoustic Doppler current profiler (ADCP). Water samples were collected for measurements of salinity, dissolved oxygen, nutrients, chlorofluorocarbons, dissolved inorganic and organic carbon, total alkalinity, pH, colored dissolved organic matter

ADCP, surface temperature/salinity/pCO_2, and other seawater properties, meteorology, solar radiation, and aerosols/precipitation. US data and accompanying documentation are publicly available at the CLIVAR and Carbon Hydrographic Data Office (via http://ushydro.ucsd.edu) and the Carbon Dioxide Information Analysis Center (http://cdiac.ornl.gov).

As we neared Cape Adare to start the first station, winds rose well past 30 knots and continued to roughen the seas during the day. This weather was a taste of the future, because storms frequently interrupted our work (e.g., 105 hours were lost in the first two weeks of the cruise alone), but the new data were fascinating from the start.

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Your Workspace

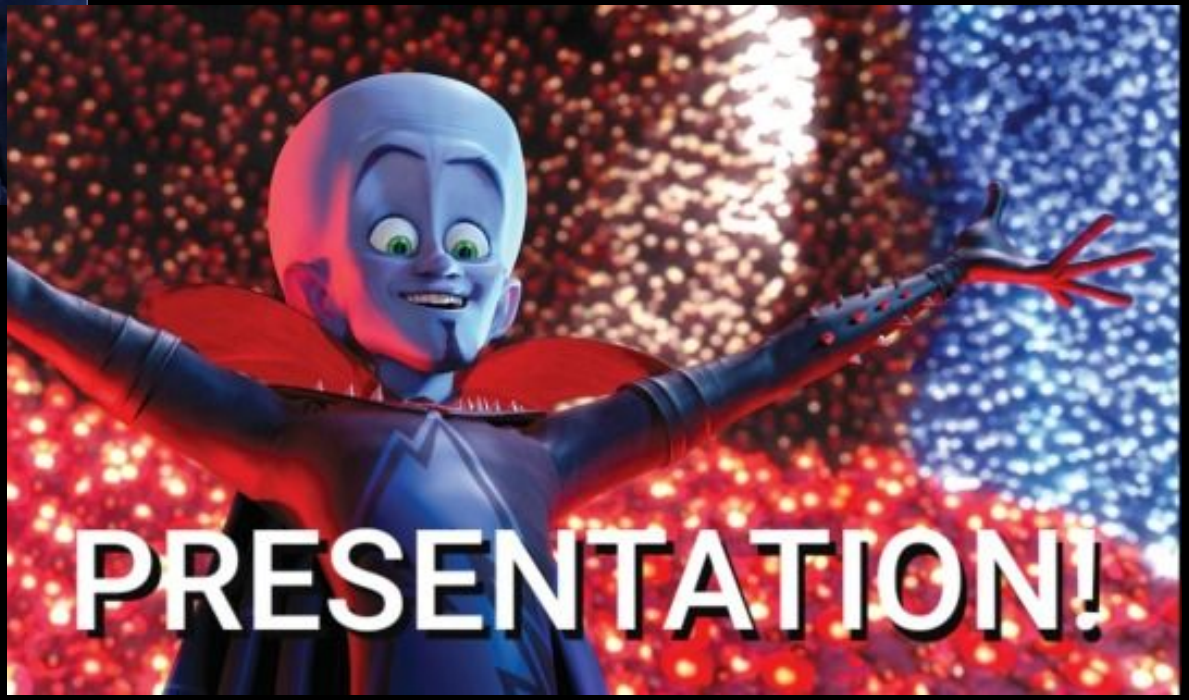
Use the provided template 1-2 slides on what you found, and be prepared to discuss your findings. You can decide on a presenter any time between now and when you present.

https://bit.ly/SoRDS_RDM_Group_Slides

Template: Your Team's Research Data Assessment Report

- **Our Team consisted of …**
  - Name 1 …. Name N
- **Persistent Identifier for the data**
  - PID
- **We found the data we were looking for here:**
  - Name of repository / data center and URL
- **The data was discoverable/accessible**
  - Were you able to read the data with ODV or other software?
  - Could not find the data (why?)
- **Overall FAIRness assessment (1=*awful* to 10=*great*)**


Oh, you're a villain, alright. Just not a SUPER one!
Oh, yeah? What's the difference?


PRESENTATION!

Your PRESENTATION!

https://bit.ly/SoRDS_RDM_Group_Slides

Hypotheses come and go but data remain. Theories desert us, while data defend us. They are our true resources, our real estate, and our best pedigree.

Santiago Ramón y Cajal
Nobel Prize in Medicine (1906)