Data Management 101

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Objectives

- Build confidence and skills
- Create talking points and pathways to better serve your constituents
- Identify gaps
- Assemble resources
- **Build community**

Part 1:
Understanding Data and Data Management

Data Basics

- Table discussion: what are data?
- What is data management?
- Associated materials and metadata

Managing data

- Research data lifecycle
- Collecting, organizing, securing, documenting, and sharing

Data Management Planning

- What is a DMP?
- Why is it important (and useful)?

Part 2:
Sharing, publishing, and preserving data

Data sharing

- Faculty attitudes
- Barriers, challenges, and incentives
- Reproducibility and impact
- Table discussion: how to talk to about sharing

Publishing and Citing Data

- Why cite data?
- DOIs and ARKs

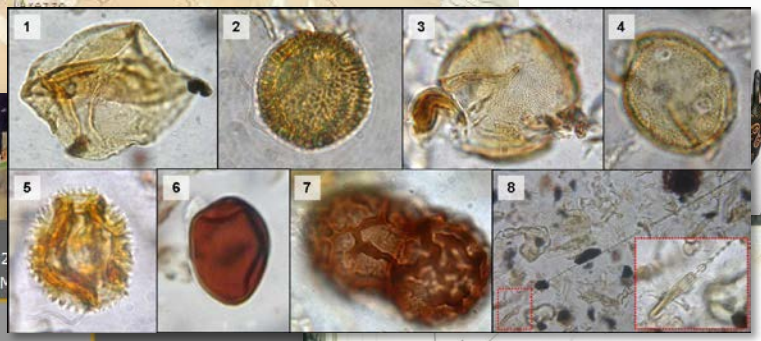
Data Preservation and Archiving

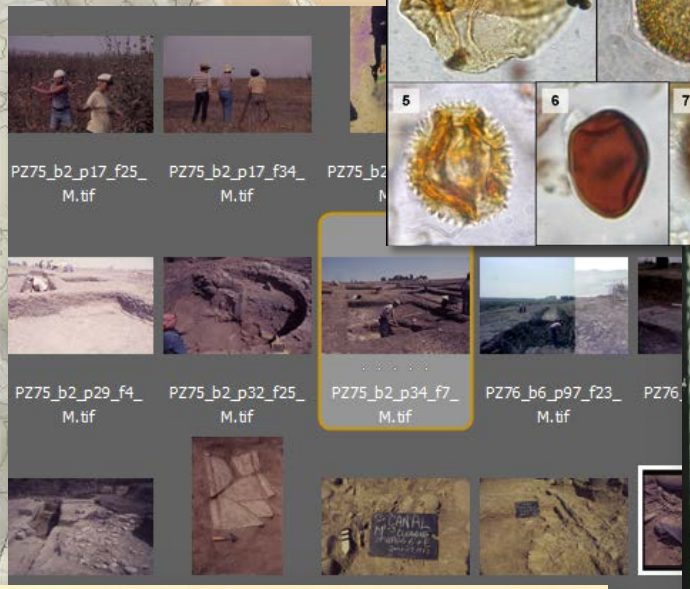
- Repositories (General vs. Disciplinary)
- Selecting data

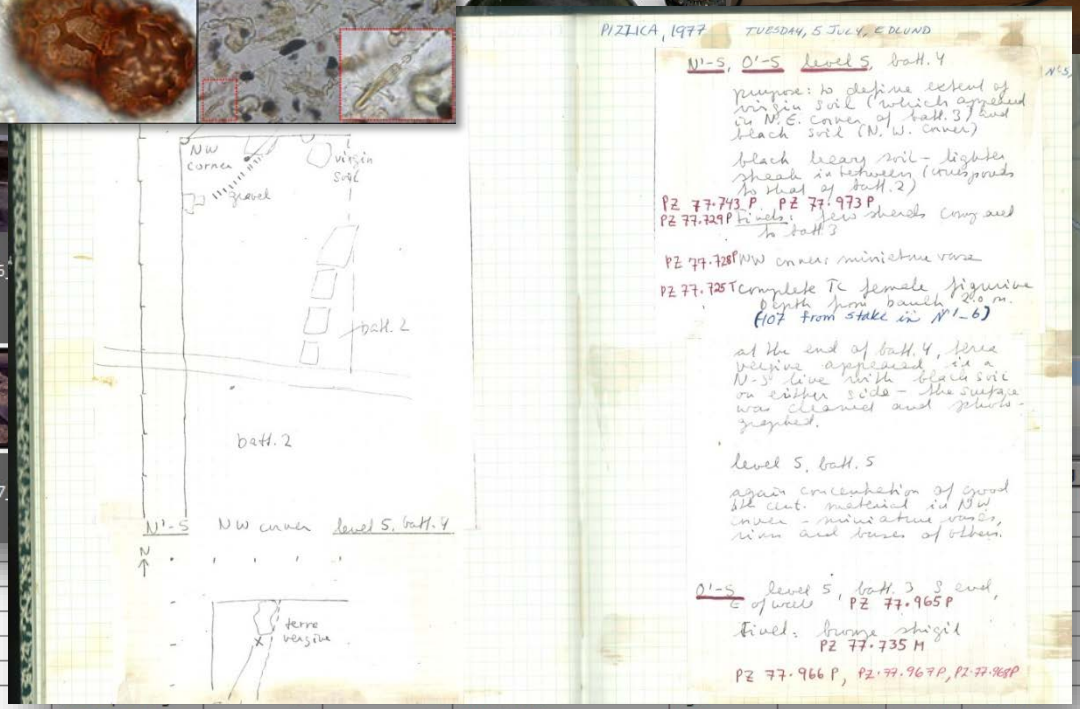
Singular? Plural?

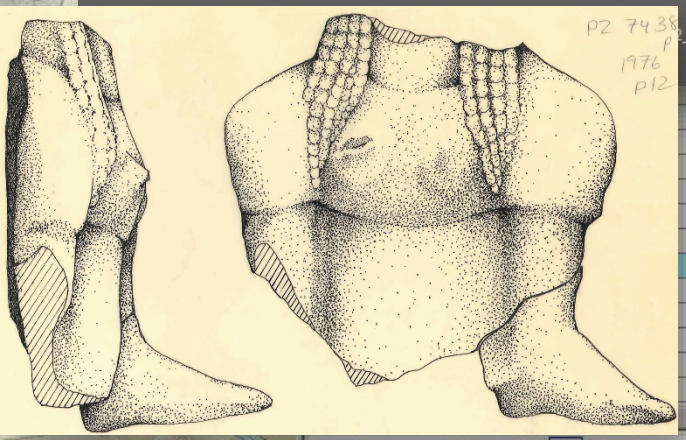
Be comfortable. Don’t sweat it.

What are “data”?









Harrowing	35	65	Small cemetery	Light	90	2007	Light
None	75	25	Other agrarian	Light	90	2007	Heavy
Harrowing	20	40	Farmhouse	Very light	90	2007	Light
Harrowing	5	70	Other agrarian	Very light	90	2006	Moderate
Harrowing	35	65	Other agrarian	Light	90	2007	Light
None	50	50	Other agrarian	Heavy	85	2005	Heavy

1 (1 out of 108 Selected)

sites 1981-2003 sites 2005 +

What are “data”?

- Varies widely by discipline
- Also by context
- Heterogeneous and situation-dependent
- For our purposes:
  - Research data
  - Digital only (born that way or digitized)

What are “data”?

Natural/Physical Sciences	**Social Sciences**	**Humanities**
Observational	Qualitative	Raw
Experimental	Quantitative	Primary
Simulation		Interpretive/Derived
Compiled		

Office of Management and Budget:

(3) Research data means the **recorded factual material commonly accepted in the scientific community as necessary to validate research findings**, but not any of the following: preliminary analyses, drafts of scientific papers, plans for future research, peer reviews, or communications with colleagues. This "recorded" material excludes physical objects (e.g., laboratory samples). Research data also do not include:

(i) Trade secrets, commercial information, materials necessary to be held confidential by a researcher until they are published, or similar information which is protected under law; and

(ii) Personnel and medical information and similar information the disclosure of which would constitute a clearly unwarranted invasion of personal privacy, such as information that could be used to identify a particular person in a research study.

White House **Office of Management and Budget** Circular A-81

National Science Foundation:

"…**determined by the community of interest** through the process of peer review and program management. This may include, but is not limited to: **data**, publications, samples, **physical collections**, software and models."

From FAQs: https://www.nsf.gov/bfa/dias/policy/dmpfaqs.jsp#1

National Endowment for the Humanities

"…materials generated or collected during the course of conducting research."

Includes:

- citations
- software code
- algorithms
- digital tools
- documentation
- databases
- geospatial coordinates
- reports and articles

Excludes:

- preliminary analyses
- drafts of papers
- plans for future research
- peer review assessments
- communications
- confidential materials
- information violating privacy

From: http://www.neh.gov/files/grants/data_management_plans_2016.pdf

Associated Materials

http://nmnh.typepad.com/.a/6a01156e4c2c3d970c01761744b558970c-800wi

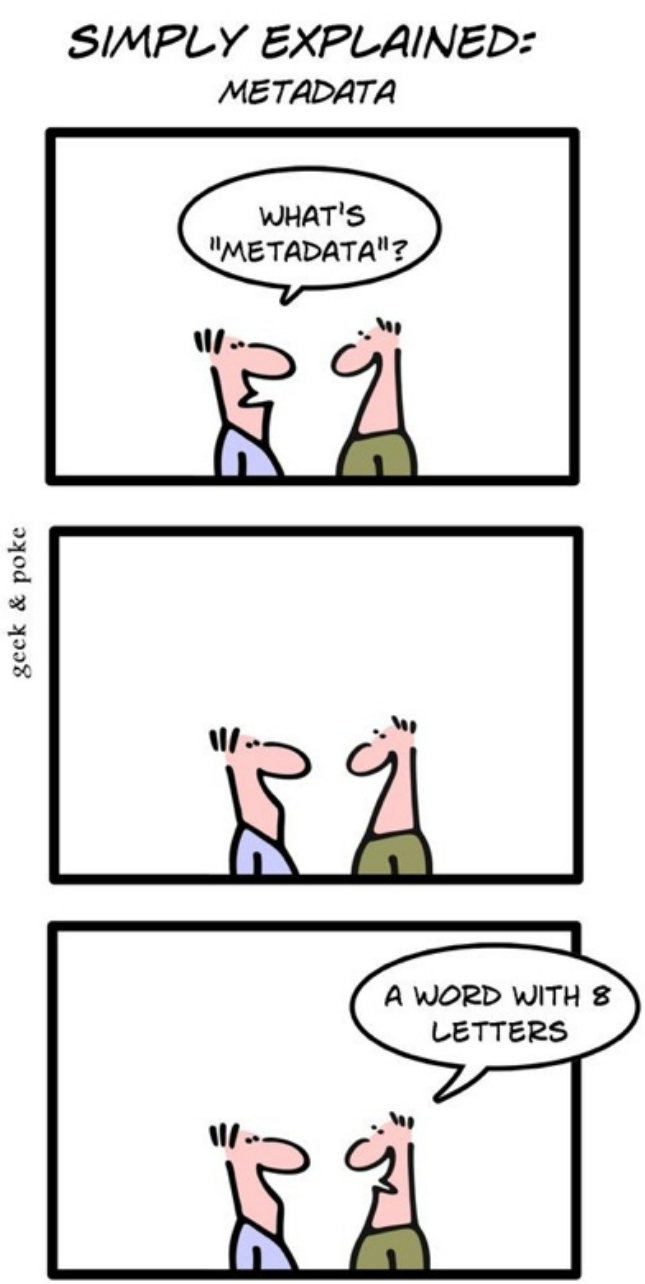
Questionnaires

Field notebooks

Codebooks

Methodologies

“Background” data



http://geekandpoke.typepad.com/geekandpoke/2010/04/meta.html

Metadata

"Structured information that describes, explains, locates, or otherwise represents something else."

National Information Standards Organization:
http://www.niso.org/standards/resources/UnderstandingMetadata.pdf

Metadata talking points

Data are only useful if understandable

Strive for structured, machine readable, standards-based

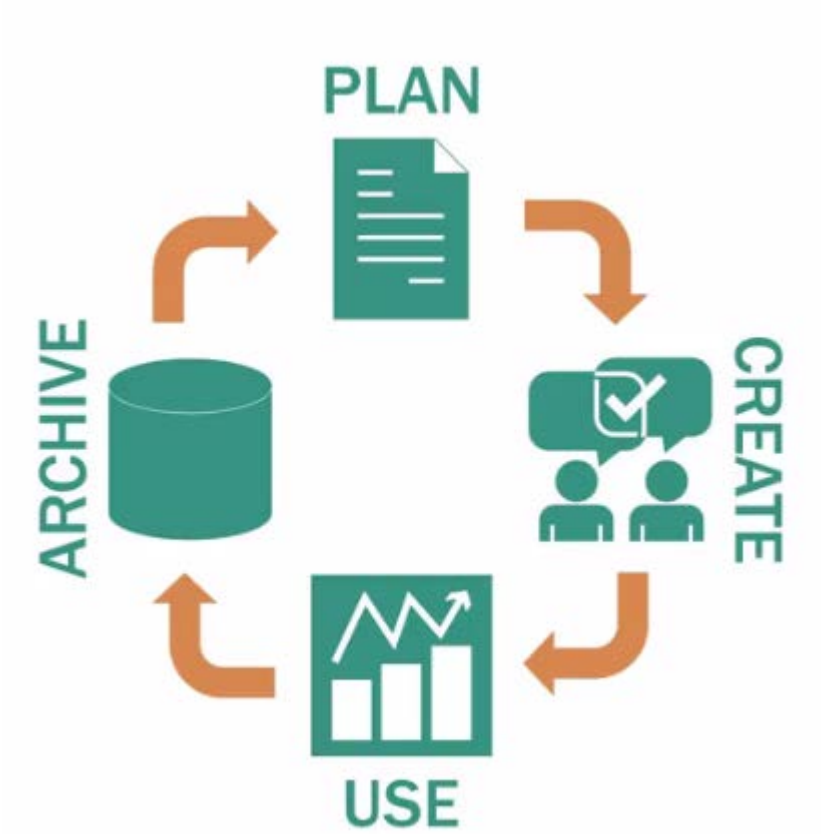
Minimum effort is better than none

But even just a story can help

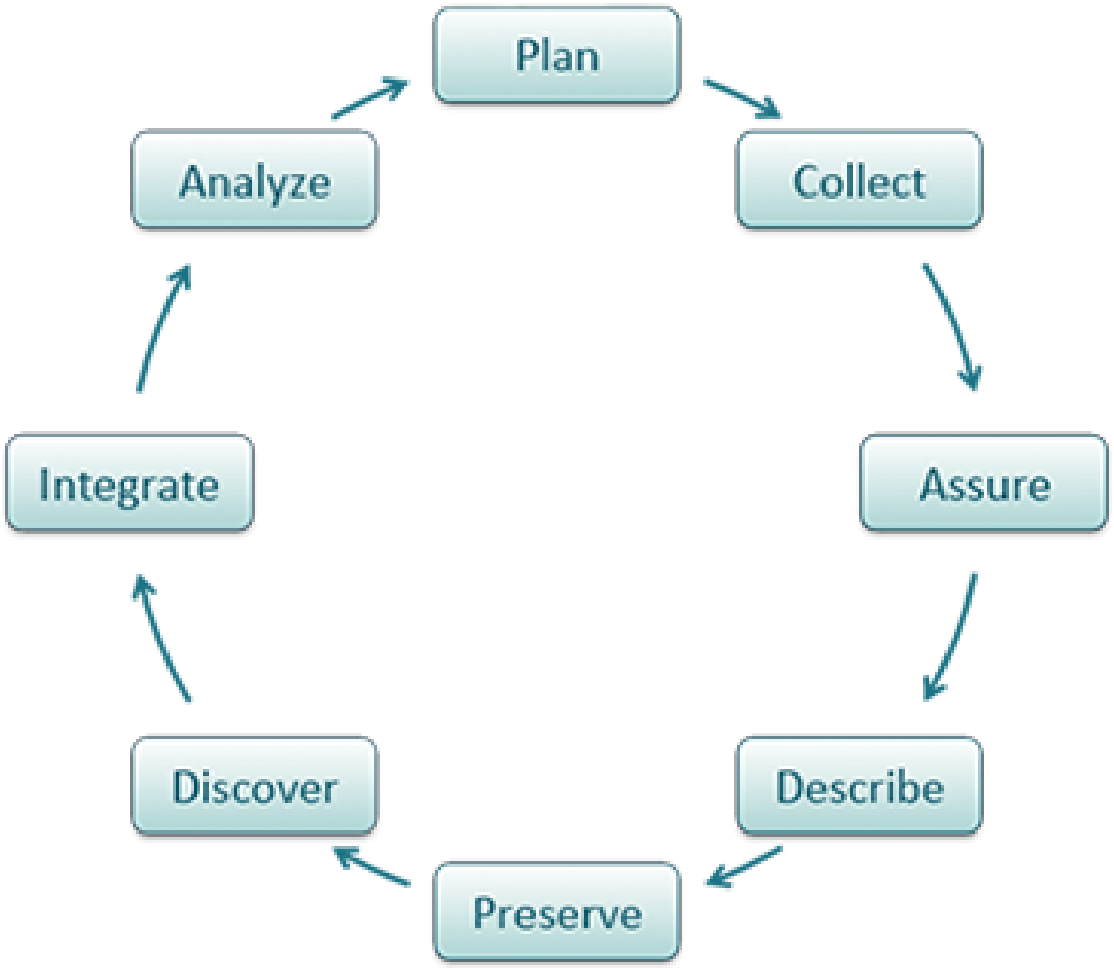
README.txt

Dublin Core 15

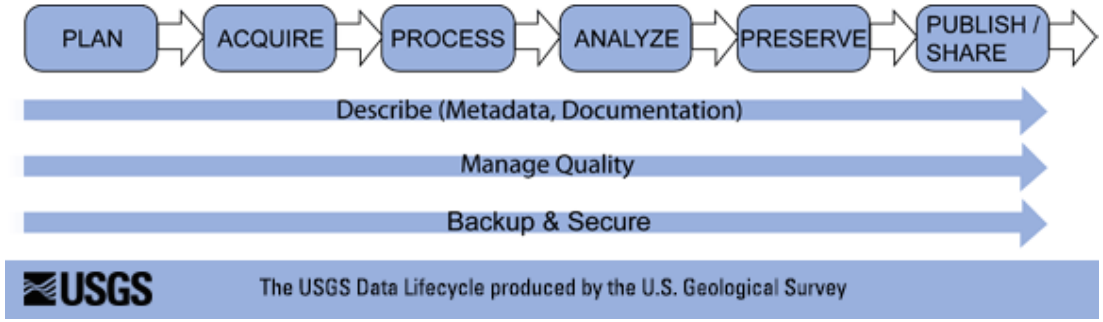
Research Data Lifecycle



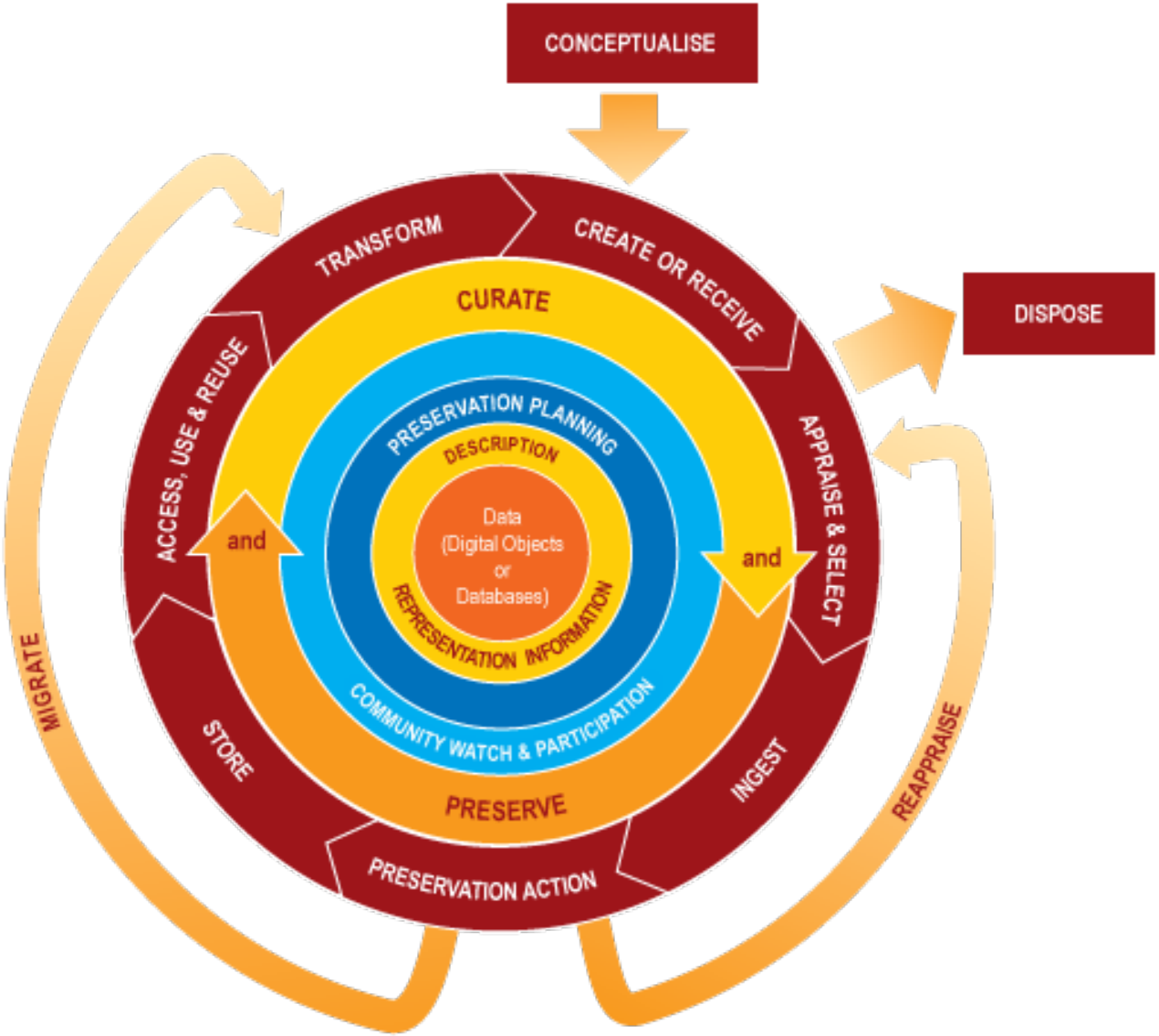
Screen capture from Lesson 2 of Coursera course on Data Management by Helen Tibbo and Sarah Jones, 2016.



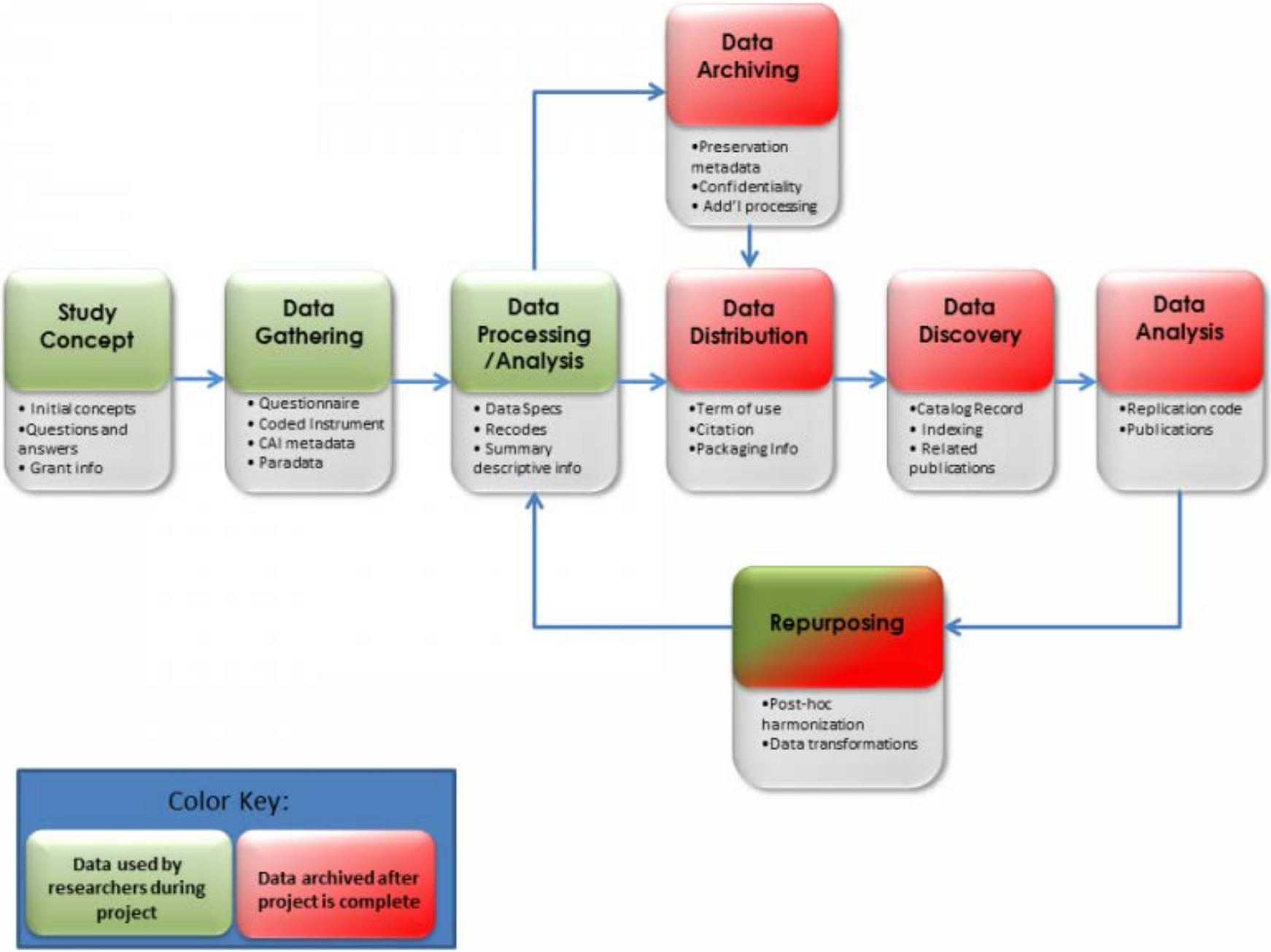
https://www.dataone.org/data-life-cycle



http://www.usgs.gov/datamanagement/why-dm/lifecycleoverview.php



http://www.dcc.ac.uk/resources/curation-lifecycle-model



http://www.lib.utexas.edu/datamanagement/managing

Data Management Plans

A data management plan (DMP) is a **written document** describing the **nature** and **structure** of the data you will likely use or produce in the course of research, along with your **strategies** for dealing with it **throughout and after** your project.

Why bother?

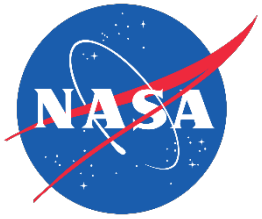
Save time and money

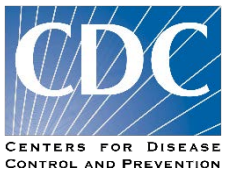
Maximize your impact

Allow for reuse

Do better science

Why else?





It's required.

What goes into one?

It depends.

http://researchsharing.sparcopen.org/

How to write one?

- Sign in with your institution (or create account "Not in List")
- Templates for most major funding agencies
- Customized for templates for member institutions
- Save, cut/paste, print

https://dmptool.org/

Common Elements of a DMP

1. Data description
2. Data documentation
3. Access, sharing, re-use
4. Storage and backups
5. Preservation and archiving
6. Resources and responsibilities

flickr.com/photos/craightonmiller/8161895185

1. Data Description

What data will you gather or create?

File types, formats, volume

Methods and context of data collection

Discussion of data sources

Structure and organization of data files

Data validation, quality assurance

Data transformations or processing steps

Conditions of access and use; confidentiality

http://www.csr.utexas.edu/rs/gallery/valley/dscn0064.gif

2. Metadata

What documentation will accompany your data?

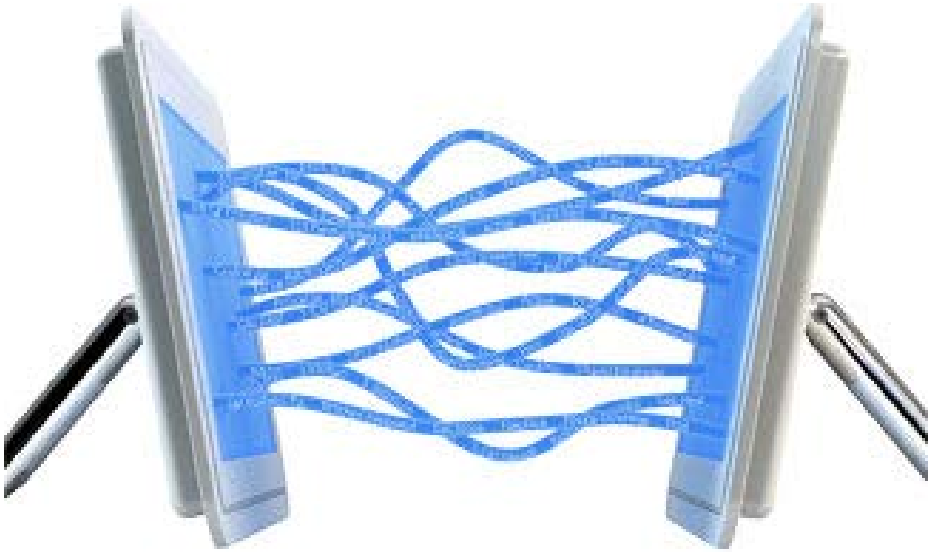
Type and form

Metadata standards

Basic details

Definitions of variables, units, codes

3. Access, Sharing, and Reuse



From: http://www.trendmls.com/guest/News/ShowDoc.aspx?id=771

Have you gained consent?

Who will have access?
When? How?

Are there any restrictions?

What are the approved uses?

How will you protect
sensitive information?

4. Storage and Backups

Do you have enough storage space?

Do you need security measures?

How/how often will you do backups?

What's your recovery plan?

5. Preservation and Archiving

What is your long-term preservation plan?

What data should be retained? Shared? Destroyed?

How will you maintain and curate it?

What future uses are there?

Where will data live after the project? For how long?

Are there any future costs?

http://theamazeworld.blogspot.com/2010/10/fossils-of-extinct-technology.html

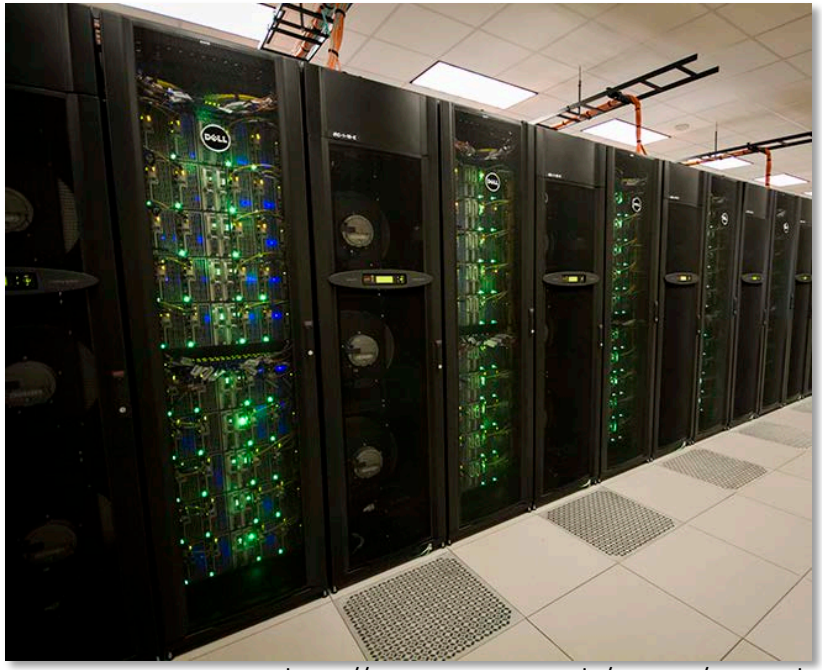
6. Resources and Responsibilities

Will you need additional help?

Software? Hardware?

What is this going to cost?

Who is responsible for what?



https://www.tacc.utexas.edu/systems/stampede

Data Management

What is Data Management?

condensedconcepts.blogspot.com/2009_09_01_archive.html

A **collection of tasks** practiced **throughout the lifecycle of research** that make it easier to find, understand, navigate, and use your data.

Collecting data

Test your plan

Automate where possible

Create snapshots

Ensure compliance

Re-using data

Find the right data

- Subject specialists: lib.utexas.edu/subject/index.php
- re3data.org

Know your sources

- Restrictions
- Copyright
- Data citation

  datacite.org

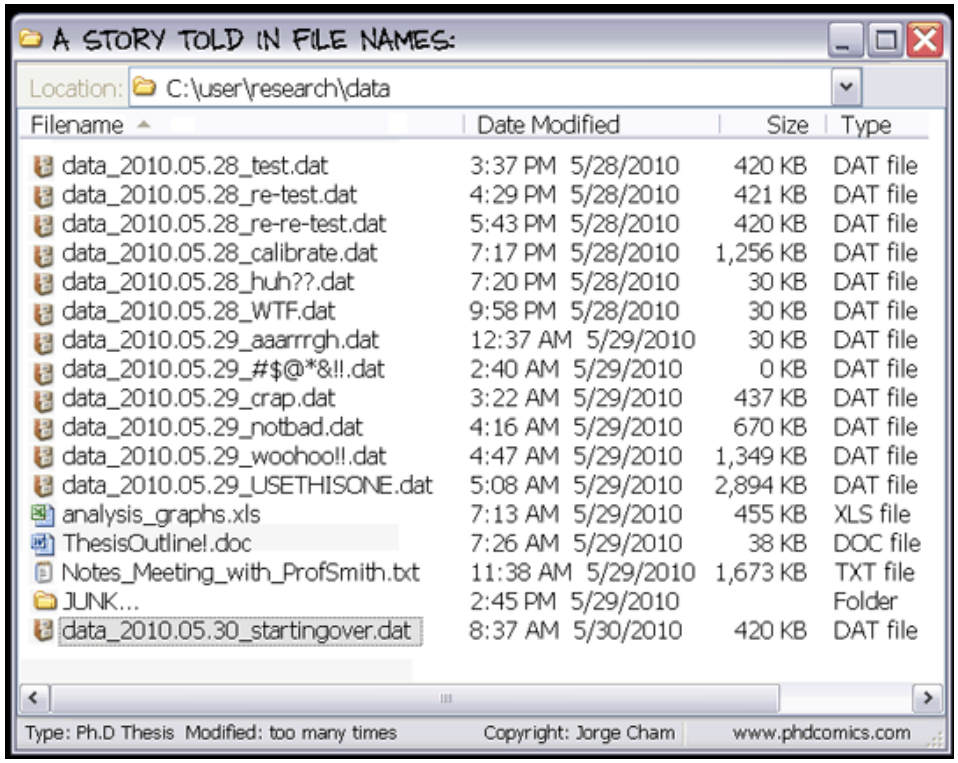
Integrate/Normalize

- OpenRefine

Organize

By i ♥ happy!! from NY, NY (Flickr), via Wikimedia Commons

File Names



http://www.phdcomics.com/comics/archive.php?comicid=1323

Be descriptive, not generic

Include dates

CamelCase vs Pot_hole_case

No funny characters

" / \ : * ? " < > [ ] & $

Describe your convention

Use a batch re-namer:

www.bulkrenameutility.co.uk (Windows)
www.renamer4mac.com (Mac)
www.powersurgepub.com/products/psrenamer.html (Linux, Mac, Windows)

File Formats






Non-proprietary, open standards

Used commonly in your domain

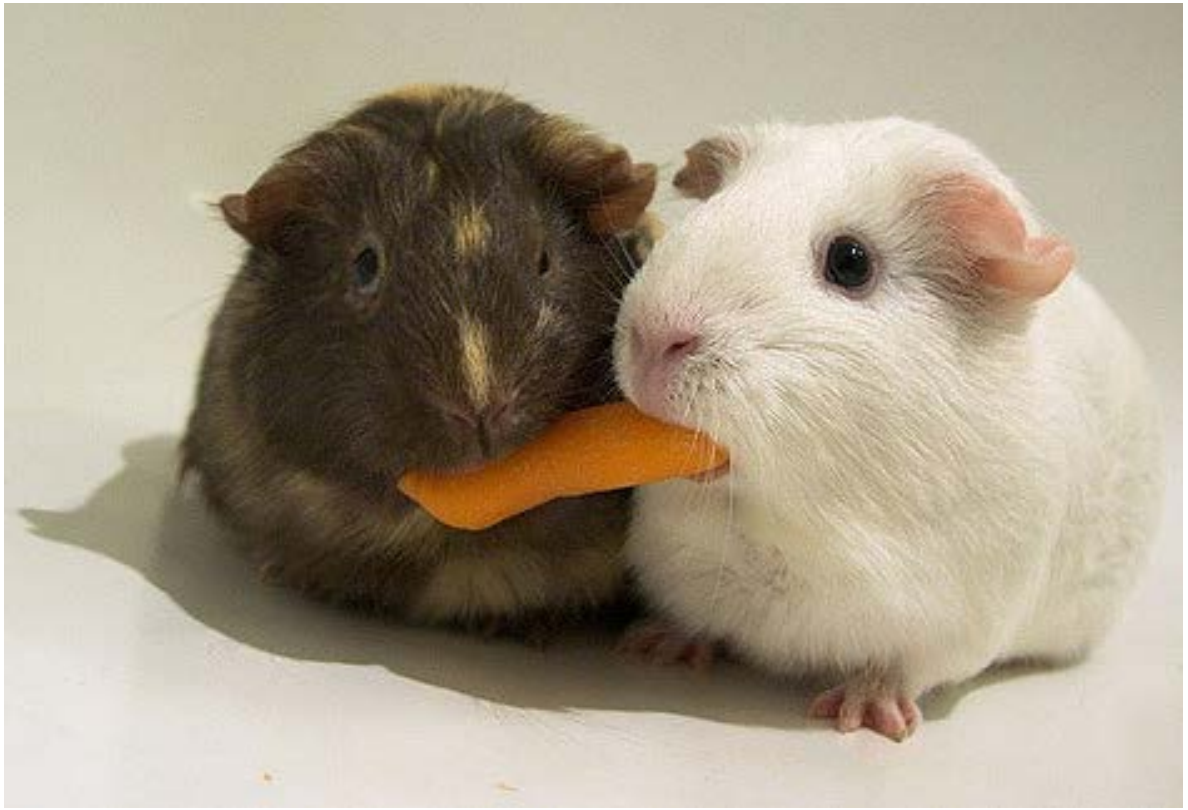
Encoded with standard characters

Uncompressed (?)

DROID :
www.digital-preservation.github.io/droid/

Library of Congress:
www.loc.gov/preservation/resources/rfs

Sharing active data



https://www.flickr.com/photos/ryanr/142455033

Ensure easy access

Avoid duplication

Control versions

Keep a list!

Document, Document, Document!

Data only useful if understandable!

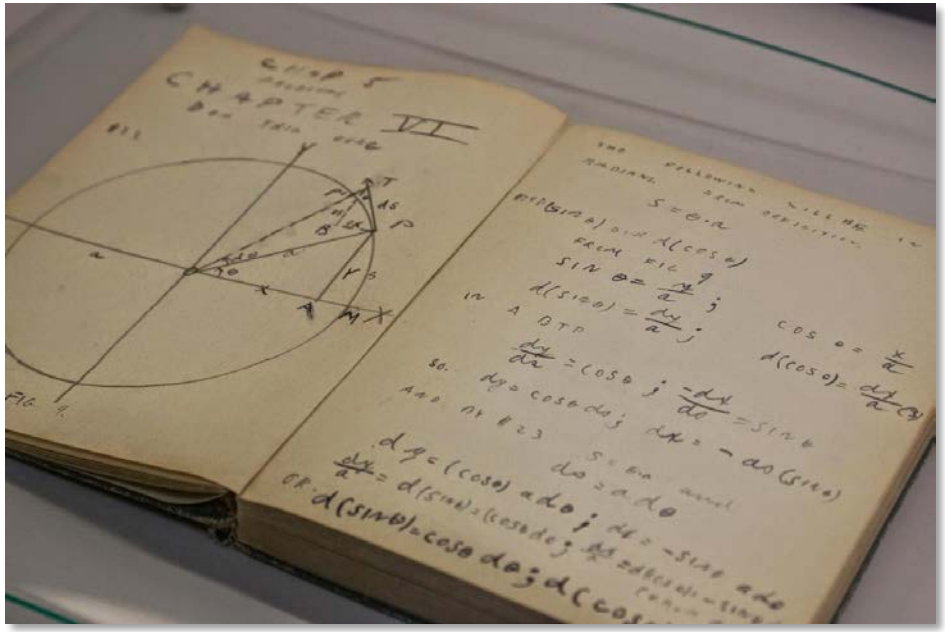
Metadata

Readme.txt (use a template)

Data Dictionaries

Electronic Lab Notebooks

Codebooks/lab books/field notes



http://physicsbuzz.physicscentral.com/2014_11_01_archive.html

Storage

University of Texas

- Departmental
- 2 TB in Box
- UTMail (Google Drive)
- 5 TB at TACC
- ITS: VMs

Other Cloud

- DropBox
- Google Drive
- iCloud

Security

Passwords

Encryption

Updates

Backup strategies

Sensitive data

Managing Sensitive Data

Personally Identifiable Information (PII):

"Any representation of information that permits the identity of an individual to whom the information applies to be reasonably inferred by either direct or indirect means" (US Department of Labor)

Protected Health Information (PHI):

"Any [individually identifiable] information, whether oral or recorded in any form or medium, that–

> (A) is created or received by a health care provider, health plan, public health authority, employer, life insurer, school or university, or health care clearinghouse; and
>
> (B) relates to the past, present, or future physical or mental health or condition of any individual, the provision of health care to an individual, or the past, present, or future payment for the provision of health care to an individual." (US Department of Health and Human Services)

Restrictions

https://www.flickr.com/photos/nycstreets/8358489746/in/photostream/

Embargos

Access Restrictions

Data Use Agreements

Ownership

Discussion

- Paradigm shift
- *What does it feel like/mean to you?*
- *What are you hearing by way of attitudes from faculty?*
- *How can we communicate, support, or change those attitudes?*
- *Where/how can we intervene?*
- *What approaches work? What don't?*

Publishing and Citing Data

What is publication?

https://commons.wikimedia.org/wiki/File:The_Makings_of_a_Modern_Newspaper-_the_Production_of_%27The_Daily_Mail%27_in_Wartime,_London,_UK,_1944_D20461.jpg

Uploading to a repository

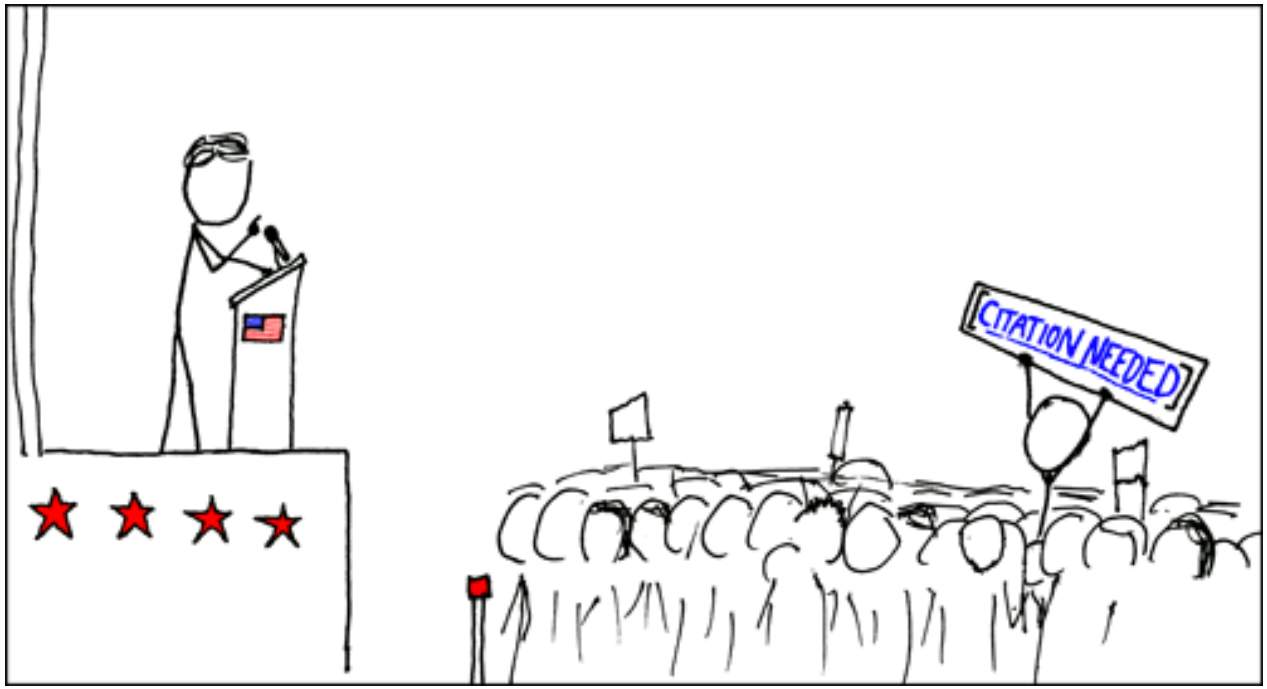
Submitting with an article

Including as an appendix/supplement

Making available on a public website

Why cite?

- For the same reasons you would cite a journal article – to get and give credit
- To help data stand on their own as scholarly output



https://upload.wikimedia.org/wikipedia/commons/3/31/Webcomic_xkcd_-_Wikipedian_protester.png

Citation serves several purposes

- Provides appropriate credit to data producers & data publishers
- Enables other researchers to access the data
- Assists in measuring the impact of data
- Helps data producers know how their data is being utilized

Force 11 Data Citation Principles: https://www.force11.org/group/joint-declaration-data-citation-principles-final

How do you cite?

- Citing is easy – making data citable is harder
- Be deliberate about publication
- Request a persistent identifier
- Different versions of the same dataset should get different identifiers
- Data citation should go to a “catalog” page instead of directly to the data
- The data should link to any associated publications

Elements of a citation

Author/creator

Title

Version

Publication Date

Publisher/archive

Identifier/locator

Style

Data Cite:

- Creator (PublicationYear): Title. Version. Publisher. ResourceType. Identifier

APA:

- Creator (PublicationYear). Title (Version Number) [Description of form]. Retrieved from http://
- Pew Hispanic Center. (2008). *2007 Hispanic Healthcare Survey* [Data file and code book]. Retrieved from http://pewhispanic.org/datasets/

DOI Citation Formatter: http://crosscite.org/citeproc/

Questions about data citation

At what level of granularity should data be made citable?

What about regularly updated datasets?

Should ORCID and/or ISNI be included in a data citation?

Preservation and Archiving

Goals of this part of data lifecycle

- To have ongoing, consistent, citable access to data after a project is complete.
  - Allows review, re-use, interpretation, and re-creation of the data
- Ensure the integrity of the data

How long to keep it?

Are there any retention guidelines you need to follow?

- e.g. NIH requires 3 years from the close of grant

How long will it likely be useful to yourself and others?

Be realistic – this will probably cost you money

https://pixabay.com/en/pickles-mixed-food-700059/

What to keep long-term?

- Data that can’t be replicated (e.g. weather data)
- Can be replicated but would be prohibitively expensive
- Major discovery
- High impact researcher
- Raw and final, processed files but not intermediate files
- Technical documentation is comprehensive and data is in a format that allows for ease of use and preservation

What is deposited?

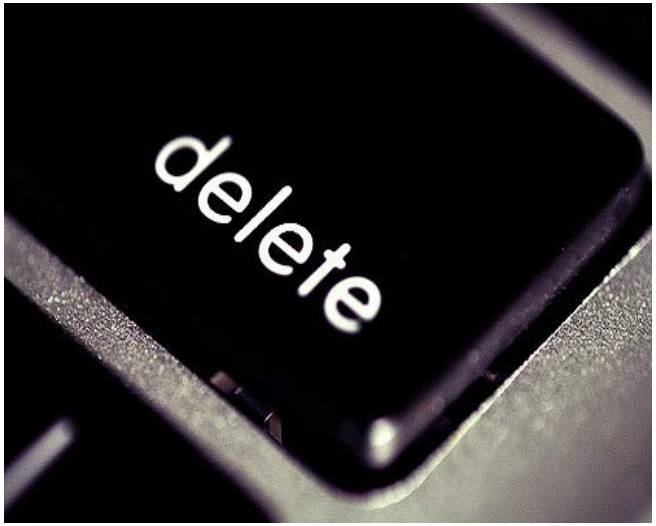
- Raw data and processed data
- Description of project methodology
- Explanation of how data was handled post-collection
- Codebooks or other records
- Project generated software or code that was created to analyze the data
- Related records (e.g. human subjects protocols)

What about stuff you don't need to keep?

Delete when finished or after the retention period

Keep basic records of the things you delete

- date, format, info about project/grant, reason for destruction



https://www.flickr.com/photos/ladymixy-uk/4059154289

Types of repositories

- Institutional repositories (e.g. Texas ScholarWorks)
- Disciplinary repositories (e.g. ICPSR, Dryad)
- Open repositories (e.g. Dataverse)

re3data.org
REGISTRY OF RESEARCH DATA REPOSITORIES

http://www.re3data.org/

Possible limitations & requirements

http://wellcomeimages.org/indexplus/obf_images/67/20/3731082355ff6795a0b678873930.jpg

Size limitations

Costs for deposit

File format requirements

Metadata requirements

Features to look for:

- OAI-PMH compliant
- Should assign a persistent identifier
- Preservation functions
  - Regular back-ups/replication (preferably with some geographic separation)
  - Check-sums or similar integrity checks
  - Migration plan
  - Succession plan if repository folds
- Automatic recording of provenance metadata

Why use a repository?

Digital content is fragile

Websites (especially personal ones) are ephemeral

- No integrity checking
- Likely not very visible to search engines
- Require upkeep and technological dependencies
- Links may not be persistent

Funding agencies expect it

https://www.flickr.com/photos/johnjack/3449280414

Questions?

- References:
  - New England Collaborative Data Management Curriculum. Retrieved April 19, 2016 from http://library.umassmed.edu/necdmc/modules
  - Digital Curation Centre. (2012). *Data Citation & Linking*. Retrieved April 19, 2016 from http://www.dcc.ac.uk/resources/briefing-papers/introduction-curation/data-citation-and-linking
  - Data Citation Synthesis Group: Joint Declaration of Data Citation Principles. Martone M. (ed.) San Diego, CA: FORCE11; 2014. Retrieved April 19, 2016 from https://www.force11.org/group/joint-declaration-data-citation-principles-final