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Title

Why you should care about open data: Open Access Week thoughts on why research data rarely are reused

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Why you should care about open data: Open Access Week thoughts on why research data rarely are reused

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University of California, Los Angeles

OPEN  International
ACCESS WEEK



The Conundrum of Sharing Research Data

*If the rewards of the data deluge are to be reaped, then researchers who produce those data must share them, and do so in such a way that the data are interpretable and reusable by others.**



*Borgman, C.L. (2012). The Conundrum of Sharing Research Data. *Journal of the American Society of Information Science and Technology*, 63(6):1059-1078

<http://www.tzanis.org/tzanisblog/archives/images/push-pull-tumb.jpg>

Overview



- **Paradigm shift**
- Arguments for sharing data
- Science friction, data friction
- Requirements for reusing data

Data sharing imperatives



- European Union
 - European Open Data Challenge
 - Policy Recommendations for Open Access to Research Data in Europe
 - Riding the wave: How Europe can gain from the rising tide of scientific data
 - OpenAIRE
- Research Councils of the UK
 - Open access publishing requirements
 - Provisions for access to data
- Wellcome Trust
 - Open access publishing
 - Data sharing requirements
- National Science Foundation
 - Data sharing requirements
 - Data management plans
- U.S. Federal policy-2013
 - Open access to publications
 - Open access to data



Supported by
wellcome trust



National Science Foundation
WHERE DISCOVERIES BEGIN

Policy RECommendations for Open Access to Research Data in Europe





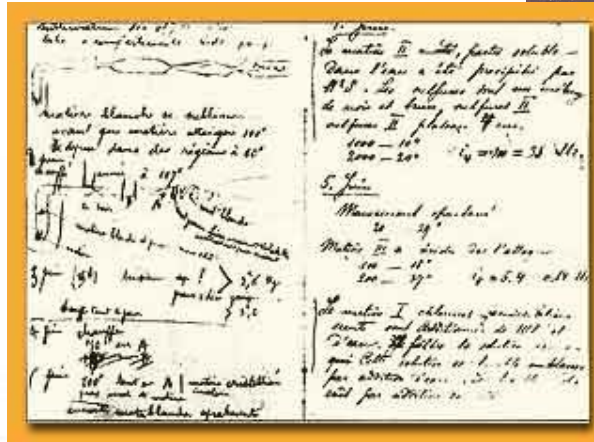
- Open access to research findings
- Open access publishing
- Open data
 - Structured, searchable
 - Shared
 - Deposited
 - Reusable
 - Licensed...



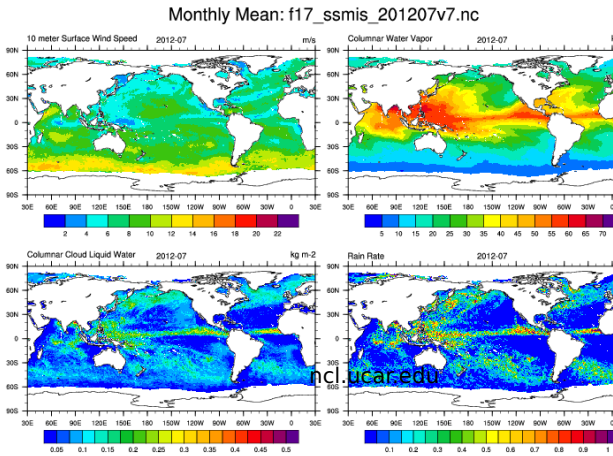
What are data?



hudsonalpha.org



Marie Curie's notebook aip.org



Date: 1/2.07.75 Place: Sakaltutan
Zafor

He will grow old in his present house; new house is for sons - 5 sons. Not sure they want to live in village. He will only build another if they want him to. eS came from Germany and did the plastering. He arranged the carpentry in Kayseri. Çok para gitti. (much money went) Has a tractor.

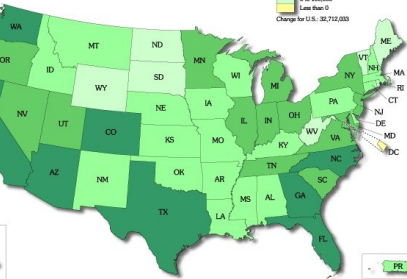
Date: July 1980 Place: Sakaltutan
Zafor:

Household now Zafor and wife; Nazif Unal and wife and youngest son, still a boy. They run two dolmuş; one with a driver from Süleymanlı. Goes in and out once a day. He gets 8,000 a month. Zafor then said, keskin de'oil. (not sharp - i.e.? not profitable) I said he did very well on 8,000 TL with only two journeys a day. Nazif Unal has "bought" a Durak (dolmuş stop) from Belediye and works all day in Kayseri.

http://onlineqda.hud.ac.uk/Intro_QDA/Examples_of_Qualitative_Data.php

Figure 2. Numeric Change in Resident Population for the 50 States, the District of Columbia, and Puerto Rico: 1990 to 2000

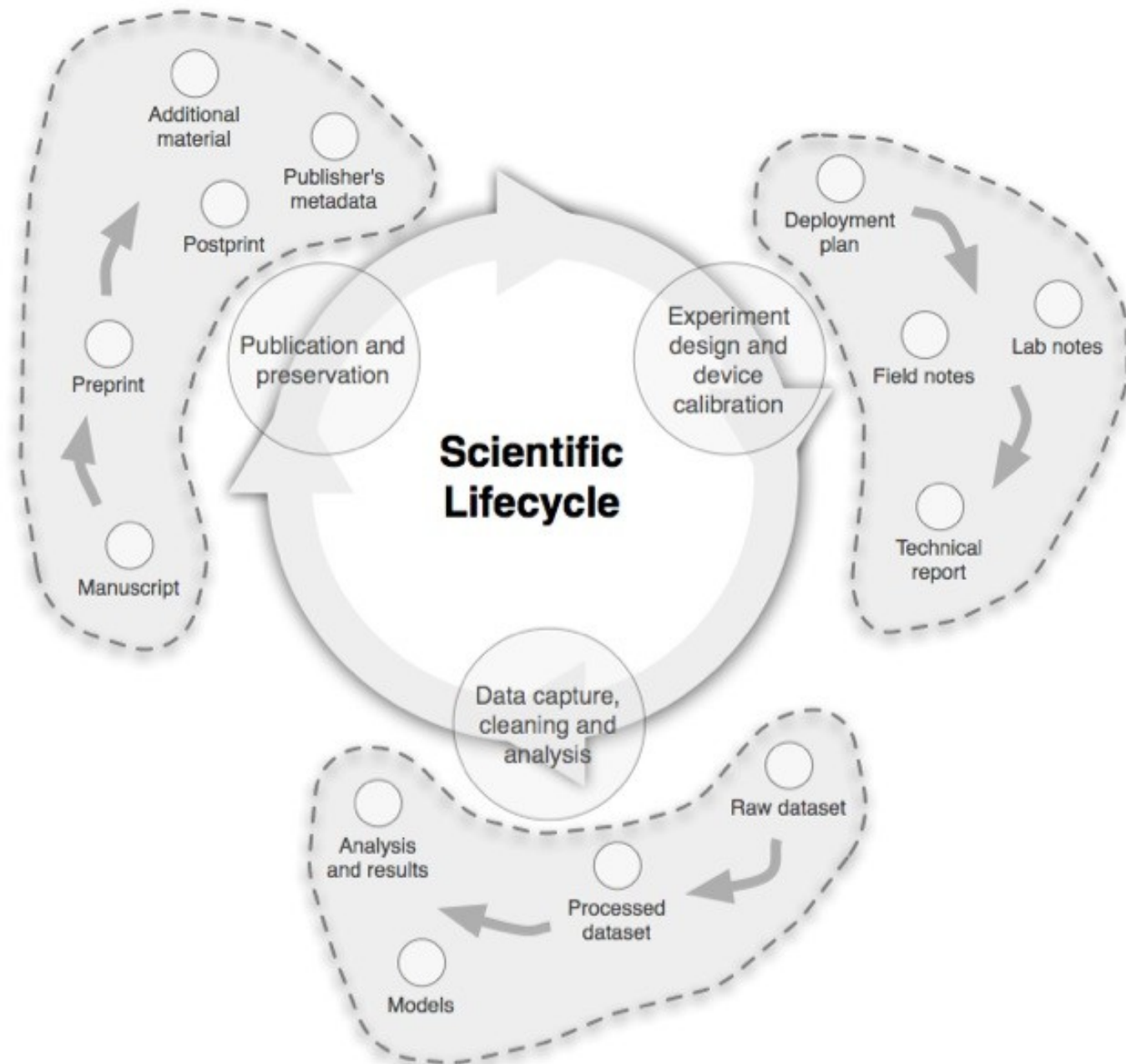
Change in Number of People
 More than 1 million
 500,000 to 1 million
 0 to 500,000
 Less than 0



<http://www.census.gov/population/cen2000/map02.gif>



US CENSUS BUREAU
 Mapping the Nation's Growth and Change



Pepe, A., Mayernik, M. S., Borgman, C. L. & Van de Sompel, H. (2010). From Artifacts to Aggregations: Modeling Scientific Life Cycles on the Semantic Web. *Journal of the American Society for Information Science and Technology*, 61(3): 567-582.

Overview

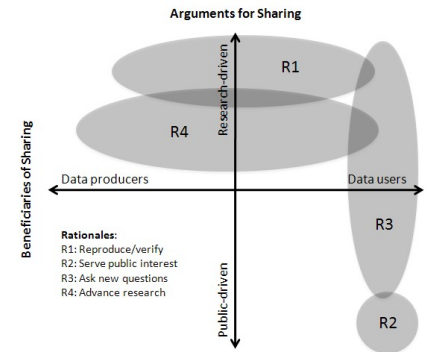


- Paradigm shift
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Why share research data?

Rationales

1. To reproduce research
2. To make public assets available to the public
3. To leverage investments in research data
4. To advance research and innovation



Borgman, C.L. (2012). The Conundrum of Sharing Research Data. *JASIST*, 63(6):1059-1078

& Borgman, C.L. (forthcoming): Big Data, Little Data, No Data: Scholarship in the Networked World. MIT

1. To reproduce research



<http://chemistry.curtin.edu.au/research/index.cfm>



Benzoic Acid	% yield		IR Peaks (cm ⁻¹)		Solid (C) or Oil (O) Product	Mp (°C)
	Gross	Recrystallization	N-H	C=O		
Sodium benzoate		2.58	3327	1638	White C	79-89
Sodium benzoate			3337	1640&1600	O	
Sodium benzoate			3326	1642&1601	O	
Sodium benzoate	37.8		3274	1640	O	
p-nitro	51.84	10.59	3423	1693	Yellow C	152-157
m-nitro	37.38	5.43	3334	1694	Green C	152-157
Benzoic acid		7.44	3293	1642	White C	152-154
m-bromo		47.4	3316	1702	Green paste	
p-bromo		14.53	3344	1638	Pink C	164-166
p-chloro		29.69	3340	1638	Yellow C	
m-chloro		74.53	3410	1637	tan paste	
o-chloro		17.31	3422	1654	Tan C	
3,5-dinitro		44.53	3297	1647	Tan C	139-141
p-hydroxy		3.751	3401	1643	yellow/green C	210
p-amino		8.475	3411	1645	Dark O	
o-methoxy		42.49	3412	1646	Yellow O	



<http://serc.carleton.edu/cismi/broadaccess/groupwork.html>

Scientific Gold Standard



REPLICATION—THE CONFIRMATION OF RESULTS AND CONCLUSIONS FROM ONE STUDY obtained independently in another—is considered the scientific gold standard. Chin, G., Chong, L. & Vignieri, S. (2011). Again, and again, and again. *Science*, 334(6060): 1225.





Victoria Stodden, Columbia

- Deductive sciences
- Check the proof
- Experimental sciences
- Redo the field work
- Computational sciences
- Start with the dataset
- Reconstruct workflow

Reproducibility?

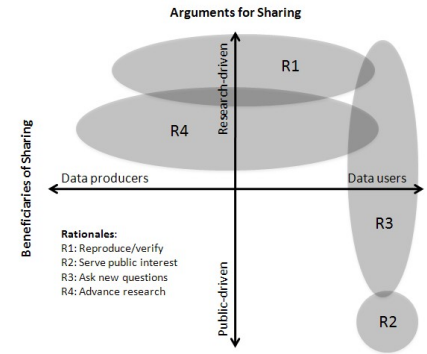
Analytic validity	Do different labs, techniques, and platforms measure the same thing?
Repeatability	Can other scientists access the data and protocols, repeat the analyses, and get the same results?
Replication	Do many different data sets and their combination (meta-analysis) get consistent results?
External validation	Do different data sets by different teams, preferably prospectively and with large-scale evidence, get consistent results?
Clinical validity	Does the discovered information predict clinical outcomes?
Clinical utility	Does the use of the discovered information improve clinical outcomes?



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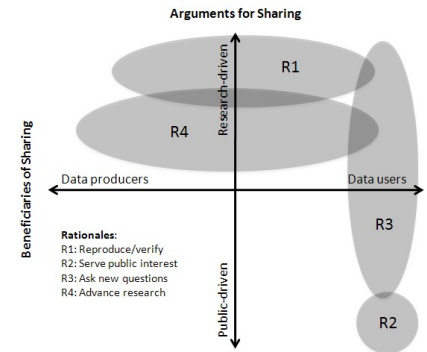
2. To make public assets available to the public



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3. To leverage investments in research data



data



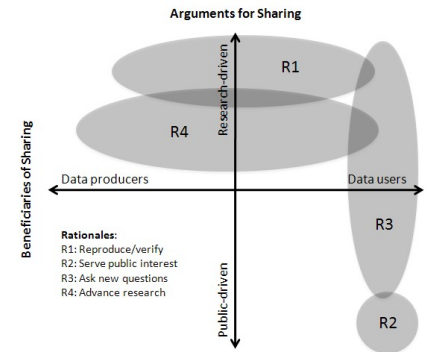
discovery

<http://annualreport.ucdavis.edu/2008/images/photos/discovery.jpg>

Why share research data?

Rationales

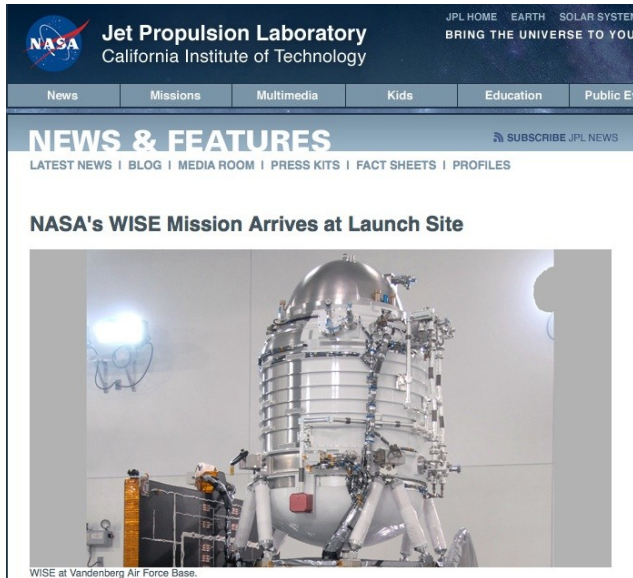
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4. To advance research and innovation



International Virtual Observatory Alliance



telescope

Overview



- Paradigm shift
- Arguments for sharing data
- **Science friction, data friction**
- Requirements for reusing data

Science friction, data friction* Motion



Friction



*Edwards, P. N., Mayernik, M. S., Batcheller, A. L., Bowker, G. C., & Borgman, C. L. (2011).
Science Friction: Data, Metadata, and Collaboration. *Social Studies of Science*, 41, 667-690.
doi:10.1177/0306312711413314

Lack of incentives to share data



- Rewards for publication
- Effort to document data
- Competition, priority
- Control, ownership

Image source: www.buildingsrus.co.uk/.../target1.htm

Intractable problems

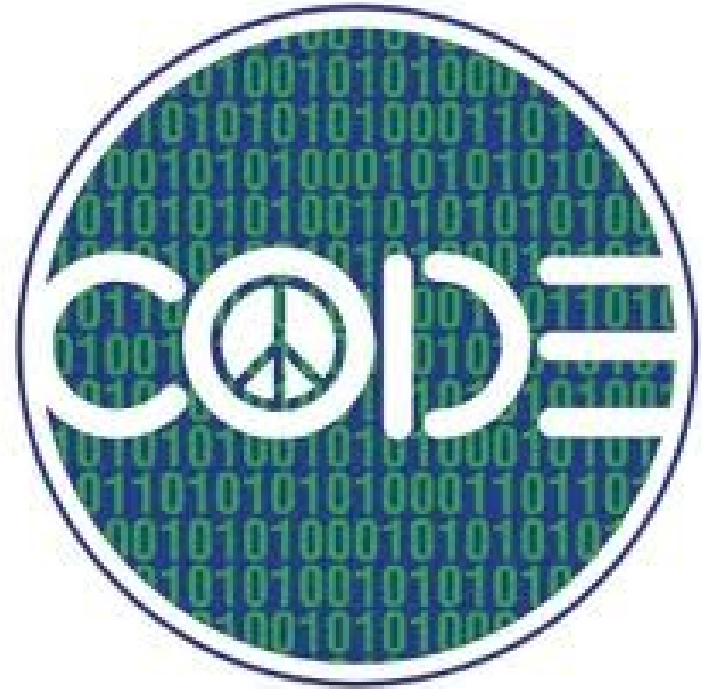
- Confidentiality
- Anonymization
- Reidentification
- Intellectual property
- Economics



http://fyi.uiowa.edu/wp-content/uploads/2011/10/utopia_in_four_movements_filmstill5_utopiasign.jpg

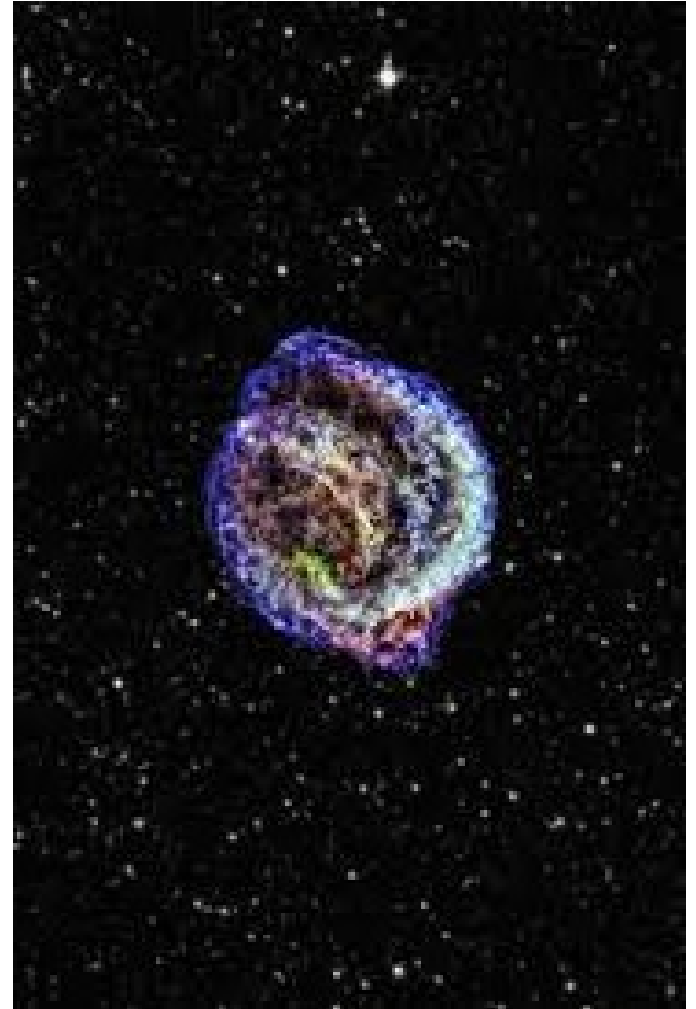
Data do not stand alone

- Data are inseparable
 - Code
 - Technical standards
 - Documentation
 - Instrumentation
 - Calibration
 - Provenance
 - Workflows
 - Local practices
 - Physical samples



Distance from origin

- Reuse by investigator
- Reuse by collaborators
- Reuse by colleagues
- Reuse by unaffiliated others
- Reuse at later times
 - Months
 - Years
 - Decades
 - Centuries



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How to share data

- Make data publicly available
 - Curated data archive: NASA, UKDA, ICPSR...
 - Author curated data archive
 - University repository
 - Personal website
 - ftp site
- Release upon request*

*Wallis, J. C., Rolando, E., & Borgman, C. L. (2013). If We Share Data, Will Anyone Use Them? Data Sharing and Reuse in the Long Tail of Science and Technology. *PLoS ONE*, 8(7), e67332. doi:10.1371/journal.pone.0067332



10 Simple Rules for the Care and Feeding of Scientific Data*

1. Love your data, and let others love it too.
2. Share your data online, with a permanent identifier.
3. Conduct science with data reuse in mind.
4. Publish workflow as context
5. Link your data to your publications as early as possible.
6. Publish your code (even the small bits).
7. Say how you want to get credit for your data (and software).
8. Foster and use data repositories.
9. Reward colleagues who share their data properly.
10. Help establish “Data Science” and “Data Scientists” as vital.

*Goodman, A.; Pepe, A.; Blocker, A.; Borgman, C.L., et al, (in review), PLOS Computation

Why openness matters

- Interoperability
 - Import and export in open formats
 - Mixup and mashup
 - Add value
 - Avoid lock in
- Discoverability of related
 - Documents
 - Data
 - Assorted digital objects
- Usability and reusability
 - For research
 - For learning



Conclusions

- Data sharing is a paradigm shift
 - Conducting research with reuse in mind
 - Managing data for reuse
- Data are not journal articles
- Data do not stand alone
- Data friction is part of scholarship
- Data reuse depends on
 - Context of research
 - Conditions of sharing
 - Conditions of reuse



Data Citation and Attribution

For Attribution—

Developing Data Attribution and Citation Practices and Standards

Summary of an International Workshop

Uhlir, P. F. (Ed.). (2012). *For Attribution -- Developing Data Attribution and Citation Practices and Standards: Summary of an International Workshop*. Washington, D.C.: The National Academies Press. Retrieved from http://www.nap.edu/catalog.php?record_id=13564

OF THE NATIONAL ACADEMIES

OUT OF CITE, OUT OF MIND:

THE CURRENT STATE OF PRACTICE, POLICY, AND TECHNOLOGY FOR THE CITATION OF DATA

CODATA-ICSTI Task Group on Data Citation Standards and Practices

Edited by Yvonne M. Socha

Data Science Journal,
Volume 12, 13 September
2013



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- Sloan Foundation: The Transformation of Knowledge, Culture, and Practice in Data-Driven Science: A Knowledge Infrastructures Perspective. # 20113194. C.L. Borgman, PI; S. Traweek, Co-PI. Joshua Greenberg, program director



Project website: <http://cens.ucla.edu>



University of Oxford
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Centre



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