

## Bringing Digital Data Management Training into Methods Courses for Anthropology

## Archaeology: Principles and Practices of Digital Data Management

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Bringing Digital Data Management Training into Methods Courses for Anthropology is a set of five modules:

General Principles and Practices of Digital Data Management Archaeology: Principles and Practices of Digital Data Management Biological Anthropology: Principles and Practices of Digital Data Management Cultural Anthropology: Principles and Practices of Digital Data Management Linguistic Anthropology: Principles and Practices of Digital Data Management

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# Organization

- I. Review of material from "General principles and practices" module
- II. Managing digital research data in a graduate project
- III. Research data and ethical codes of conduct
- IV. Digital data in archaeology
- V. Why digitize physical data?
- VI. Why deposit digital data?
- VII. Data lifecycles and management plans
- VIII. Exercises
- IX. Instructor notes
- X. References
- XI. Acknowledgments

# Review of material from "General principles and practices" module

- What are data?
- What is data management?
- What are the advantages of making data accessible?
- What are ethical dimensions of data management?
- What is a data management plan?

# Managing digital research data in a graduate project

Why learn data management?

- Good data underpin high quality research.
- Credible and verifiable interpretations are encouraged by long-term preservation.
- Academic and professional recognition and reputation
- Funding body requirements
- Legal and ethical codes of conduct
- To help you finish your project on time with the least stress

## Research data and ethical codes of conduct

- Responsible data management is about researchers' relationships with, and responsibilities to, wider communities:
  - Research communities
  - The general public
  - Other interested groups and stake-holders
  - The future
- Data management is part of the publication process.
  - Scholars need to be able to demonstrate the validity of their interpretations
  - The best way to do this is to make accessible the data as you publish your findings.
- Much archaeological research is based on the re-use of old excavation data. Similarly, we have a responsibility to make sure that the data we produce is accessible and re-usable.
- To adhere to professional codes of conduct, we need to ensure that we have authority to make public and as open access as possible our research data, while not disregarding other people's and rights.

## **Research data and ethical codes of conduct**

Archaeological Institute of America, Code of Professional Standards

3. Archaeologists should anticipate and provide for adequate and accessible long-term storage and curatorial facilities for all archaeological materials, records, and archives, including machine-readable data, which require specialized archival care and maintenance.

4. Archaeologists should make public the results of their research in a timely fashion, making evidence available to others if publication is not accomplished within a reasonable time.

5. All research projects should contain specific plans for conservation, preservation, and publication from the very outset, and funds should be secured for such purposes.

## **Research data and ethical codes of conduct**

Society for American Archaeology, Principles of Archaeological Ethics

Principle No. 7: Records and Preservation:

Archaeologists should work actively for the preservation of, and long term access to, archaeological collections, records, and reports. To this end, they should encourage colleagues, students, and others to make responsible use of collections, records, and reports in their research as one means of preserving the *in situ* archaeological record, and of increasing the care and attention given to that portion of the archaeological record which has been removed and incorporated into archaeological collections, records, and reports.

http://www.saa.org/AbouttheSociety/PrinciplesofArchaeologicalEthics/tabid/203/Default.aspx 8

# **Digital data in archaeology** Data types

In beginning any research project, it is important to define the data to be studied, make the data accessible, and clearly state the methods of analysis cleared stated.

- Amongst the humanity subjects, archaeology studies a very wide range of data. Archaeological data range from
  - genes to pots.
  - soils to satellite photographs.
- In working with hard physical data, such as pots, bones, and stones, etc., archaeologists create masses of digital data as part of the research process.
- Digital data may be captioned from a physical source and input into a spreadsheet, e.g., scans of field drawings
- Digital data may also be digitally created in the first instance, e.g., digital photographs.

## **Digital data in archaeology** Data types

Data: "A reinterpretable representation of information in a formalized manner suitable for communication, interpretation, or processing." Digital Curation Centre (<u>http://www.dcc.ac.uk/</u>)

Digital data are everything created or manipulated on a computer:

- E-mail correspondence
- Text files
- Images
- Audio
- Video
- Spreadsheets and databases: numerical and textual data
- Survey data" from simple EDM surveys to Lidar scans and geophysical surveys
- Text messages
- Websites: even YouTube can be research data.

#### [In-class exercise: Discuss data types]

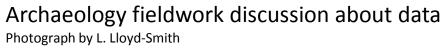
## **Digital data in archaeology** Issues and risks with digital data

Ethical and legal issues include:

- Ethical
  - Who has the authority to publish and/or archive the data?
- Legal
  - Who "owns" the data?
  - Sensitive data

**Practical issues** 

- Volume
  - Curation: selection and retention, what to discard or keep
- Management and preservation
  - Fragility of digital data, formats and costs
- Re-use
  - Knowing the technical details of the digital data
  - Understanding the context of digital data





# Why digitize physical data?

Archaeologists study material remains, so why should they digitize physical data?

- Publication materials are all digital.
- Back-up of paper archive
- Tidy up paper archive: field notes, illustrations, etc.
- Enable analysis in searchable spreadsheets and databases
- Portable
- Sharable and re-useable



Hand-drawn field data needs digitising. Photograph by L. Lloyd-Smith

# Why deposit digital data?

"The single best thing people can do to improve their data management is to plan for the re-use of the data in the future." The Archaeology Data Service, <u>http://archaeologydataservice.ac.uk/</u>



- Ensure preservation
- Provide access
  - Potential to link data to related articles
  - Simplify re-use of data for research and teaching
- Professional recognition
  - Increased visibility of your research
- Funding body requirements

Archives des députés allemands. Photograph by Hamadryades.

www.flickr.com/photos/hamadryades/2549161782/

# Why deposit digital data?

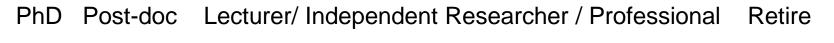
Reasons and benefits for depositing digital data properly: Ask yourself, who will be interested in re-using archived data in the future?

- Ensure its preservation. Digital data and media are fragile and require much more active management for their preservation over the long term than paper archives.
- With the Internet, digital archives can be open access and the data can be linked to published interpretations.
- Well-prepared, well-documented digital data are easily reused for both research and teaching purposes.
- If others are accessing and using data that you have produced and archived, this raises your professional standing.

# What to do with my research data?

"I'll deal with sorting out my data when I retire ...."

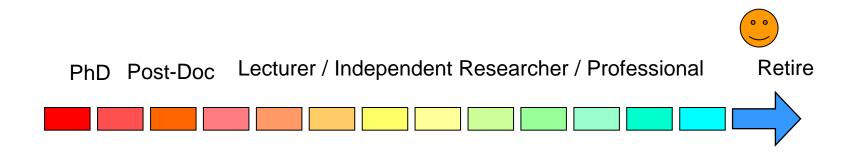




- Non-funded or piecemeal research grants over many years
- On-going and never-ending research projects
- No provision to deposit data along the way

# What to do with my research data?

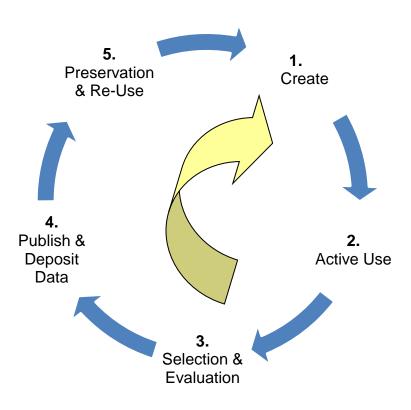
Rolling data management plans for on-going research



- Non-funded or piecemeal research grants over many years
- On-going research projects broken up into discrete blocks
- Data management as part of a publication strategy

# Data lifecycles and management plans

Data management is not about being an IT geek!



- 1. Define your data: What data will the project produce?
- How will the data be organised? File structure/naming, formats, software
- 3. Evaluate data management: Getting rid of useless data
- 4. What data will be deposited and where?
- 5. Who will be interested in re-using the data?

# Data lifecycles and management plans

- Data management plans (DMPs) can define the aim of research over a length of time, such as 3–5 years.
- Breaking research into discrete blocks help avoid the nightmare of dealing retrospectively with a mountain of old data.
  - In completing the plan, relevant data can be archived and shared with others to use.
  - It also sets up the next stage of continued analysis and interpretation of the archived data set.
- Protective attitudes about sharing data are common because
  - So much time and effort is invested in gathering data.
  - Concerns that others may simply reap the rewards of those efforts.
- We must acknowledge that we have access to and use other peoples' data.
- Data sharing has more positive effects:
  - studies have shown that data sharing actually increases citations to the original creators of the data.

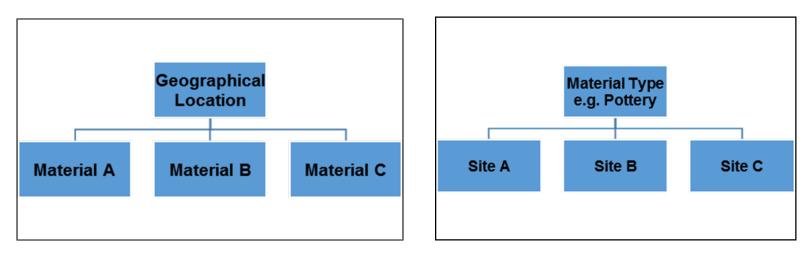
## In-class exercise: Discussing data

Is your research:

- Part of a larger project?
- Based at, or funded by, a research institute / body?
- With a Native American or Indigenous Community?
- With a Public Archaeology / Community Group?

How will these factors affect your data management?

What types of archaeological data will you collect, create, and analyse?



## **In-class exercise: Discussing data**

Accompanied by Handout A, Discussing Your Digital Data

Spend 10–15 minutes writing answers to the questions below and on the handout. Discuss your answers with other students.

- 1. Are you working on your own or as part of a group?
  - Does this affect how you will look after the data?
- 2. Who is funding the work?
  - Does this affect what you can or must do with the data?
- 3. Is the work with a Native American or Indigenous Community?
  - How does this affect data management?
- 4. Is the work part of community or public archaeology project?
- 5. What data can or will be archived?
- 6. Do you have authority to deposit these data?
- 7. To archive the data, what steps will you need to carry out?

## **In-class exercise: Handout A**

#### **Discussing Your Digital Data**

- When considering the Data Management questions below, it is important to bear in mind the following:
- What are the key research questions of the project?
- Where (physically) are the data under study (museum, library, laboratory, archaeological site, published materials, etc.)?

Data Management Questions:	Data Types	Existing Data: Published or Archival	Who 'owns' the data?
What types of existing physical data are you planning to analyse?			
What types of physical data are you planning to create?			
What types of existing digital data are you planning to use?			
What types of digital data will you create?			

Where might the digital data created	
through your project be deposited?	
What potential ethical issues are there	
concerning data creation, management,	
archiving, and future re-use?	
What legal issues are there concerning	
data creation, management, archiving,	
and future re-use?	
Can you think of any other data	
management issues concerning this	
project?	

# Outside-class exercise: Creating a graduate data management plan

Key questions to bear in mind:

- Where will the data end up?
- Are any of the data sensitive? That is, are there personal, political, or ethical considerations?
- Who "owns" your research data?
  Will you have the authority to archive it?
- Are any of the data copyrighted (e.g., images)?
- Will you be working with any unusual or large file formats?

### **Outside-class exercise: Creating a graduate data management plan**

Accompanied by Handouts B and C

A good way to start drafting a plan for looking after your own research data is to think of the plan in reverse order:

• What do you want, or are you required, to do with your digital data after completing your graduate project?

By working towards this goal from the outset you will organise your data with this in mind as you progress with your work.

Building upon what you jotted down in the class discussion, the questions in this second short exercise lead you in reverse order into drafting your data management plan.

Spend 20-30 minutes writing a short paragraph in answer to each of these questions:

- What do you want / have to do with your research data after completing your PhD?
- Are any of the data sensitive?
- Who 'owns' your research data and will you have authority to archive it?
- Describe any copyrighted material you plan to include in your thesis, e.g. images.
- Will you be working with any unusual or large file formats?
- Describe the core data set of you research.

Talk with your academic supervisor / tutor about where and how best archive the digital data from your project. The sooner you do this, the better!

#### **Outside-class exercise: Handout B-1**

Graduate projects: File structure and naming

Researcher:			
Project Title:			
Project Duration:			
Project Context:			
1. File Structure			
[When completing this form on a computer please delete this and write as much as you need to in each of the sections – do not worry about keeping the form to a single page]			
2. File Naming			
Signed:	Version:		
Date Created:	Date Amended:		

#### **Outside-class exercise: Handout B-2**

#### Graduate projects: File structure and naming prompt sheet

Researcher: Name				
Project Title: Provisional dissertation or thesis title				
Project Duration: Dates of graduate project				
Project Context: Where is the research being carried out, and what is under study? Is the research individually based, part of a larger project, or being carried out in agreement with a group(s) or institution(s), e.g., Native American, First Nation or indigenous community(s), Cultural Resource Management company, a museum(s), a state/regional authority, or other community group(s)?				
<ol> <li>File Structure</li> <li>Describe the organisation of computer folders for your post-graduate research project.</li> <li>Does the file structure follow conventions from a host project, laboratory or institution?</li> <li>List the primary folders, and then summarise the organisation of their sub-folders.</li> <li>How will the computer folders for your graduate research be distinguished from other research projects and work that you might be involved with?</li> </ol>				
<b>Good Practice</b> Use a system that is logical to you, but simple and self-explanatory to others. Avoid using the same name for sub-folders as this may lead to the over-writing of their contents. Avoid the over-use of folders.				
<ul> <li>2. File Naming</li> <li>Describe the logic behind the file naming system for your graduate research.</li> <li>Does the file naming follow conventions from a host project, laboratory or institution?</li> <li>Give examples of the file names, from different types of digital data used in your research.</li> <li>How will the file names in your post-graduate research be distinguished from files in other research projects and work that you might be involved with?</li> <li>If a coding or numbering system is used to name files, where will the explanation of this system be saved?</li> </ul>				
Good Practice Use underscores instead of spaces. If the date is included, write this in numbers: year-month-date, e.g., 2011-01-10. If numbering files, consider how many files are potentially needed: 001, 002, will order files up to 999. DO NOT WRITE ENTIRE FILE NAME IN CAPITALS AS THIS IS HARD TO READ.				
Signed:	Version:			
Date Created:	Date Amended:			

#### Outside-class exercise: Handout C-1

Data management plan for graduate research projects

When filling in on a computer, the whole form should be 2 pages maximum

Researcher:				
Project Title:				
Project Duration:				
Project Context:				
1. What Data will be Produced?				
2. How will the Data be Documented and Described?				
3. Has a 'File Structure/Naming Form' been completed? (see separate form)				
Date Created: Date	e Amended:	Version no.		
4. Deposition of Digital Copy of Dissertation / Thesis: delete as appropriate,				
A. Intend to deposit an e-thesis with[fill in]with open access.				
B. Intend to deposit an e-thesis with[fill	in] with a tim	e-limited embargo on open access.		
<b>C.</b> Do not intend to deposit an e-thesis.				
Give Reasons:				
5. What are the plans for data sharing and access after submission of the thesis?				
6. What are the plans for long-term archiving of the digital data supporting the thesis?				
Signed:	Versior	ו:		
Date Created:	Date A	mended:		

#### **Outside-class exercise: Handout C-2**

#### Data management plan for graduate research projects: Prompt sheet

Researcher: Name				
Project Title: Provisional dissertation / thesis title				
Project Duration: Dates of graduate project				
Project Context: Where is the research being carried out, and what is under study? Is the research individually based, part of a larger project, or being carried out in agreement with a group(s) or institution(s), e.g. Native American, First Nation or indigenous community(s), Cultural Resource Management company, a museum(s), a state/regional authority, or other community group(s), etc.?				
1. What Data will be Produced? What physical data will you study? And what digital data will be captured/derived from these? (field notes, images, measurements, spreadsheets, survey data, etc.). What data will be 'created' digitally (images, some analytical and survey data, etc.)? Describe the methods/standards for data creation? What file formats and software will you use? Consider how many individual files you expect to make, anticipated file sizes, and total storage volume.				
2. How will the Data be Documented and Described? Think about what contextual information is required to make the data understandable to others: What standards will be used to record the data? What information on the data collection methods, standards, and context ('metadata') will be recorded for each data type/set? Where will the metadata for each data type/set be located? (e.g. within the data file and/or as separate metadata text document, and/or in method chapter/appendices in the thesis)				
3. Has a 'File Structure/Naming Form' been completed? (see separate form)				
Date Created: Date Amended:	Version no.			
<ul> <li>4. Deposition of E-Thesis: delete as appropriate and state reasons:</li> <li>A. Intend to deposit e-thesis with[fill in]with open access.</li> <li>B. Intend to deposit e-thesis with[fill in] with a time-limited embargo on open access.</li> <li>C. Do not intend to deposit e-thesis.</li> <li>Give Reasons:</li> <li>Intended publication of articles or book after submitting thesis (three years is the standard length of an embargo)</li> <li>Agreement with sponsoring body, community group, or institution to embargo e-thesis.</li> <li>NB. If you intend to deposit your thesis with a digital repository agreement must be sought with all concerned third-parties (museums etc), particularly for use of any copyright material.</li> </ul>				
5. What are the plans for data sharing and access after submission of the thesis?	oncerned third-parties (museums etc), particularly for use of any copyright material.			
What are the parts of data sharing and access after submission of the triess? Who, if any, are the anticipated future users of any digital data / resources from the research? Will any of the digital data supporting the thesis (e.g. organised project archive folders with images, drawings, spreadsheets, databases, etc) be made available to others on request or open access? (e.g. to the host project, research lab/community, museums, or open-access web-based organisation) Are there any ethical issues (e.g. personal data, site locations) that need to be taken into account? If so, what actions will safe guard these data? Are there any funding body / institutional requirements regarding re-use of, or open-access to, data?				
<ul> <li>6. What are the plans for long-term archiving of data supporting the thesis?</li> <li>Where will the digital data be archived?</li> <li>What arrangements are there to archive the digital data with a laboratory or institution?</li> <li>Will a copy of the digital data be archived with the physical data (in a laboratory / institution)?</li> <li>If no institutional archiving is possible, how will the data be safe guarded by the individual? (e.g. per</li> </ul>	sonal computer, external hard drive, future use of institutional server back-up during employment)			
Signed:	Version:			
Date Created:	Date Amended:			

## Instructor notes: Managing digital research data in a graduate project (Slide 5)

Good data underpins high quality research, supporting credible and importantly—verifiable interpretations. To be able to go back and check other researchers' interpretations in the future, take work further and re-use old data, the long-term preservation of data—and increasingly this means digital data—is of central importance.

The production of well managed and accessible data sets can help an anthropologist scholar gain academic and professional recognition.

The importance of looking after research data is recognised by major funding bodies, and one of the conditions of receiving grants is the provision for good practice in data management, preservation, and archiving.

Producing well managed data also aids with one immediate concern of graduate students: to finish a project on time.

## Instructor notes: Issues and risks with digital data (Slide 11)

Two main concerns with digital data are:

Ethical and legal issues

- Ethical: Most important are our ethical duties to ensure that the digital data we create are used responsibly and in accordance to the moral and legal rights of the communities with which we work.
- Legal: While it is conceivable that we may have to deal with the issue of whether data are real or not, e.g., doctored photographs, this may be taking things a little too far. However, the authenticity of emails is a real issue, particularly for those working in government or official bodies around the world in the course of research. Similarly for sensitive data: both personal data on living individuals and/or the locations of archaeological sites which may need to be protected from looters.

Practical issues

- Volume: The size of computer memories doubles every two years, so one might think storage shouldn't be a problem. However, as memories have increased, so have file sizes, particularly of digital images. In the long run we have to make a decision what we keep and what we throw away. How long we will keep what we keep? Should we try to keep everything, for ever?
- Management: By its very nature digital data is fragile. It is often kept on a fragile physical medium, such as magnetic tape, floppy disks, compact discs, and flash-drives. The second point here is whether the format the data are in will be readable in the future.
- Re-use: To be able to best re-use digital data collected or created in the past not only do we need to be able to read the format it is stored on, but we need to know the technical details of how the data were created in the first place. This is particularly important for digital images, audio and video files.

The last issue brings us back to the beginning: what we decide to keep and archive must be understandable to others in the future. Not only must we record how the data were created, but we must also document why the data were produced and what information they contain. For example, when were digital photographs taken, why they were taken, and what do they show?

### Instructor notes: Why digitize physical data? (Slide 12)

Archaeology deals with a vast range of physical data. In addition, many archaeologists still work, at least in part, with traditional paper records: hand-written field notes and record sheets, hand-drawn field drawings and artefact illustrations. The paper archive is still in many peoples' eyes the primary archive, and provision has to be made for the location where these physical data, along with artefacts, animal bones, soil samples, and other materials, will be archived.

Digitisation of field documentation should be a routine procedure. Like everything that is tedious and routine it really helps to get this out of the way as soon as possible after the production of the paper material. Ideally one should input field data into a computer during field work. If it cannot be done until after fieldwork is completed, make a full digital copy of your physical documentation as soon as you can.

Reasons for digitizing the paper archive: it helps you tidy up your field notes; enables analysis providing searchable spreadsheets and databases; and makes data portable, easy to share, and easy to re-use in the future. As part of data analysis, interpretation, and presentation, we digitize most, if not all, of the paper documentation. All publication preparation is digital.

The digital archive provides a back-up of the paper archive. However, the original material should not be discarded. In terms of volume of shelf space, field notebooks, drawings, and photographs do not pose a serious threat to storage space.

### Instructor notes: What to do with my research data? (Slides 15, 16)

Unfortunately, researchers commonly believe that they will "deal with sorting out my data when I retire...," at the end of a life time of on-going work:

- Starting as graduate projects, some funded, some not; some individual, others part of larger projects. All of these factors affect data management.
- Individual post-doctoral projects (1-3 years) are often characterised by the fact that they generate new archaeological data, while many doctoral projects analyse existing data. There may also be stronger funding body requirements for data management.
- Post-doctoral researchers can be part of larger research projects, with their own data management requirements.
- Often academics get funding for small projects of 1-2 years, possibly as pilot projects that may or may not lead on to larger more substantial projects. It is important at the outset of small projects to think how the data will fit into the possible larger data set in the future. This is a good time to get to grips with the range of data management issues to be encountered.
- A similar situation occurs at the other end of larger projects: spin-off projects. Again, how will the data fit into what has gone before?
- There is also research that academics carry out as part and parcel of their career. Such work is long term, on-going, and often non-funded or funded by small grants. This work is characterised by its never-ending nature. Often, it is dealing with this type of research data that scares people the most.

Research data starts accumulating on a hard-drives from the beginning, if not prior to, graduate projects. Hopefully we get a job, or even if not, we might continue to do research independently and our hard-drives get fuller and fuller. The rate of data accumulation increases as we work on more and more projects at the same time.

Before we know it we're about to retire and we've a mountain of old research data to worry about. And this is the good story.

The nightmare scenario is when a researcher passes away unexpectedly and takes with them a lot of the background information with which to make sense of their undocumented data.

#### Instructor notes: Data lifecycles and management plans (Slides 17, 18)

See also Outside-class exercise, and accompanying Handout B.

A data lifecycle model divides the research process into a number of tasks: project planning; data collection; data analysis; data distribution and archiving; data discovery and re-use; leading to data re-analysis, and so on and so forth. Thinking of data in terms of a life cycle helps to:

- Identify and define the different tasks involved in making a realistic and effective plan to look after the data during the course of the project;
- Plan ahead and define what the outcome of the project will be;
- Think about where the data—both physical and digital—will end up;
- Think about what formats the data will need to be in;
- And what documentation we will need to provide so that the data are re-usable in the future.

And all a Data Management Plan is, is a project document that works through each of these stages around the lifecycle and answers each of these questions:

- What types of digital data will I produce?
- How will I organise the data? (file structure/naming, formats, software)
- At what points during the project, and how, will the data be evaluated?
- What data will be kept and what deleted?

At this point some data may be re-cycled, re-analysed, and feed back into the management process. Or, new data may be required. The remaining parts of the management plan address the questions:

- What data will be deposited and where?
- Who will be interested in re-using the data?

A possible analogy to a Data Management Plan is a Risk Assessment Form, completed before we carry out any fieldwork, in which we think through all the possible things that could go wrong, the procedures in place to mitigate the risks, and finally the actions that will be taken if something does go wrong. In a similar way the purpose of a Data Management Plan is to think through and explicitly define the data that will be created, how it will be looked after, and what data will end up where.

## References

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Pryor, Graham. "Librarians doing data—a paradox?" Paper presented at the conference, Libraries@Cambridge, Cambridge, England, 6 January 2011. <u>http://www.dcc.ac.uk/webfm\_send/319</u>

Sheehan, Beth. "Comparing Digital Archaeological Repositories: tDAR Versus Open Context." *Behavioral and Social Sciences Librarian* 34 (2015): 173-213. DOI:10.1080/01639269.2015.1096155

#### Web resources

The Archaeology Data Service (UK): <u>http://archaeologydataservice.ac.uk/</u>

DataTrain. Open Access Post-Graduate Teaching Materials in Managing Research Data in Archaeology. <u>http://archaeologydataservice.ac.uk/learning/DataTrain</u>

The Digital Archaeological Record (tDAR). A service of Digital Antiquity. <u>http://www.tdar.org/about/</u>

Digital Curation Centre, United Kingdom. <u>http://www.dcc.ac.uk/</u>

National Science Foundation. Arch-DDRI, Archaeology, Doctoral Dissertation Research Improvement Awards. <u>http://www.nsf.gov/funding/pgm\_summ.jsp?pims\_id=505076&org=BCS&from=home</u>

National Science Foundation. Archaeology and Archaeometry Program. http://www.nsf.gov/funding/pgm\_summ.jsp?pims\_id=11690&org=BCS&from=home



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*Workshop Two, May 13, 2016:* Phillip Cash Cash, Jenny Cashman, Ricardo B. Contreras, Sara Gonzalez, Candace Greene, Christine Mallinson, Ricky Punzalan, Thurka Sangaramoorthy, Darlene Smucny, Natalie Underberg-Goode, Fatimah Williams Castro, Amber Wutich

#### American Anthropological Association:

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