NEH Application Cover Sheet (HAA-258826)
Digital Humanities Advancement Grants

PROJECT DIRECTOR

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Field of expertise: Archaeology

INSTITUTION

Thomas Jefferson Foundation, Inc.
Charlottesville, VA 22902-9998

APPLICATION INFORMATION

Title: *Expanding the DAACS Research Consortium*

Grant period: From 2018-01-01 to 2019-12-31
Project field(s): Archaeology; African American History; History, General

Description of project: Over the past two decades, archaeologists have struggled to discover how the web can help them collaborate across institutional boundaries to generate accurate and commensurate data, share them publicly, and analyze them to advance our understanding of human history. This proposal from the Digital Archaeological Archive of Comparative Slavery, based at Monticello, offers linked social and digital strategies that can meet these challenges in the archaeological study of early-modern slave societies. We seek Level III funding to enhance proven open-source software (www.daaacrc.org) and training programs that provide our collaborators with flexibility in how they collect data and share it with diverse stakeholders. We will optimize search and navigation on the DAACS website (www.daacs.org) to accommodate a 10-fold increase in the number of archaeological sites represented. We show how a core facility like DAACS can leverage collaboration among researchers working in diverse institutions.

BUDGET

Outright Request	325,000.00	**Cost Sharing**	119,573.00
Matching Request	50,000.00	**Total Budget**	494,573.00
Total NEH	375,000.00		

GRANT ADMINISTRATOR

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2. Participants

Participant	Title	Institution	Institution Type	Role
Agbe-Davies, Anna (Ph.D.)	Associate Professor and Director of Undergraduate Studies of Anthropology	University of North Carolina, Chapel Hill	University	Advisory Committee Member
Arendt, Beatrix (Ph.D.)	Curator of Collections, Monticello Department of Archaeology	Thomas Jefferson Foundation	Museum	Advisory Committee Member
Armstrong, Douglas (Ph.D.)	Professor, Department of Anthropology	Syracuse University	University	Advisory Committee Member
Bates, Lynsey (Ph.D.)	DAACS Senior Archaeological Analyst	Thomas Jefferson Foundation	Museum	DAACS Staff
Beier, Zachary (Ph.D.)	Lecturer in History and Archaeology	University of West Indies, Mona	University	Advisory Committee Member
Bingler, Robert	Senior Programmer and Analyst	The University of Virginia's Institute for Advanced Technology in the Humanities	University	Programmer
Bollwerk, Elizabeth (Ph.D.)	DAACS Senior Archaeological Analyst	Thomas Jefferson Foundation	Museum	DAACS Staff
Boudreaux, Tony (Ph.D.)	Director, Center for Archaeological Research and Associate Professor of Anthropology	University of Mississippi's Center for Archaeological Research	Cultural Resource Management/ University	Advisory Committee Member
Breen, Eleanor (Ph.D.)	Acting City Archaeologist	Alexandria Archaeology	City Agency/Cultural Resource Management	Advisory Committee Member
Brown, Dave (Ph.D.)	Director	The Fairfield Foundation	Cultural Resource Management	Advisory Committee Member
Clarke, Sarah Stroud (ABD)	Director of Archaeology	Drayton Hall	Museum	Advisory Committee Member
Cobb, Charles (Ph.D.)	James E. Lockwood, Jr. Professor/Curator, Historical	Florida Museum of Natural History and University of	Museum/University	Advisory Committee Member

		Archaeology	Florida		
Cooper, Leslie	DAACS Senior Archaeological Analyst	Thomas Jefferson Foundation	Museum	DAACS Staff
Devlin, Sean (ABD)	Curator	Mount Vernon	Museum	Advisory Committee Member
Galle, Jillian (Ph.D.)	Director, DAACS	Thomas Jefferson Foundation	Museum	Project Director
Galliard, Meg	Archaeologist	South Carolina Department of Natural Resources' Heritage Trust Program	State Agency	Advisory Committee Member
Harris, Khadene (ABD)	PhD Candidate	Northwestern University	University	Advisory Committee Member
Hauser, Mark (Ph.D.)	Associate Professor of Anthropology	Northwestern University	University	Advisory Committee Member
Heath, Barbara (Ph.D.)	Associate Professor of Anthropology	University of Tennessee	University	Advisory Committee Member
Kansa, Eric (Ph.D.)	Project Director	Open Context	Digital Archaeology Non-Profit	Advisory Committee Member
Martin, Worthy (Ph.D.)	Director of the Institute for Advanced Technology in the Humanities and Professor of Computer Science	University of Virginia's Institute for Advanced Technology in the Humanities	University	Project Co-Director
McDaniels, Tim	Managing Partner and Senior Developer	Convoy	Web Development Firm	Access Mode Design, Open API Development
Meyers, Maureen (Ph.D.)	Assistant Professor, Department of Anthropology	University of Mississippi	University	Advisory Committee Member
Monroe, Cameron (Ph.D.)	Department of Anthropology	University of California, Santa Cruz	University	Advisory Committee Member
Neiman, Fraser (Ph.D.)	Director of Archaeology, Monticello	Thomas Jefferson Foundation	Museum	Advisory Committee Member
Platt, Sarah (ABD)	PhD Candidate	Syracuse University	University	

Smith, Karen (Ph.D.)	Director, Applied Research Division	South Carolina Institute for Anthropology and Archaeology	Cultural Resource Management/ University	Advisory Committee Member
Thomas, Matt	Managing Partner and Creative Director	Convoy	Web Development Firm	Web Designer
Waters, Gifford (Ph.D.)	Collections Manager for Historical Archaeology	Florida Museum of Natural History	Museum/University	Advisory Committee Member

3. Abstract

Over the past two decades, archaeologists have struggled to discover how the web can help them collaborate across institutional boundaries to generate accurate and commensurate data, share them publically, and analyze them to advance our understanding of human history. This proposal from the Digital Archaeological Archive of Comparative Slavery, based at Monticello, offers linked social and digital strategies that can meet these challenges in the archaeological study of early-modern slave societies. We seek Level III funding to enhance proven open-source software (www.daaacrc.org) and training programs that provide our collaborators with flexibility in how they collect data and share it with diverse stakeholders. We will optimize search and navigation on the DAACS website (www.daacs.org) to accommodate a 10-fold increase in the number of archaeological sites represented. We show how a core facility like DAACS can leverage collaboration among researchers working in diverse institutions.

4. Narrative
Overview

This proposal outlines a new digital initiative from the Digital Archaeological Archive of Comparative Slavery (DAACS: www.daacs.org), an award-winning archive based at the Thomas Jefferson Foundation at Monticello. DAACS fosters inter-site, comparative archaeological research on slavery in the Chesapeake, the Carolinas, and the Caribbean. *Expanding the DAACS Research Consortium* (hereafter *Expanding DRC)* aims to advance DAACS's primary goals. The first is to enable a growing community of archaeologists to transparently digitize and share high-quality, systematically comparable archaeological data from North American and Caribbean slave societies of the early-modern era (c. 1500-1860). The second is to empower scholars from different disciplines to confidently use those data to identify large scale temporal and geographical trends and to advance our understanding of the underlying historical dynamics. Finally, we aim to explore linked digital and social strategies that researchers in archaeology and other disciplines might use to build productive research collaborations among diverse institutions, based on a culture of openness and transparency that will ultimately enhance the legitimacy and credibility of inquiry and research conclusions.

Expanding DRC enhances and extends a research collaboration initiated in 2014 with funding from the Andrew W. Mellon Foundation. In that initial phase, we built a new open-source PostgreSQL database and a Rails data-entry and query application that would run in a web browser from www.daacs.org. We improved the DAACS data structures, their related classification and measurement protocols, and exhaustively documented them. We developed training and evaluation programs to certify our collaborators in their accurate use. Our collaborators used these tools to digitize and then analyze data from their own archaeological research on slavery in North America and the Caribbean. We then linked the new PostgreSQL database to our public-facing website (www.daacs.org), so that our collaborators could share their data with one another and the public. The DRC is unique among digital archaeological projects in two critical, linked ways. It provides long-term data curation and sharing while also ensuring data integration and validation within and among different research projects conducted in different regions. To our knowledge, DRC is the only digital archaeology project that is tackling the issue of *ex-ante* coordination in data capture, not simply *ex-post* adjustments to previously created data, to facilitate intra- and inter-site comparative analysis.

In this proposal, DAACS, in collaboration with the University of Virginia's Institute for Advanced Technology in the Humanities (IATH) and archaeologists working in museums, universities, CRM firms, and state agencies across North America and the Caribbean, seeks 24 months of Level III funding ($325,000) to design, develop, and implement a second phase of the DAACS Research Consortium that builds on the successes of the first in three directions. We are also requesting a $50,000 Sustainability Match to seed an endowment for the DRC. Since 2014, the number and diversity of our actual and aspiring collaborators have grown. Their need for flexibility in how they digitize assemblages has also changed. Working with our collaborators, we will identify two successively simpler subsets of the DAACS classification and measurement protocols and build two new modes for the data-entry interface based on them. The new data-entry modes respond to our collaborators' desire to decrease the level of detail coded on each artifact in order to catalog larger assemblages without sacrificing the analytical power of quantitative, inter-assemblage comparison that the DAACS protocols make possible.

Our increasingly diverse collaborators also need greater flexibility in how they present data to their stakeholders. We will work with them to identify the kinds of data they want to expose on the web via a new application programming interface (API). We will build and document an API that will allow our collaborators' home institutions and others to serve DAACS data on their own

websites in ways that meet the needs of their local stakeholders, especially the general public. Finally, we will work with our collaborators to build new search tools into the DAACS website that will, for example, allow users to search for sites by time period, geographical region, plantation crop, and to search for particular artifact classes across sites. This new search functionality responds to growth of the number of archaeological sites whose data reside in DAACS, from 10 in 2004 to over 80 today. These strategic investments in digital technology will make possible new kinds of scholarly collaboration and data sharing, across institutional boundaries, at a scale that is unprecedented in the discipline of archaeology.

Enhancing the Humanities
Interpretive Significance

The fundamental purpose of The Digital Archaeological Archive of Comparative Slavery is to convert information from archaeological artifacts and their excavated contexts[1] into web-accessible evidence that scholars and other stakeholders can use to advance our understanding of early-modern slave societies in North America and the Caribbean. From its inception, DAACS has sought data from places and times that would strengthen scholars' ability to assess how variation in the cultural origins of those enslaved in Africa, demography in the plantation setting, and the niche those plantations occupied in the Atlantic economy, affected the trajectory of historical change in each region (Ortiz 1947; Berlin 1998; Morgan 1998). The archaeological sites in DAACS were chosen to deliver sharper insights into the effects of these and other variables on the dynamics of slave societies.[2]

We singled out four aspects of everyday life in the early modern Atlantic World as likely foci for research, and we kept them in mind when devising the DAACS data structures and classification and measurement protocols. The first set of issues related to the arrangement and use of domestic architectural space, including change and variation in the amount of influence enslaved individuals had over their living conditions (Neiman 2008; Heath 2012). A second cluster of issues revolved around consumer goods and the extent of enslaved individuals' participation in a burgeoning "consumer revolution" that swept the Atlantic world in the late-17th and 18th centuries (Carson 1994, Galle 2010, 2011, 2016). A third set of key questions centered on the diet of enslaved people and subsistence strategies (Bowen 1996). Finally, archaeologists and historians have been intrigued by the possibility of identifying African cultural and religious influences in material remains of the period (Sobel 1987; Ferguson 1992; Franklin 1997; Agbe-Davies 2017).

Over the past 17 years, this research agenda has shaped DAACS as it has grown into the largest, and longest-lived, archive of downloadable archaeological data for any specific region or time period. Today, the DAACS website freely provides standardized data on millions of artifacts, and the archaeological contexts in which they were found, from more than 80 excavated archaeological sites related to the lives of enslaved laborers in the early modern Atlantic World. Through the website, scholars and the public can also access historical backgrounds on each site, detailed artifact and site images, digitized maps, site chronologies, and a wide range of additional information on slavery.

Two factors enhance researchers' ability to address these historical dynamics with DAACS data. The first is commensurability. All DAACS data conform to a single set of classification and measurement protocols, devised initially and updated continually in collaboration with our partners.

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[1] Context data includes the locations, descriptions, interpretations, and sediment descriptions that provide important spatial and temporal context for excavated artifacts.
[2] For current sites in DAACS, see: https://www.daacs.org/about-the-database/project-list/.

Commensurability makes comparative data analysis across regions and time periods possible. The second factor is the growing number of sites, regions, and time periods represented in the archive. More data increase the power to detect meaningful temporal and regional variation.

In the initial, Mellon-funded phase of DRC, we developed the DRC Application and made it available to our partners via an accredited login (www.daacsrc.org). We trained our ten partners in the DAACS protocols and tested and certified their expertise. They used the DRC Application to catalog collections from their own labs and share the results on the web via www.daacs.org. A commitment to public data sharing is a necessary condition for joining DRC and a primary motivation for all our partners. Our partners included faculty in archaeology graduate programs, their graduate students, and museum-based researchers. *Expanding DRC* adds flexibility to this proven open-source technology. This greater flexibility will not only increase the rate at which current DRC collaborators contribute data to DAACS, it will attract new collaborators, not only from academia and museums, but also from state agencies and cultural resource management firms. As a result, we expect a significant increase in the number of sites, time periods, and regions for which data are available at www.daacs.org.

Digital Humanities Significance

Expanding DRC will also contribute to a larger digital humanities effort to discover and improve ways to use the web to advance scholarly collaboration and openness, especially in the discipline of archaeology. *Expanding DRC* explores how researchers based at diverse, scattered institutions and united by a research focus on a single culture-historical system or entity, in our case early-modern Atlantic slave societies, can use openly documented classification and measurement protocols, training and evaluation in their accurate application, and web-based informatics infrastructure to generate and share accountably accurate and commensurate data. Commensurability and sharing are critical if stakeholders are to use data from many sites to discover temporal and regional trends and departures from those trends. Accountable accuracy is essential to motivate analysis by diverse stakeholders and is a necessary condition for confidence in their conclusions. Both challenges are ubiquitous and unresolved in the discipline of archaeology (See *Environmental Scan* for further discussion). *Expanding DRC* offers a promising solution.

Expanding DRC serves as a valuable experiment in the applicability to the humanities of the "core facilities" model that has benefited many fields in the sciences. Core facilities house costly informatics and analytical infrastructure that can be widely shared (Farber and Weiss 2011). The model seems especially promising in archaeology, where even the best funded individual researchers and projects often are unable to muster the technical and financial resources required to produce and share on the web commensurate and accurate data, along with the protocols used to generate them (*e.g.*, Berggren *et al.* 2015). *Expanding DRC* explores how the core-facility model might leverage collaboration among diverse archaeologists and help them achieve greater openness and accountability in their research, not only through data sharing, but also by making the entire data production open and transparent. We emphasize that devising ways to increase collaboration and openness in the research process in archaeology is ultimately relevant to all the humanities. It is a key to the legitimacy and credibility of all inquiry and thus the wellbeing of all who engage with it (Lupia and Elman 2014).

Core Upgrade 1: DRC Silver and DRC Bronze Modes for the Data-Entry Interface

Expanding DRC consists of three core upgrades to our digital infrastructure that will advance these goals. Reaping the benefits of greater collaboration and openness requires that our stakeholders embrace and help us improve standards for creating and reporting data. We recognize that these standards impose costs and other constraints. The first core upgrade gives stakeholders greater flexibility so they can adapt those costs and constraints to their own circumstances. We will

add two new data-entry modes, designated "DRC Silver" and "DRC Bronze", to the DRC Application. These modes will instantiate subsets of the full set of DAACS classification and measurement protocols and allow DRC collaborators to digitize larger sites on tighter budgets.

The DRC Application gives DRC-trained and certified archaeologists the ability to add data on artifacts and their contexts to a PostgreSQL backend from a browser anywhere on the web. The current interface mode, which we now call "DRC Gold," consists of fifteen data-entry modules to accommodate the complete set of DAACS protocols. There is one module for each of the basic data types represented in the database: Projects, Contexts, Features, Ceramics, General Artifacts, Glass Vessels, Beads, Buckles, Buttons, Pipes, Utensils, Fauna, Images, Objects, and Artifact Boxes (Appendix 1). Each data entry module contains over 40 required data fields and has up to eight sub-modules to handle data entry for related tables. In addition to data entry, the application provides a host of tools to help our partners navigate the application, keep track of their recent work on the system, message one another, query the database and share data files and code. A full description of the Application can be found in Appendix 1 and reviewers can watch a brief video tour of the DRC Application [here](#).

The design and development of two new alternative interface modes will allow users to customize the level of effort required to enter their data, without sacrificing a basic level of inter-site and inter-regional comparability on which the analytical promise of DRC participation depends. In analyzing their finds, archaeologists inevitably face a tradeoff between the amount of data they can record on each artifact and its associated contextual information and the total number of artifacts and contexts on which they can record data. The complete DAACS protocols favor recording a large amount of data per item to discover and evaluate new ways to measure variation that might yield important insights into slave societies. They serve that goal well. However, many current and prospective DRC collaborators need the flexibility to increase the number of artifacts recorded in a limited amount of time. We will work with them to define two successively smaller subsets of fields for each artifact class and for context records. We will develop "DRC Silver" and "DRC Bronze" data-entry modes for the DRC Application, based on the fields identified by our collaborators. The two new data entry modes will give collaborators needed flexibility, while avoiding a "tragedy of the commons." The "tragedy" refers to the idiosyncratic choices often made by researchers on which fields to record without full consideration of the need for commensurability. Such decisions compromise the ability to do inter-site comparisons, which is the key benefit from participation in DRC.

Our collaborators at museums, universities, CRM firms, and state agencies who have agreed to serve on the *Expanding DRC* Advisory Board will help us select the fields and refine the designs for "DRC Silver" and "DRC Bronze." We will conduct user surveys of the current "DRC Gold" access mode to assess how it is used and will bring those lessons to the new interfaces. IATH and Convoy, the technical partners on this project, who helped us develop the DRC Application, will serve as the designers, developers, and programmers for *Expanding DRC.*

How will data entry work in these new modes? The upgraded DRC Application will require collaborators to specify which mode they need before data entry proceeds for a new project. When choosing "DRC Silver" or "DRC Bronze," researchers will be presented with streamlined data-entry screens. "DRC Bronze" will require only minimal cataloging effort, enabling users to create basic, standardized artifact inventories containing between five and seven critical data fields, such as artifact count, material, manufacturing technique, form, ceramic ware-type (if applicable), decorative type, and weight.

"DRC Silver" is the intermediate-level data entry option. Users will be given the option to record between 10 and 12 fields per artifact type. This gives them the ability to record additional measurements, manufacturing and decorative details, while still providing them with a significantly streamlined experience compared to complete "DRC Gold" entry. Users will retain the option of recording more detailed information in "DRC Gold" fields, if they wish, by simply accessing their data through the "DRC Gold" interface.

Core Upgrade 2: DAACS Open Application Programming Interface (API)

The second core upgrade gives collaborators and others greater flexibility in how they access and serve DAACS data. We will work with our collaborators to build a read-only Open Application Programming Interface (API) that will allow them to deliver those data on their own websites. The Open API will publish data from the PostgreSQL database in JSON format. Users with programming skills, or those with their own web developers, can use it to customize data searches, create their own site-specific data visualizations, analyze data, and link DAACS data to existing non-DAACS datasets. DAACS staff will work with DRC collaborators and IATH programmers to identify the kinds of data that the API will return. DAACS and IATH staff will write example scripts that explain how to use the API, and will create documentation for the DAACS website, similar to Open Context's API Cookbook, that will facilitate the API's use.

An example of the importance of these capabilities is highlighted by a current NEH-funded collaboration between the Florida Museum of Natural History (FLMNH) and DAACS. FLMNH's *Digitizing the Franciscan Missions of La Florida* (NEH 2016) project is using the DRC web application to catalog and curate artifact assemblages and field records from three Franciscan Missions in Florida. These data will be served from the DAACS database to scholars and the public through a dedicated Spanish Missions website. In the absence of a DAACS Open API, FLMNH must contract directly with IATH to pull the data from DAACS and repurpose it on this forthcoming website. In future collaborative projects, an Open API would eliminate the middleman between the user and the data, most critically allowing archaeologists to present DAACS data in ways that will enhance engagement from their organization's unique constituents.

Core Upgrade 3: DAACS Website Improvements

Improvements to the public-facing DAACS website comprise the third core upgrade. They respond to the significant increase in the number of sites, regions, and time periods for which data are served from DAACS and to the advent of the new "DRC Silver" and "DRC Bronze" data-entry standards. The basic structure of the DAACS website, which delivers the archaeological data and related discursive site content, maps, and images to the public, has remained unchanged since its development in 2004 when it was launched with data from only six sites. Today, there are data from over 80 sites and that number will only increase more rapidly in the wake of the initial phase of DRC and the current proposal.

Three critical areas need to be addressed: Site Navigation, Queries, and Website and Database optimization for speed. We will redesign basic website navigation to enable users to easily find data from sites based on key variables such as occupation dates, occupant status, rural or urban context, colony, region, and the ecological niche that the plantation or production unit occupied in the Atlantic economy.

We will also redesign the DAACS Query Module to accommodate data produced by the two new cataloging access modes. Multi-site queries that include data for "DRC Bronze" and/or "DRC Silver"-mode sites will return data values for fields associated with the lower level, avoiding confusion that might arise from large numbers of missing values. We will also add an often requested feature: logins that will allow DAACS website users to run and save time-stamped queries to which they can return. We will use Google Analytics, along with interviews and user testing with

our collaborators to track current user experience. These studies will enable the optimization of the site's navigation menus and search functionality. Appendix 2 discusses these upgrades and reviewers can watch a brief video that highlights areas slated for redesign here.

Environmental Scan

The past two decades have witnessed the emergence of an increasingly diverse archaeological "information ecosystem" (Kansa 2012), as archaeologists explore strategies to use the web to advance traditional scholarly goals and to reach new audiences. *Expanding DRC* contributes to this exploratory process. To describe this contribution, we begin by positioning the DRC's goals relative to the goals of other digital archaeological initiatives.

A first set of goals is archiving: long-term curation and sharing of data generated in both the field and lab by archaeological research projects. In the UK, the Archaeological Data Service (ADS) has offered these services for over two decades, underwritten by government funding. In the US, The Digital Archaeological Record (tDAR) plays a similar role. DRC provides this archiving function for collaborators via data curation in the DRC back end on IATH servers and public access via the DAACS website (http://daacs.org), with sustainability guaranteed by a dedicated endowment.

A second goal is data integration and validation within and among different research projects. The analytical potential of archived data depend on their "playing well" together. Within a given project, a necessary but by no means sufficient condition is consistency in the way observations on artifacts and their excavation contexts are coded within a single field or variable. tDAR offers no data consistency checks prior to or following data uploads. A second US-based archive, Open Context does offer within-project internal consistency checks. Open Context editors use Open Refine to align authority terms within fields originally populated by free or poorly controlled text (Kansa and Kansa 2013). Such e*x-post* interventions' accuracy is difficult to assess and that increases costs to data depositors (Kratz and Strasser 2014, for a comparison of tDAR and Open Context, see Sheehan 2015).

Combining data across multiple research projects presents additional challenges, most notably aligning field names and data structures that specify relationships among fields. One approach simply concatenates records on artifacts and contexts from multiple projects into a single file, leaving measurements of the same variables in different fields as they were defined and named by the different projects (http://colonialencounters.org/index.aspx). A more recent approach uses *ontologies*: tools that allow users to map diverse field names and coding schemes to a shared structure, if one exists, and then use the shared structures to integrate files from multiple projects. Archaeological experiments with ontologies have been limited to zooarchaeology (Spielmann and Kintigh 2011; Arbuckle et al. 2014; Kansa, Kansa, and Arbuckle 2014; Neusius and Styles 2017;), where the Linnean taxonomy provides the necessary *ex-ante* structure. tDAR offers users web-accessible ontology building tools.

DRC takes a different and complementary approach to facilitating systematic comparison of assemblage content within and among sites. Through training, testing, and ongoing consultation, DRC empowers our partners to use and to improve community-developed classification and measurement protocols that are explicitly and carefully documented in web-accessible manuals. To our knowledge, DRC is the only digital archaeology project that is exploring *ex-ante* coordination in data creation, not *ex-post* adjustments to previously created data, to facilitate intra- and inter-site comparative analysis.

The benefits of sharing data depend not only on their playing well together, but on the ease with which they can be accessed in data tables that can be read by analytical software. Here again we see considerable variability. The modal approach of tDAR, ADS, and elsewhere is to allow users to download files as they were archived by principal investigators, all of whom use different data structures and terminology. Furthermore, the lack of *ex-ante* data coordination creates difficulty for researchers conducting comparisons among multiple sites. Both the DAACS website and DRC web application offer users a point-and-click query interface that generates custom SQL queries to return data on both context and artifacts from fields and sites chosen by the user. Data are returned in HTML tables to the browser and can be downloaded for easy ingestion by an analytical package where, thanks to their conformity to a single set of classification and measurement protocols, they can be readily analyzed.

Project History

Since its inception in 2000 at Monticello, DAACS' approach has been to use the web to facilitate communication and community building among researchers focused on early-modern slave societies, based on shared engagement with large amounts of fine-grained data that conform to explicit protocols a collaborative team of researchers helped devise. Hence the initial step for the DAACS project was to engage leading archaeologists and historians studying enslaved societies to identify major research issues and the kinds of data required to address them. Together DAACS staff and collaborators delineated data structures for both artifacts and the excavation contexts in which the artifacts were found, along with explicit classification and measurement protocols and data structures for both artifacts and contexts. These structures were instantiated in a SQL database with an accompanying data-entry client. Today the DAACS database contains roughly 200 related tables, including authority tables. The [data structures](#) and [cataloging protocols](#) are documented on the DAACS website.

Between 2000 and 2013, entire archaeological assemblages from 60 excavated sites were brought to Monticello for cataloging into the DAACS database. The majority of these digitization projects were funded by peer-reviewed grants (Appendix 3). The database resided on a single server at Monticello and the data it contained were served to the public through the DAACS website. As DAACS grew and scholars reaped the interpretive benefits of large quantities of comparable data about slavery, archaeologists working in museums and academia began requesting use of the database not only to curate their own collections but to also contribute data from their sites so it could be served from the DAACS website. By 2012, DAACS had freely provided stand-alone versions of the DAACS client-server database to museums such as Mount Vernon and Drayton Hall, and to graduate students working at multiple universities.

It was clear that managing and reintegrating data from these separate databases into the main DAACS database at Monticello, from which data was served to the public via www.daacs.org, would quickly become untenable. To address the growing demand to use the DAACS database, DAACS pursued funding for the [DAACS Research Consortium (DRC)](#). In 2012, the Mellon Foundation provided funds to build the DRC Application, giving DRC collaborators the ability to enter data via a browser from anywhere on the web. Appendix 1 provides details of the DRC Application and reviewers can watch a brief video tutorial about describing the application here: (b) (4) .

Scholarly and Educational Impacts of DAACS and DRC

DAACS's influence on archaeological scholarship is evident in an accelerating stream of journal articles, monographs, and theses that feature DAACS data. Recent authoritative reviews by archaeologists have highlighted DAACS' role in advancing the cause of digital data sharing and collaboration in archaeology (Little 2007; Richards 2008; Singleton 2010; Arkush 2011; Fennell 2011; Gonzalez-Tennant 2011). Historians are also combining DAACS data with primary sources to

document literacy among enslaved people in North America (Morgan and O'Shaughnessy 2006; Bly 2008). Furthermore, each year since 2006, a new crop of masters and doctoral students have contributed data to DAACS or engaged directly with existing DAACS data for their theses and dissertations. A complete bibliography of publications that use DAACS data can be found [here](#). A bibliography of theses that use DAACS data can be found [here](#).

Furthermore, archaeologists at universities across the country use DAACS for teaching. Archaeologists and historians at Syracuse University, Northwestern University, the University of North Carolina, the University of Virginia, the University of California at Santa Cruz, and the University of the West Indies have developed courses that feature student projects built around the analysis of DAACS data. Agbe-Davies et al. (2013) provides pedagogical details on these courses, while the DAACS website provides access to [syllabi](#) from several undergraduate and graduate courses that use DAACS data.

In addition to its academic audience, DAACS leverages the Internet to share data and open research opportunities to a host of diverse audiences. Both online and bricks-and-mortar museum exhibits curated by the National Museums Liverpool's [International Slavery Museum](#), Monticello, Mount Vernon, The Fitzwilliam Museum, and the Smithsonian are driven by DAACS data. Facebook and Twitter feeds keep colleagues, students, and the interested public engaged with DAACS' most recent activities.

Work Plan

We request Level III funds to support 24 months of work, beginning January 2018 through December 2019.

January – June 2018: "DRC Silver" and "DRC Bronze" Design and Development

- In January, DAACS, IATH, and Convoy staff will conduct user feedback workshops on the DAACS [website](#) at the Society for Historical Archaeology Meetings in New Orleans. At the same time, they will design and deploy virtual user testing of both the DAACS website and the current "DRC Gold" Application to identify user difficulties and successes.
- The Advisory Committee will meet at Monticello in Spring 2018 to discuss the goals for, and content of, "DRC Silver" and "DRC Bronze" access modes. The committee will also select cataloging protocols specific to the needs of different user groups (DAACS, IATH, and Convoy Staff, Advisory Committee).
- Following user workshops and the Advisory meeting, DAACS and Convoy staff will produce data-entry interface designs and wireframes. IATH will begin access mode programming.

July – December 2018: DRC Silver and Bronze Testing, Implementation and Documentation

- Current "DRC Gold" users will do initial testing on the "DRC Silver" and "DRC Bronze" access modes (DAACS staff and Archaeology Departments at Monticello, Mount Vernon, Drayton Hall, FLMNH, and SCIAA). Galle will send the interfaces to DRC Advisory Committee members for virtual testing and feedback (Bingler, Martin, McDaniel, Thomas, Galle).
- Interface revisions will be completed by December (IATH, Convoy, and DAACS staff).
- DAACS staff creates cataloging manuals for the "DRC Silver" and "DRC Bronze" interfaces.

January –June 2019: Open API Development/DAACS Website Revision Design

- Two-day training workshop on "DRC Silver" and "DRC Bronze" access modes for current "DRC Gold" accredited and prospective users in advance of the Annual Meeting for the Society for Historical Archaeology (January 2019, St. Charles, MO). Feedback regarding API content will also be sought. Final revisions will be made to access modes (DAACS Staff).

- "DRC Silver" and "DRC Bronze" access modes go live to accredited users.
- IATH begins development of the DAACS Open API. Convoy and DAACS staff work together on DAAC website navigation and query revisions.
- Throughout 2019, DAACS staff will present on the project at the Society for Historical Archaeology, the Society for American Archaeology, and Southeastern Archaeological Conference meetings, and the Middle Atlantic Archaeological Conference.

July –December 2019: Open API Completion and DAACS Website Revision Implementation

- Open API programming is completed. IATH and DAACS staffs develop example scripts and user documentation for DAACS website.
- Convoy and DAACS staffs complete website navigation redesign.
- DAACS staff complete SQL query revisions and pass to IATH staff, who implement the new queries and connect them to www.daacs.org.
- Redesigned DAACS website launches to the public in December 2019.
- IATH and DAACS staffs complete white paper and final products (see below).

January 2020 Onward

- DAACS begins annual no-cost three-week DRC Application training at Monticello, using funds from the DRC endowment created by NEH DHAG Sustainability Match.

Staff

The principal investigators for *Expanding DRC*, Dr. Jillian Galle (DAACS) and Dr. Worthy Martin (IATH), have worked closely on numerous successful DAACS-related projects. Galle has directed DAACS since its inception in 2000. She has extensive experience managing and completing large, collaborative projects that involve both archaeological and technical components, including the management and development of the DAACS database and the DRC data entry application funded by the Mellon Foundation in 2012. Galle is responsible for coordinating and directing all aspects of the grant, including managing DAACS staff, communicating and organizing meetings with the Advisory Board, and planning and coordinating the technical work conducted by IATH and Convoy. She will spend 50% of her time on this grant, 25% of which will be matched by the DAACS endowment.

Dr. Worthy Martin, Director, Institute for Advanced Technology in the Humanities, has been involved with DAACS since 2000, first as an advisor and then in the design of the DRC web-accessible information architecture (http://www.daacsrc.org/). Martin will be responsible for overall supervision and coordination of IATH's part of the project. He will contribute to the access mode design and API implementation. He will supervise IATH programming staff and will spend 5% of his time on this project during the academic year and 10% in the summer.

Tim McDaniels, Managing Partner and Senior Developer with Convoy, has worked directly with DAACS since 2003, as programmer and project manager for the development of the DAACS website. He has most recently worked with DAACS and IATH on the development of the DRC Application. He will manage the user testing and access mode design. He will also contribute to the development of the DAACS Open API.

Technical staff include Mr. Robert Bingler, Senior Programmer and Analyst with the Institute for Advanced Technology in the Humanities and Mr. Matthew Thomas, Managing Partner and Creative Director, Convoy. Bingler developed the DAACS PostgreSQL database and wrote the Ruby-on-Rails "DRC Gold" application. He will program the "DRC Silver" and "DRC Bronze" access modes and the new website queries specific to the new modes. He will spend 20% of his time on this project. Mr. Thomas will oversee the creative

development for all studio accounts for Convoy. He will lead the Convoy design team in the design of the "DRC Silver" and "Bronze" access modes, as well as the DAACS website updates and additions.

Together DAACS Senior Archaeological Analysts, Dr. Lynsey Bates, Dr. Elizabeth Bollwerk, and Ms. Leslie Cooper, have over 30 years of experience working with DAACS. They are not only responsible for collections analysis, digitization, and cataloging, they also run DAACS training workshops, work closely with DAACS collaborators, and conduct research and analysis. They are skilled programmers in SQL and R, and are proficient in CAD and GIS packages. For this project, the DAACS Senior Archaeological analysts will play a critical role in planning and guiding user testing of the DAACS website and DRC interfaces. During the first year of the project, they will help run the March Advisory Board meeting. They will work with Convoy to produce the "DRC Silver" and "DRC Bronze" access mode wireframes. Starting at the end of the first year and working well into the second year, they will produce the related cataloging manuals for the new "DRC Silver" and "DRC Bronze" interfaces. They will also work with IATH and Convoy to write code and a User Guide to accompany the DAACS Open API. They will spend 30% of their time on the project. We request funds for Bates' and Bollwerk's time, with Cooper's time matched by the DAACS endowment.

The DAACS Research Consortium Advisory Board will advise the development of the data entry interfaces. It is comprised of archaeologists working in academia, museums, government agencies, and cultural resource management firms who currently use or have expressed interest in using the DRC Application. The board will convene once at Monticello, for a two-day workshop, again for two days prior to the Society for Historical Archaeology meeting in January 2019, and virtually as needed over the course of the project. The Board will guide content and design of the data entry interfaces. Letters of commitment from each Advisory Board member are provided in Section 8 of this proposal.

Final Product and Dissemination

The source code for the current DRC Application "DRC Gold", developed with Mellon Funding in 2014, is publically available on GitHub under a GNU Affero General Public License, Version 3 (https://github.com/jgalle/DRC). We will make the source code for the new DRC interfaces available through the same GitHub link. The archaeological content digitized using all access modes will be made publically available on the DAACS website. Cataloging protocols and manuals for "DRC Gold" are currently available through the DAACS website. New cataloging manuals for "DRC Bronze" and "DRC Silver" will be made publically accessible through the same link.

Promotion of the "DRC Silver" and "Bronze" access modes and DAACS Open API will begin in 2019 at the major annual archaeology and history conferences. In addition to presenting professional papers and scientific posters, DAACS will maintain a table at the book rooms of these conferences. We will also promote the new digital assets through social media posts (Facebook, Twitter, Instagram), and through professional listservs. Galle, Martin, and DAACS staff will seek to publish articles related to the project. Links to these publications will be provided on the research section of the DAACS website. A final white paper describing the project, and documenting the process, will be submitted to NEH and posted on the DAACS and DRC websites.

Upon completion of the interface development, DAACS will offer annually one no-cost three-week long training session at Monticello for six archaeologists seeking to use the DAACS database. This free annual training, as described earlier, will be supported by the 5% draw from the DRC endowment established by the NEH Sustainability Match, requested in Section 10: Sustainability.

7. Appendices

Appendix 1: The DRC Application

The current DRC Application, "DRC Gold," is accessible to accredited users with a login from any web browser through www.daacsrc.org (Figure 1). We have created a short video that introduces the DRC Application, and all of its components. It can be viewed here:
(b) (4)

The public facing side of www.daacsrc.org provides information on the project and its partners. It also highlights current research conducted by our DRC partners using the DRC Application (Figure 1). Those users who log into "DRC Gold" are taken to a *Dashboard*, the "homepage" through which our partners navigate the application, keep track of their recent work on the system, message one another, and share data files and code (Figure 2). From the *Dashboard*, users can access fifteen *Data Entry* modules, one for each of fifteen basic data types represented in the database: Projects, Contexts, Features, Ceramics, Glass Vessels, Beads, Buckles, Buttons, Pipes, Utensils, Fauna, All Other Artifacts[3], Images, Objects, and Artifact Boxes. Users can also access the *Query the Database* module, which provides dozens of customizable queries for interrogating the data in the Archive. Users can also access the *Tools* module of the Application from the *Dashboard*, where they can download readings, SQL and R code, and manage their account.

Figure 1: Home Page for www.daacsrc.org. Login box on upper right. Zoom in to view details.
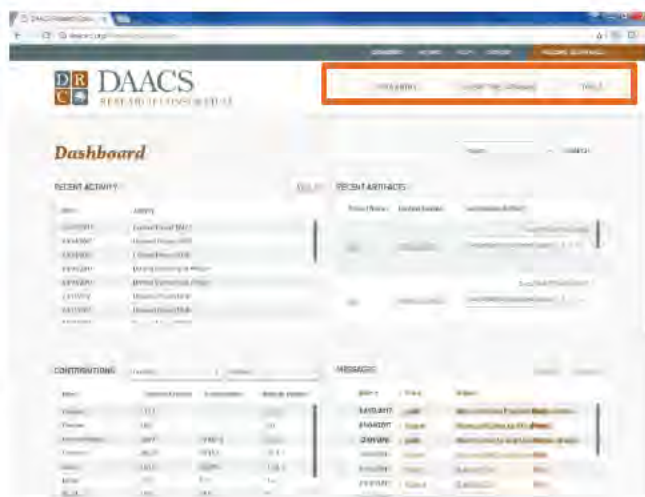
Figure 2: The DRC Application Dashboard tracks a user's recent cataloging activity, provides summary information on cataloger progress sorted by user and time period, and offers a message center. Zoom in to view details.

The *Data Entry* modules are the front-end forms that give users direct access to the DAACS PostgreSQL database, a complex hierarchical database of over 200 data tables. The DAACS website describes the database structure. These Data Entry Modules comprise the backbone of "DRC Gold" and require users to enter data into as many as 50 fields per module. Each module has up to

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[3] "All Other Artifacts" is a general category

eight sub-modules to handle data entry for related tables. Figure 3 shows how a *Data Entry* module for ceramics is structured. The brief video provides a dynamic view into multiple *Data Entry* modules, not only for artifacts, but also for field records, images, and objects. Modules that facilitate the entry of data for Objects, Images, and Artifact Boxes serve a critical curatorial function while the other artifact-type and context modules are designed to collect detailed data for research and analysis. The *Data Entry* modules have benefited from over a decade of workflow optimization.

Figure 3: The Ceramic Data Entry module in "DRC Gold" contains 9 tabs for recording data from general information on ware type and form, to detailed sherd measurements, decorative data, information on wear and condition, base mark data, inclusions and other data specific to hand-built coarse earthenwares, and image and object information. Zoom in to view details.

Another critical component of the DRC application is the *Query the Database* module that contains dozens of point-and-click customizable queries (Figure 4). These queries are identical to the queries found in the publicly-accessible *Query the Database* section of the DAACS website (Figure 5). DRC collaborators have access to data from all sites in the PostgreSQL database when querying while logged into the DRC Application. The public only has access to data from sites that have been published on the DAACS website. More details on queries are provided in Appendix 2 and in the video.

Figure 4: Publically-accessible *Query the Database* portal for www.daacs.org. Zoom in to view details.
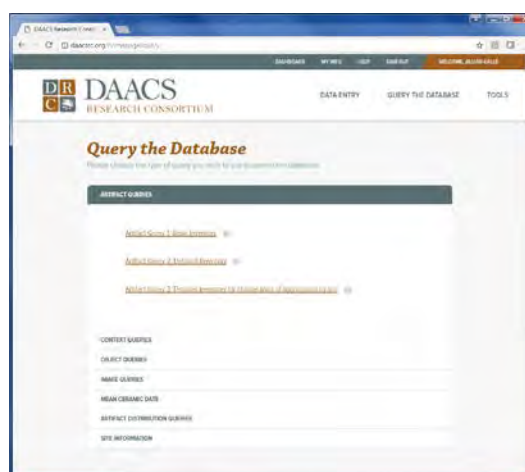
Figure 5: *Query the Database* portal for www.daacsrc.org, available only to DRC partners with a login. Zoom in to view details.

Appendix 2: The DAACS Website (www.daacs.org)

Two sections of the DAACS website are slated for upgrades: *Archaeological Sites* and *Query the Database*. The *Archaeological Sites* section of the website delivers detailed discursive information on each of the 80+ archaeological sites in the database (e.g. https://www.daacs.org/sites/field-quarter-kes/#home). The *Query the Database* (https://www.daacs.org/query-the-database/) section contains point-and-click query tools that give the public access to data from these sites. The DAACS PostgreSQL database contains over 2 million records on artifact and the contexts from which they came, as well as associated images. Query results may be viewed on screen, or downloaded for import into local statistical and mapping applications.

The basic structure of the DAACS website, which delivers the archaeological data and related discursive site content, maps, and images to the public, has remained unchanged since its development in 2004 when it was launched with data from only six sites. Thirteen years later, the website delivers data from over 80 sites and that number will only increase more rapidly in the wake of the initial phase of DRC and this current proposal. We have created a short video that demonstrates navigation and querying on the DAACS website and how those sections can be better improved. It can be viewed here: **(b) (4)**

The navigation and search features for the *Archaeological Sites* section need to be redesigned to effectively handle the large number of sites now in the Archive. There are two main ways to find archaeological sites in DAACS: through fly-out menus organized by region (Figure 1) or by navigating a map (Figure 2) organized by region, country, and state. These methods have become unwieldy as the number of sites has grown. In addition, as the sites in DAACS have become more variable, users have asked for ways to find sites by key variables such as occupation dates, occupant status, rural or urban context, colony, region, and the ecological niche that the plantation or production unit occupied in the Atlantic economy. We need easier ways for researchers to discover sites without having to read each discursive site background page. In addition to updating and streamlining basic site navigation, we will develop new site discovery and visualization tools, along the lines offered by https://www.tableau.com/, to help users find sites they wish to use in their research.
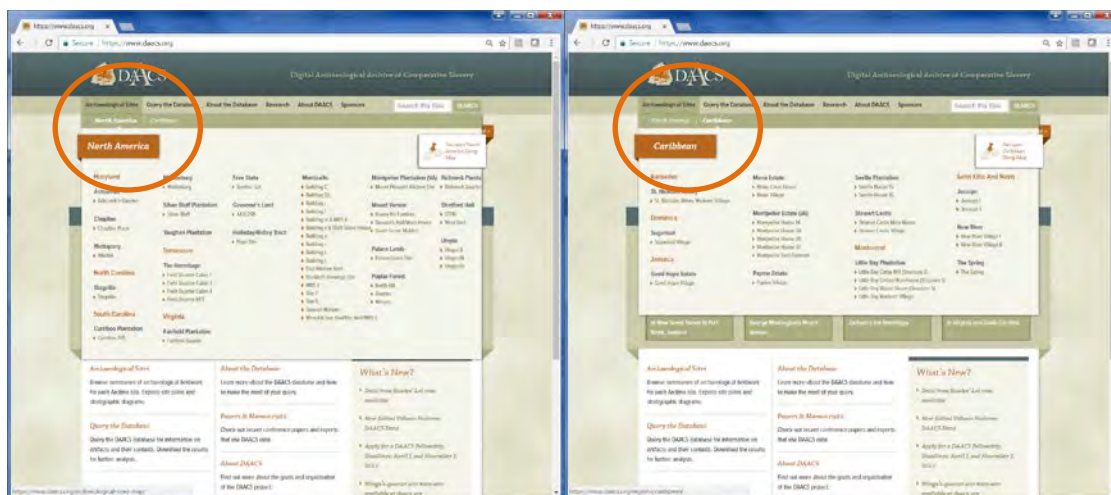

Figure 1: Overly dense fly-out menus from the *Archaeological Sites* link off the DAACS homepage (www.daacs.org) is one way to find sites in DAACS. Zoom in to view details.
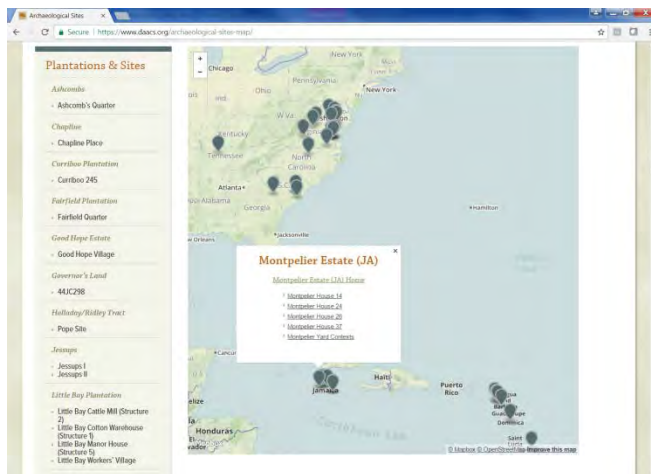
Expar

30

Figure 2: A navigable map, with pop-up links, and right-hand side bar provide a second way to find sites in DAACS. Zoom in to view details.

The *Query the Database* section of DAACS offers users myriad ways to access the large quantities of complex data contained in DAACS PostgreSQL database. We currently offer seven different types of queries: Artifact Queries, Context Queries, Image Queries, Object Queries, Site Information Queries, and Document Queries (Figure 5). Users can select queries based on the level of data they would like returned. Although these queries are highly customizable, the initial design was based solely on the numerous "DRC Gold" data fields and standards (Figures 3-6). Over a decade of feedback has indicated that users want more flexibility to choose specific data even in their most basic queries. We will design multi-site queries that include data for "DRC Bronze" and/or "DRC Silver"-mode sites that will return data values for fields associated with the lower level of recorded detail, avoiding confusion that might arise from large numbers of missing values. We will also develop less complex customizable queries based on user feedback.
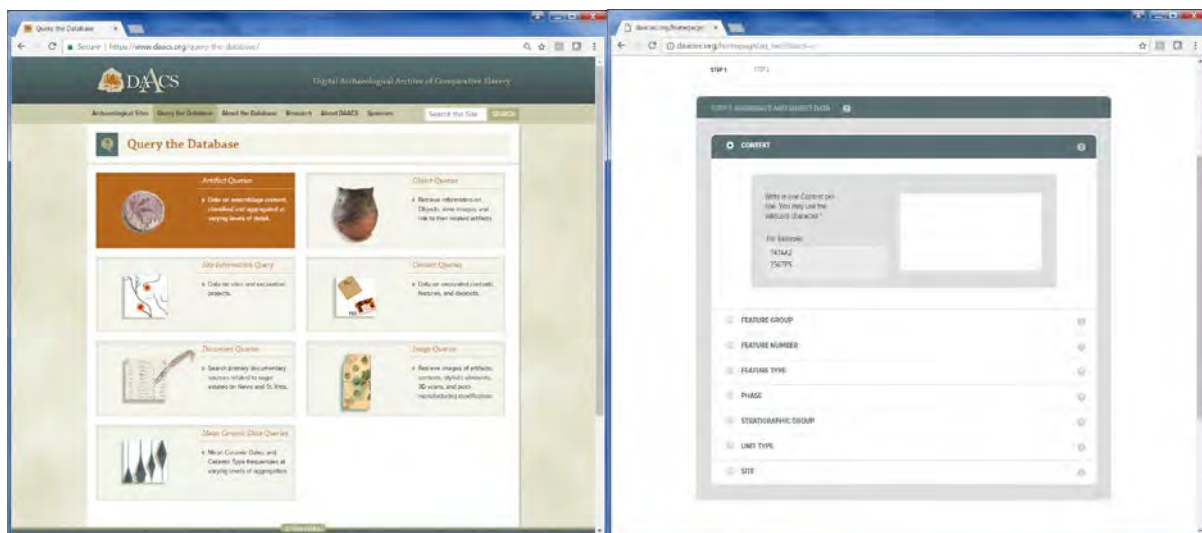
Figure 3: [Query the Database](#) landing page offers DAACS users access to seven query types, each type containing multiple customizable query options. Zoom in to view details.

Figure 4: Each query allows users to select the level of aggregation at which they would like data returned. They can choose to view data by Context, Feature Group, feature Number, Feature Type, Phase, Stratigraphic Group, Unit Type, and Site. Zoom in to view details.
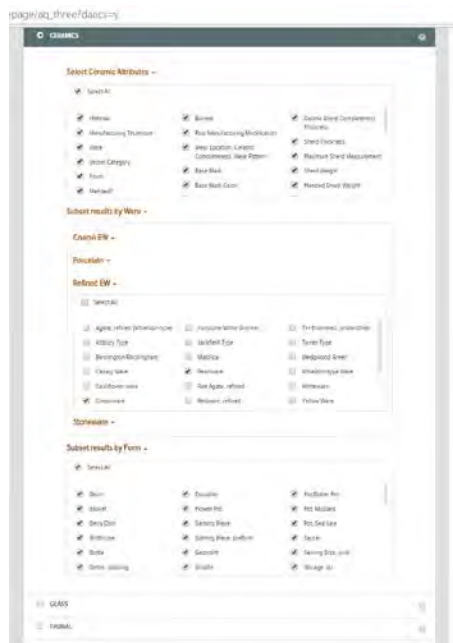
Figure 4: Customizable queries allow users to select which attributes and types for which they would like data. Zoom to view details.

Figure 5: Data are returned on screen and downloadable in html format for import into statistical and mapping programs. Zoom to view details.
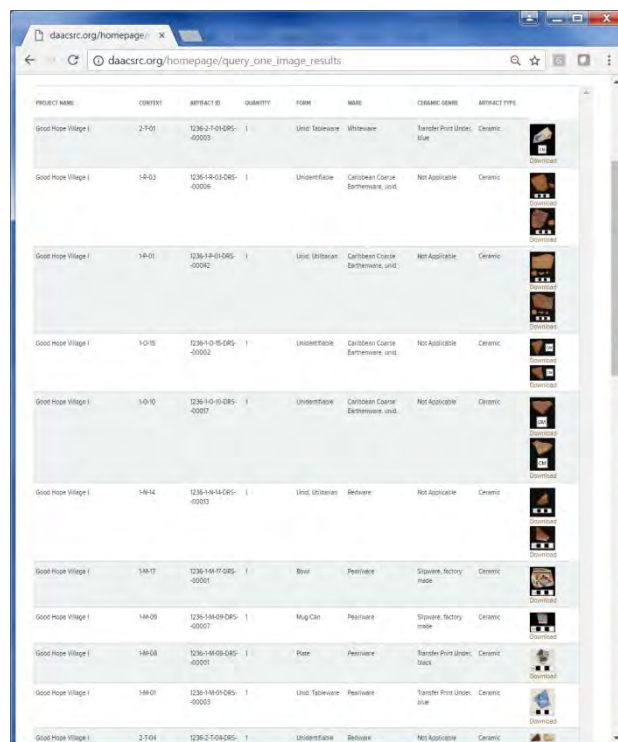

Figure 6: Users can choose to have images, along with many other attributes, when selecting data. Zoom to

Appendix 3: DAACS History of Grants

The Digital Archaeological Archive of Comparative Slavery (DAACS) began in 2000 as a regional collaboration among archaeologists and historians working in the Chesapeake region on the history of slavery. This initial project, originally known as The Digital Archaeological Archive of Chesapeake Slavery, was funded for four years by the Andrew W. Mellon Foundation ($600,400). In 2001, the National Endowment for the Humanities awarded DAACS a Challenge Grant. The Challenge Grant provided DAACS $500,000 toward an endowment, conditional on raising $1.5 million from private sources over four years. This endowment provides long-term financial stability, ensuring DAACS's continued on-line presence and data longevity. On June 1, 2003 Bruce Cole, chairman of the National Endowment for the Humanities, designated DAACS part of NEH's new "We the People" initiative.

In October 2004, the Mellon Foundation awarded DAACS a second grant to fund the addition to the archive of data from 22 sites in Virginia, Maryland, the Carolinas, and Jamaica ($576,000). The Reed Foundation, Inc. provided funds in April 2007 ($22,000) and April 2008 ($20,000) to support for UWI, Mona undergraduate participation in the DAACS-UVA Field School in Historical Archaeology in Jamaica (2007) and The St. Kitts-Nevis Digital Archaeology Initiative survey on Nevis (2008). DAACS, in collaboration with the University of Southampton and The International Slavery Museum, was awarded a JISC\NEH Transatlantic Digitization grant in support of The St. Kitts-Nevis Digital Archaeology Initiative (2008).

In 2009, the Monticello lab received a major grant from NEH ($304,971) to catalog and digitize six sites from Mulberry Row. This project was completed and launched on the DAACS website in 2012. DAACS also assumed responsibility for the NEH-funded The Hermitage Cataloging Project in August 2009. Sites analyzed in this grant launched on the DAACS website in July 2013.

In 2011, DAACS forged a collaboration with the South Carolina Institute for Anthropology and Archaeology (http://artsandsciences.sc.edu/sciaa/) to conserve and digitize field records and artifacts from the most completely excavated and frequently cited eighteenth-century slave village sites in South Carolina (*e.g.* Ferguson 1992, Singleton 1985). This project was funded by Save America's Treasures, a joint program from the National Trust, the National Park Service, the Institute for Museum and Library Services, and NEH (http://www.preservationnation.org/travel-and-sites/save-americas-treasures/). This project was completed in May 2014 when the data went live on the DAACS website.

In 2013, DAACS received its third Mellon Foundation award for the DAACS Research Consortium ($450,000). That same year, Jillian Galle and DAACS were awarded a NSF MURR for the Instrumental Neutron Activation Analysis of Jamaican coarse earthenware ceramics ($23,730).

In 2014, NEH awarded DAACS funds for *Beyond the Mansion 2.0: Completing a digital archive for thirty years of archaeological research at The Hermitage* ($300,000). This project is ongoing and slated for completion in May 2018. DAACS is also currently a subcontractor for the Florida Museum of Natural Histories' 2016 NEH grant (PW-234762-16), *Cataloguing the Franciscan Missions of La Florida* (subcontract $50,221.40).

Date	Granting Agency	Project Title	Amount
1999	Andrew W. Mellon Foundation	*The Digital Archaeological Archive of Chesapeake Slavery*	$600,400
2001	National Endowment for the Humanities	Challenge Grant for *The Digital Archaeological Archive of Comparative Slavery*	$500,000
2003	National Endowment for the Humanities	DAACS is designated an NEH "We the People" Project	
2004	Andrew W. Mellon Foundation	Scholarly Communications grant for The Digital Archaeological Archive of Comparative Slavery	$576,000
2007	Society for Historical Archaeology	Award of Merit for The Digital Archaeological Archive of Comparative Slavery	
2007	The Reed Foundation, Inc.	The DAACS Caribbean Initiative, Stewart Castle Survey. Grant to support the enrollment of UWI, Mona students in the UVA Jamaica field school in historical archaeology	$22,000
2007	The Reed Foundation, Inc.	The DAACS Caribbean Initiative and The St. Kitts-Nevis Digital Archaeology Initiative, New River Survey. Grant to support the historical archaeology internships for UWI, Mona students.	$20,000
2008	The National Endowment for the Humanities	NEH- JISC Transatlantic Digitization Grant for *The St. Kitts-Nevis Digital Archaeology Initiative*	$132,832
2009	The National Endowment for the Humanities	Assumed transfer of *The Hermitage Cataloging Project* and remaining funds	$166,128
2009	The National Endowment for the Humanities	Awarded Monticello Department of Archaeology funds for *The Mulberry Row Reassessment: Digitizing a Decade of Archaeological Research on Slavery at Monticello.* A collaboration with DAACS	$304,971
2011	Save America's Treasures	*The Archaeology of Slave Life at Yaughan and Curriboo, South Carolina* (with SCIAA)	$105,199
2013	Andrew W. Mellon Foundation	Scholarly Communications grant for *The DAACS Research Consortium*	$449,918
2013	Missouri Research Reactor Archaeometry Laboratory	NSF grant #1110793 awarded to Jillian Galle and DAACS for *Manufacturing Dynamics of Afro-Caribbean Ceramics on Jamaica in the 18th and 19th Centuries*	$23,730
2014	The National Endowment for the Humanities	NEH HCRR Grant for *Beyond the Mansion 2.0: Completing a digital archive for thirty years of archaeological research at The Hermitage*	$300,000
2016	The National Endowment for the Humanities	Subcontractor on FLMNH's NEH HCRR *Cataloguing the Franciscan Missions of La Florida*	$50,221

Appendix 4: The Thomas Jefferson Foundation

The Thomas Jefferson Foundation (TJF) is a scholarship-driven, nonprofit educational organization that owns and operates Monticello, the history museum that interprets the mountaintop plantation that was home to Thomas Jefferson and his family, and hundreds of enslaved people and their families in the eighteenth and early-nineteenth centuries. Monticello is a National Historic Landmark and the only house in America on the United Nations World Heritage List (other sites on the list include the Great Wall of China, the pyramids of Egypt, and the Taj Mahal). TJF serves as the primary institution devoted to preserving and illuminating the diverse worlds of Thomas Jefferson. Over the past few decades more than 30 world leaders have visited Monticello to learn from Thomas Jefferson's life, his home and plantation, and his life-long laboratory, Monticello.

Incorporated in 1923, TJF purchased the house and land from the Levy family, stewards of the house and its ornamental grounds for 89 years. Over the ensuing years, the Foundation has reassembled the 2600-acre core of Jefferson's plantation, as well as a substantial and growing collection of furniture, decorative arts, sculpture, paintings, scientific instruments, and books that once belonged to Jefferson. Today Monticello is a history museum that actively interprets Jefferson, his house, plantation, and its enslaved and free residents to nearly 450,000 adult visitors and school children each year.

Interpretive programming is informed by cutting-edge scholarship. Jefferson was a central figure in the social and cultural dynamics of the early-modern Atlantic world, the settlement of North America by free Europeans and enslaved Africans, and the foundation of the American republic. TJF sponsors innovative research on Monticello's enslaved community. Initiatives include "Getting Word" a project devoted to reconstituting the families of people enslaved at Monticello, tracking their descendants, and collecting their oral histories and the Plantation Archaeological Survey, an ongoing study of change in agricultural ecology, slave settlement, and lifeways at Monticello, from initial European and African settlement to the Civil War. TJF's International Center for Jefferson Studies, offers residential fellowships to further research by scholars from all over the world on Jefferson's life and times (www.monticello.org/icjs). Visiting scholars have access to the new Jefferson Library, which houses books and access to digital resources related to Jefferson scholarship. Through ICJS, TJF sponsors the scholarly publication of the Papers of Thomas Jefferson, Retirement Series (www.monticello.org/papers). TJF is also home to the Digital Archaeological Archive of Comparative Slavery, an experiment in the use of the internet to encourage collaboration, data sharing, and comparative quantitative study of material life in the slave societies of the early-modern Atlantic (www.daacs.org). ICJS and DAACS staff offers undergraduate and graduate courses in history and archaeology at the University of Virginia.

As a private, nonprofit organization, TJF receives no regular local, federal, or state budget support. The Foundation is governed by a national board of 18 active trustees composed of business and public leaders. Revenues from ticket sales, museum shop, garden center, catalog, and contributions support TJF's annual budget of approximately $35 million. The Foundation has been governed by sound fiduciary principles and has operated on a balanced budget for more than 20 years. TJF has a staff that includes 150 full-time employees; 160 seasonal and part-time employees; and 16 PhDs. As illustrated by its diverse successes, the Thomas Jefferson Foundation has become a beacon among historical sites worldwide, as the interdisciplinary center for exploration of one of America's and the world's historical treasures.

Appendix 5: Select Bibliography

The following is a select bibliography drawn from the text of the grant proposal. A complete bibliography of publications that use DAACS data can be found here. A bibliography of theses and dissertations that use DAACS data can be found here.

Agbe-Davies, Anna, Jillian Galle, Mark Hauser, and Fraser Neiman
2013   Teaching with Digital Archaeological Data: A Research Archive in the University Classroom. *Journal of Archaeological Method and Theory* DOI 10.1007/s10816-013-9178-3.

Arkush, Elizabeth
2011   Explaining the Past in 2010 (The Year in Review). *American Anthropologist* 113(2):200-212.

Arbuckle BS, Sarah Witcher Kansa, Eric Kansa, Orton D, C ̧akırlar C, et al.
2014   *Data Sharing Reveals Complexity in the Westward Spread of Domestic Animals across Neolithic Turkey*. PLoS ONE 9(6): e99845. doi:10.1371/journal.pone.0099845

Berggren, Åsa, Nicolo Dell'Unto, Maurizio Forte, et al.
2015   Revisiting Reflexive Archaeology at Çatalhöyük: Integrating Digital and 3D Technologies at the Trowel's Edge. *Antiquity* 89(344): 433–448.

Berlin, Ira
1998   *Many Thousands Gone: The First Two Centuries of Slavery in North America*. Harvard University Press, Cambridge.

Bly, Antonio T.
2008   "Pretends he can read": Runaways and Literacy in Colonial America, 1730 - 1776. *Early American Studies: An Interdisciplinary Journal* 6(2), 261-294.

Bowen, Joanne
1996   Foodways in the 18th-century Chesapeake. In *The Archaeology of 18th-century Virginia*, T.R. Reinhart, editor, pp.87-130. Special Publication no. 35, Archaeological Society of Virginia, Richmond.

Carson, Cary
1994   The consumer revolution in Colonial British America: Why demand? In *Of Consuming Interests: The Style of Life in the 18th century*, Cary Carson, Ronald. Hoffman, and Peter J. Albert, editors, pp.483-700. University Press of Virginia, Charlottesville.

Farber, Gregory K., and Linda Weiss
2011   Core Facilities: Maximizing the Return on Investment. *Science Translational Medicine* 3(95): 95cm21.

Fennel, Christopher C.
2011   Early African America: archaeological studies of significance and diversity. *Journal of Archaeological Research*, 19(1):1-49.

Galle, Jillian E.
2010   Costly Signaling and Gendered social Strategies among Slaves in the 18th-Century Chesapeake. *American Antiquity,* 75(1):19-43.

2011   Assessing the Impacts of Time, Agricultural Cycles and Demography on the Consumer Activities of Enslaved Men and Women in 18th-Century Jamaica and Virginia. In *Out of Many, One People: The Historical Archaeology of Colonial Jamaica*, James Delle, Mark Hauser, and Douglas Armstrong, editors, pp. 211-242. University of Alabama Press, Tuscaloosa.

2012   Will today's graduate training in Historical Archaeology predict the future of digital research archives? *Society for Historical Archaeology Blog*. http://www.sha.org/blog/?p=1684.

2017   The Abundance Index: Measuring variation in consumer behavior in the early modern Atlantic World. In *Material Worlds: Archaeology, Consumption, and the Road to Modernity*. Barbara J. Heath, Eleanor E. Breen and Lori A. Lee, editors, pp. 162-191. Routledge, London.

Heath, Barbara J.
2012 Slave Housing, Household Formation and Community Dynamics at Poplar Forest, 1760s-1810s. In *Jefferson's Poplar Forest: Unearthing a Virginia Plantation*, Barbara J. Heath and Jack Gary, editors, pp. 105–128. University Press of Florida, Gainesville, FL.

Kansa, Eric, Sarah Witcher Kansa, and Benjamin Arbuckle
2014   Publishing and Pushing: Mixing Models for Communication Research Data in Archaeology. *International Journal of Digital Curation* 9(1):57-70.

Kansa, Sarah Witcher
2015   Using Linked Open Data to Improve Data Reuse in Zooarchaeology. *Ethnobiology Letters* 6(2):224-231.

Lupia, Arthur, and Colin Elman
2014   Openness in Political Science: Data Access and Research Transparency. *PS: Political Science & Politics* 47(01): 19–42.

Morgan, Philip D.
1998   *Slave Counterpoint: Black Culture in the Eighteenth-Century Chesapeake and Lowcountry.* Published for the Omohundro Institute of Early American History and Culture, Williamsburg, Virginia by the University of North Carolina Press, Chapel Hill, NC.

Morgan, Philip. D. and Andrew. J. O'Shaughnessy
2006   Arming Slaves in the American Revolution. In *Arming Slaves: From Classical Times to the Modern Age*, Christopher Leslie Brown and Philip D. Morgan, editors, pp. 180-208. Yale University Press, New Haven, CT.

Neiman, Fraser. D.
2008   The lost world of Monticello in evolutionary perspective. *Journal of Anthropological Research* 64:161–193.

Sheehan, Beth
 2015   Comparing Digital Archaeological Repositories: TDAR Versus Open Context. *Behavioral & Social Sciences Librarian* 34(4): 173–213.

Spielmann, Katherine A., and Keith W. Kintigh
2011   The Digital Archaeological Record: The Potentials of Archaeozoological Data Integration through tDAR. *SAA Archaeological Record* 11(1): 22-25.

9. Data Management Plan

Data Sharing

For each research project, typically an excavation at a particular site, DRC collaborators enter context and artifact data into the DRC Application and its PostgreSQL backend. The primary means by which data are shared with scholars and the general public is the DAACS website (www.daacs.org), which is built in WordPress. The Principle Investigator (PI) for each project or site works with DAACS staff to create a "home page" for each project and link to it discursive background historical information, archaeological chronologies, stratigraphic summaries, and overall digital site plans, sections, and photographs (*e.g.*, https://www.daacs.org/sites/sugarloaf/#home) After final checks are complete and the site's PI has signed off, data for the project in the PostgreSQL backend are made available to the query module on the DAACS website (https://www.daacs.org/query-the-database/).

The query module gives users access to a point-and click interface that generates custom SQL queries against the PostgreSQL backend. Users can query on chosen sites and artifact classes and chosen variables that describe them and have the data returned at different levels of aggregation, ranging from individual excavation contexts to entire sites.

Based on user choices, the query module can deliver fine-grained data on artifacts and their excavation contexts from related tables, in which each record represents a different attribute value on an artifact, and single artifacts, identified by a unique DAACS artifact ID number, span multiple records. This is useful, for example, in the study of correlations among decorative motifs on ceramics. The query module can also deliver coarse-grained data as well. For example, site-level assemblage summaries, in which each record represents a broad artifact class (*e.g.*, cut nails and its total count). The new "DRC Silver" and "DRC Bronze" cataloging modes will require catalogers to record values for smaller subsets of the complete set of "DRC Gold" fields. The DRC Advisory Committee will help us identify the fields that will be required for each mode. Finer grained data will not be available for sites catalogued in Silver and Bronze modes. But the benefit of the tradeoff is the ability to catalog larger assemblages on tighter budgets.

Data Types

Below is a summary of the kinds of data types cataloged into, and managed, by the DRC Application and the DAACS website.

Archaeological Field Records: DRC-certified archaeologists enter all information found on the original archaeological field records, including sediment descriptions for layers, and the stratigraphic relationships among those layers, into the DAACS database's context tables and related tables. This process creates easy to search records that are linked to each artifact from that context. DRC partners link photos and scanned paper field records to their corresponding context records. All context data are available for download in .html format through the *Query the Database* section of the DAACS website.

Artifact Records: The structure of the DAACS database allows for recording of detailed information about individual artifacts. DAACS classification and measurement protocols are described in online manuals. Detailed guidelines in written form ensure consistency among catalogers and provide researchers with an opportunity to understand how the data they seek

to use were generated. DRC catalogers and analysts undergo specialized training and testing in these protocols to ensure that they are implemented accurately across all collections. All artifact data are available for download in .html format through the *Query the Database* section of the DAACS website (https://www.daacs.org/query-the-database/).

Artifact Images: All unique, illustrative, or diagnostic artifacts and all artifacts exhibiting any sort of post-manufacture modification are digitally imaged. A set of DAACS cataloging protocols specifies how these artifacts should be imaged, named, and stored. Depending on size, select artifacts are either scanned or photographed using a professional camera setup. Images are uploaded and image records are linked to the appropriate artifact and/or object record. They are served to the public through the Query-the-Database section of the DAACS website.

Context and Other Excavation Images: Existing photographs and slides are scanned at 300 dpi, saved as archival .tiffs and .jpgs, and are linked to the appropriate project and context records in the database. They are served to the public through the Query-the-Database section of the DAACS website.

Site Maps, Excavation Plans and Profiles: Hand-drawn site maps and excavation plans and profiles are scanned following established DAACS protocols at 300 dpi and saved as archival .tiffs and .jpegs. Plan and sections of individual contexts are linked in the DAACS database to the appropriate context records. Composite site plans are then digitized in vector format using a CAD program from the mosaics of the scans, following standard DAACS protocols to ensure consistency in the depiction of particular subsurface features, above-ground, extant architectural elements, and excavation areas across all sites launched online. Vector plans are saved for delivery on the DAACS website in .dgn (Microstation) and .dxf (AutoCad) formats. Site plans in .pdf (Adobe) also are made available online for download.

Metadata Resources: DAACS maintains detailed metadata on the DAACS data structures and the process for creating the archaeological data in DAACS, such as cataloging manuals, and tutorials on how to use the data. These are shared on the DAACS website (https://www.daacs.org/about-the-database/daacs-cataloging-manual/)

Source Code

As detailed in the Final Product and Dissemination section of the Narrative, all source code for the DRC interfaces and Open API will be documented and made freely available for download, reuse, and modification in a public repository at GitHub.

Storage, Maintenance, and Protection of Data

Currently, the DAACS database backend and all linked artifact and context images are housed on a dedicated PostgreSQL server located at the University of Virginia's Institute for Advanced Technology in the Humanities. The entire server is backed up daily on two Quantum VS1 DLT tapes. The DAACS PostgreSQL database is not directly connected to the Web. The DRC Application website (www.daacsrc.org) and PostgreSQL database are tarred and gzipped to another server not accessible to the public after every update. This process adds a third layer of backup and allows previous versions of the website to be retained for historical purposes. Finally, the DAACS PostgreSQL database is also manually backed up prior to any database maintenance or updates. This

process of data storage and maintenance has worked seamlessly since 2014. We will continue using this process for all software and data produced as a result of the *Expanding DRC* project. The DAACS website is built in WordPress, an open-source content management system. It presents, in HTML, discursive sites summaries and the items listed above.

10. Sustainability plan

Financial Sustainability

The DAACS Endowment

The Digital Archaeological Archive of Comparative Slavery reaps many benefits from its institutional setting at the Thomas Jefferson Foundation (Appendix 4, http://www.monticello.org). One of the most important is financial sustainability, made possible by a restricted endowment, seeded with a $500,000 NEH Challenge Grant in 2001 and matched 3:1 by Monticello donors by 2005. The successful match created an initial $2 million endowment, worth roughly $3.3 million dollars today. Under Monticello's conservative accounting rules, this yields an annual income stream of about $170,000 which supports essential DAACS staff, the DAACS and DRC websites, DRC application maintenance, and equipment upgrades. This annual endowment draw ensures the longevity of the digital resources produced and supported by DAACS. Additionally, the Monticello Department of Archaeology contributes $4000 annually specifically to maintenance of, and upgrades to, the current DRC database application, as it is the only cataloging system used by Monticello. They will continue to do so for the foreseeable future.

NEH DHAG Sustainability Match

Here we request the $50,000 Sustainability Match offered by NEH to be matched 1:1 by Monticello donors. The $100,000 raised by this matching program will be held in a separate restricted endowment to support training and technical support for the DRC Application. Following Monticello's accounting rules, we expect an initial annual yield of around $5000 to support one annual three-week training and certification session that would be offered at no cost to six archaeologists by application. At least three of the six positions will be reserved for graduate students wishing to use the DRC system in their dissertation research.

Sustaining the DAACS Research Consortium and its related technology requires not only financial investments but also investments in training, and community building. Training in the DRC Bronze, Silver, and Gold interfaces is the most effective way to annually grow and broaden the user base of both the database and the DAACS archive that delivers the data to the public. DRC training is a rigorous, three-week commitment that combines background readings, lectures, hands-on material culture investigations and direct data-entry practice, with careful guidance and supervision from veteran DAACS catalogers. Our experience training both new DAACS staff members and current DRC partners over the past decade reveals that all three components are necessary to ensure that new users can accurately implement the protocols. We have found that no amount of reading or lecture can substitute for hands-on cataloging experience.

During the training sessions, new DRC partners begin entering data for archaeological contexts and artifacts from their sites into the new DRC Application. DAACS staff works closely with the partners, ensuring that they will generate accurate data using new database access modes. The new partners must pass an exit material culture and cataloging assessment in order to become "certified" to contribute data that will eventually go live to the public on the DAACS website. This certification exam is the most reliable way to ensure that accurate and comparable data are being created and entered into DAACS. Upon completion of the training program, new DRC partners will return to their home institutions from which they can catalog and analyze their sites, while choosing which ones to make publically accessible either through DAACS or their own dedicated websites.

The DRC Endowment will also grow annually with contributions from our DRC partners, long-term, non-student users of the DRC Application, who contribute to its maintenance. DRC Partner rates are scaled to the institution type. Cultural resource management firms and other for-profit organizations are asked for an initial $8,000 contribution to the DRC endowment, with an annual $1200 fee for unlimited cataloging seats. Museums, government agencies, and other non-profit organizations are asked for initial $5000 contribution to the endowment, with an annual $1000 fee for unlimited cataloging seats. Academics teaching in college or university settings are asked for a one-time contribution of $1000 to the DRC endowment. As it grows, the annual endowment draw will be used to increase the number of no-cost training sessions and provide funds for technical upgrades.

Collaborating graduate students will be given free access to use the DRC interfaces and database for the duration of their graduate studies and will retain free access to their dissertation data after they have completed their degree. They are asked to launch their research sites live on the DAACS website within one year of completing their degree. Postdoctoral collaborators will be asked to contribute to the DRC endowment scaled by their institutional affiliation, in order to add data from new sites. Postdoctoral scholars who used the DRC application for their dissertation, and who do not have an institutional affiliation, will retain access to the system for data entry at no cost until they obtain a formal position.

In exchange for these contributions, DAACS guarantees secure access to DRC partner data through the DRC Application. DAACS also ensures the long term security of their data, which reside on a server at the University of Virginia that is backed up nightly. DRC partners may leave the consortium at any time. If they choose to stop using the DRC application, DAACS will give them their data in .csv files and will delete their data from the database. The only exception concerns data from archaeological sites that have already been made live to the public through the DAACS website. Once sites go live on DAACS.org, they are in the public domain. DRC partners are asked to sign an institutional agreement with DAACS and the Thomas Jefferson Foundation that specifies the fees and data rights and responsibilities of each entity.

As the DRC endowment established by the NEH DHAG Sustainability Match grows, the endowment draw will also be used to support additional DRC training workshops not only at Monticello, but also at conferences and institutions requesting training.

Intellectual Sustainability

This project is a critical step in creating a network of collaborating scholars linked by DAACS application, protocols, and analytical skills, and interacting at levels that have hitherto only been possible within a single campus. Exploring new ways to nurture scholarly networks in graduate education and among research institutions is a goal with particular contemporary salience. The number of graduate students in the humanities and humanistic social sciences is shrinking. Smaller numbers of student peers at a single institution not only curtails interactions with faculty as seminars disappear, but also means a decline in engagement among student peers, which many scholars view as the most valuable aspect of their graduate educations. Students and faculty worry that the educational experience will suffer. So far the modal response has been to build connections to other disciplines on the same campus (Wilson 2012). The DAACS Research Consortium explores

a complementary solution: to use cyber infrastructure, training, and a shared research focus to build a network of scholars and graduate students at multiple institutions.

The new DRC options provided by the *Expanding DRC* project will exponentially increase the size of the current DRC network. As they do with current DRC partners, DAACS staff will provide DRC user support through email, phone, and video conferencing. The DAACS and DRC endowments will enable in-person training sessions and will provide funds for DAACS staff to have "help desk" tables at three-to-four major professional conferences a year. Finally, the DAACS and DRC endowments will also allow DAACS staff to respond to requests for new technological upgrades and additions to the website and DRC application, as user needs and technology advance.