Project Acronym: Concordia

Version: Final

Contact: charlotte.rooueche@kcl.ac.uk

Date: 13.viii.2009

JISC Final Report

Title Page

Concordia: King's College London and Institute for the Study of the Ancient World, New York University

Authors: Charlotte Roueché (Manager) with Gabriel Bodard (Technical Lead) and Tom Elliott (NYU)
Email: charlotte.roueche@kcl.ac.uk

August 2009

Table of Contents

Acknowledgements

This project was funded under the JISC/NEH Transatlantic Digitisation Collaboration Grants. It was a joint project between King's College London and Institute for the Study of the Ancient World, New York University. Several other organisations made significant contributions to our thinking - the American Numismatic Society (New York), the British School at Rome, the Classics Faculty of the University of Cambridge, the Lexicon of Greek Personal Names (Oxford), the Portable Antiquities Scheme (London), the Ancient World Mapping Center at the University of North Carolina (Chapel Hill)

Executive Summary

Within humanities the field of Classics - history, literature and archaeology - is one where digital activities have been particularly lively. There is a defined body of material, which is growing steadily; and there are existing conventions developed over many centuries for presenting such material. There is also an interested community spread all over the globe. It is however also true that there are plenty of scholars who view digital

resources with considerable suspicion. In the end such people will only be won over by being given tools which work fairly simply, and which deliver information that they actually want. Initial publications have been well-received, but each scholar demands more functionalities

The aim of this project was to build on existing relationships, and to work together to increase the usability of a cluster of digital resources, which present a range of documentary information. The most obvious of these is a publication of about 1000 Roman inscribed texts from western Libya (Tripolitania). The underlying purpose of this digitisation was however to develop a suite of new tools and protocols, focusing on bringing scattered bodies of material together, and allowing scholars to juxtapose and use them in new ways.

Finally we intended to continue to expand the community of engaged scholars, to use these tools, evaluate and improve them, and build more.

The element which will attract most immediate attention from classical scholars is the publication (on 22 September 2009) of the enhanced digital edition of the *Inscriptions of Roman Tripolitania*. This is a resource which scholars need, and will use; it is the work of a known and trusted scholar. Most users will prefer to remain ignorant of the protocols and tools behind the new edition. But the arrival of one more body of digitised materials online should allow us to demonstrate some of the tools which we have been developing, and to encourage scholars to use them.

Background

Concordia sprang from the work of three separate, but intersecting, undertakings: the *Pleiades Project*, the *EpiDoc Community*, and the combined work of the Advanced Papyrological Information System (APIS), the Duke Databank of Documentary Papyri (DDBDP) and the Heidelberger Gesamtverzeichnis der griechischen Papyrusurkunden Ägyptens (HGV). These communities of practice are so intertwined with the scope and methods of this project that they must be introduced here.

The *Pleiades Project* has been working since early 2006 to digitize, update and freely disseminate the unpublished compilation materials of the NEH-supported Classical Atlas Project (1988-2000), thereby providing all interested parties with a comprehensive, scholarly reference dataset for Greek and Roman geography. Live, online distribution of coordinates, toponymy and bibliography are cornerstones of this effort, and the Pleiades team is widely viewed within the classics, geography and open access communities as innovative developers of simple, standards-based mechanisms for cross-project information exchange. Pleiades was started by the Ancient World Mapping Center at the University of North Carolina at Chapel Hill in partnership with the Stoa Consortium for Electronic Publication in the Humanities. Pleiades is opening the website to collaborative update of content, and technical development has moved from Chapel Hill to the new Institute for the Study of the Ancient World (ISAW) at New York University, which is better positioned to resource and maintain development across grant cycles.

The *EpiDoc Community* has spent the past 10 years refining guidance and tools for applying the Text Encoding Initiative (TEI) XML tag set to primary source materials, first in the domain of epigraphy (notably the *Inscriptions of Aphrodisias* and *Inscriptions of Roman Cyrenaica*, funded by the AHRC and Leverhulme respectively) and now in papyrology and manuscript studies as well. Its encoding recommendations have emerged as recognized best practice across the epigraphic discipline, having been endorsed as an international standard by both speakers in the "Epigraphy and Information Technology" plenary session at the 13th International Congress of Greek and Latin Epigraphy (Oxford, 2007). On-going consultation with the various teams supporting the epigraphic database confederacy developed by the International Association of Greek and Latin Epigraphy is establishing criteria for metadata and text exchange that will guarantee ready summary and incorporation of EpiDoc publications into the relevant databases, and will provide a common format for cross-database search and archiving.

Scholars at Duke, Columbia and Heidelberg universities have been collaborating with colleagues at a variety of other institutions for decades to produce one of the most important federated collections of digital historical materials in the world: the Advanced Papyrological Information System, the Duke Databank and the Heidelberg Gesamtverzeichnis. Together, these resources provide access to texts, descriptive metadata and (increasingly) high-quality digital photographs of almost all published Greek and Latin documents on papyri. At present, these three institutions are collaborating with NYU, King's College and the University of Kentucky on a project of direct importance for Concordia: the *Integrating Digital Papyrology* (IDP) project (http://idp.atlantides.org). With funding from the Mellon Foundation, they are converting

the combined output of both the Duke text database and the Heidelberg metadata database to EpiDoc XML and developing a collaborative online editing system that will enable papyrologists worldwide to collaborate in the refinement and expansion of the content of both resources. Under the terms of the same grant, they are developing web portal software (the Papyrological Navigator) that will exploit this EpiDoc format to provide an unparalleled interface for text viewing and cross-textual search (including search for oblique lexical forms of words in Greek) in combination with access to full metadata and all available digital images. Concordia will make use of the combined DDbDP/HGV dataset, as well as the Papyrological Navigator software.

Aims and Objectives

1. Create "web feeds for interoperability" for existing and new digital publications

The Concordia team set out to define a basis for interoperability between the digital publications involved in the project (See Appendix B for a list of the publications). The goal was to establish Atom web feeds for the content in each publication (See Appendix A for an explanation of web feeds and the various formats discussed here). These feeds were to include links to resources in other digital publications, and the links were to be annotated using a terminological thesaurus in order to indicate relationships of scholarly interest, such as "place of finding" or "evidence for a place-name". Tooling (in the form of XSL style sheets) was promised for the conversion of content to Atom, thereby retrofitting these publications to support interoperable processes that consume web feeds and provide discovery and linking services on the basis of information found therein (see below).

The original proposal identified the then newly-promulgated OAI/ORE Resource Map Implementation in Atom as an appropriate guideline for the semantics of the web feeds and their internal links. This specification continued to evolve during the course of the Concordia period of performance. As it matured, and as we worked toward implementation of our approach, it became clear that many of the provisions of OAI/ORE are tailored more for linkages within and between heterogenous digital repositories and for the management of their content rather than for single-themed digital publications edited monographically or by cohesive scholarly teams. We further determined that the basic Atom specification itself provided, with the addition of our own link-type thesaurus, all the necessary semantic structures for the services we envisioned.

During our workshop in May 2008, our participating Advisory Board members identified a critical near-term objective that had not been envisioned in the original proposal: discussion with these colleagues was crucial in helping us define these needs. The key element here was the urgency of establishing a comprehensive set of stable identifiers for historical geographic features so that other projects could begin to incorporate them into their datasets. These IDs could then provide the basis for interaction with Pleiades as its content expands (necessarily more slowly). A scheme for generating these IDs for all *Barrington Atlas* features was devised during the meeting, as was a scheme for a “BAtlas ID Resolver,” a web-based service that would accept requests referencing BAtlas IDs

from outside systems and return links to corresponding Pleiades content items when available. Project team and advisory board members agreed that implementation of these aspects were of the highest priority to ensure broad collaboration beyond the end of the project period.

Our original objectives included a phased release of web feeds for Inscriptions of Aphrodisias, Inscriptions of Roman Cyrenaica, and Inscriptions of Roman Tripolitania. The *IAph* feeds were generated in the first instance, based on online, already published material. Due to the refocussing of work on the *IRT* texts and infrastructure to enable re-use by the *IRCyr* project (as discussed below under Implementation), the *IRCyr* texts are not yet available in XML form and so the generation of web feeds for these texts has been deferred beyond the end of this project. The XSLT that was used to generate the *IAph* and *IRT* feeds will, however, be largely suitable for this final task as they stand.

2. Establish web services to exploit those feeds

The Concordia team initially set as a key goal the creation of web services to exploit the planned web feeds. The primary objective was discovery services, exploiting two aspects of the anticipated connections between resources. Firstly, we intended to develop a limited-domain web crawler that would regularly harvest new feed content from the participating publications and use it to build an index. This index would be used by a search service designed to understand the scholarly distinctions—like "findspot" or "observed location"—embedded in the feed links. Secondly, we aimed to exploit geographic information stored in Pleiades to facilitate geographic search and visualization for all publications linked to it using our web feed implementation.

3. Reconfiguration of the Papyrological Navigator for search and display of arbitrary EpiDoc content

The Concordia team also aimed to test the fitness of a separately-developed papyrological web application for the search and display of epigraphic information, such as that contributed to the project by the King's team. The "Papyrological Navigator" was prototyped by Columbia University and was slated for release under the terms of the GNU Public License in July 2008. Our objective was to install a copy of the software on our servers, attempt to load the Concordia epigraphic materials into it, evaluate the functioning of its substring and lexical search capabilities and assess how it might be augmented to work with the feed-based services being developed by Concordia.

The Papyrological Navigator software was not publicly released in July 2008 as expected. Delays—external to the Concordia Project Team—arose from Columbia's decision to out-source work on the Papyrological Navigator. NYU's Digital Library team ultimately emerged as the subcontractor for this work, but was not able to hire an appropriately skilled programmer until February 2009. We therefore deferred Concordia work on the PN until this programmer was in place and the software has been transferred from Columbia to NYU (anticipated June 2009). The PN programmer on the digital libraries team will perform this work for us. For this reason, we requested (and received) a no-cost extension to the NEH grant in order to accommodate this work. Our aims in this area remain as outlined above.

4. Digitization, enhancement and dissemination of *The Inscriptions of Roman Tripolitania* (IRT)

This corpus of c. 1,000 texts was originally published by Joyce Reynolds and John Ward-Perkins in 1952 (British School at Rome); it has long been out of print, and was digitized (into HTML) a few years ago by a third party with the intention of distribution on CD ROM, but the project never came to publication. A particular aim was to add full illustration, which had not been possible in the circumstances of the early 1950s and remains prohibitively expensive in print today. We continued to work to this end, although the previously digitised images turned out to be of too low a standard: we therefore had to order a new set of high quality images (paid for externally). Our other principal enhancement was to link the publication to geographical data, which was not easily available to civilians in the 1950s. Our aim was to prepare this corpus for online publication during 2009. A further development was a decision to make the contents compatible with the Epigraphische Datenbank in Hedeilberg, with a view to transferring data automatically to that widely used resource.

5. Digitization of five sets of map compilation materials and publication of the resulting data.

At the time the proposal was written, the Pleiades Community had brought the point features associated with two *Barrington Atlas* maps (including Cyrenaica) into the *Pleiades* format, and had enhanced the data with primary source references and original-script orthography (the original dataset and the *Barrington Atlas* employed a Roman character transliteration scheme for Greek names). Two additional maps were in work under separate funding. *Concordia* funds were budgeted to facilitate the digitization and incorporation of cultural features and names associated with five additional maps to provide seamless Gazetteer coverage for the project study area (see Appendix C, "Study Area" below). The object of this expansion of *Pleiades* content was to provide geographic references for the epigraphic content to be produced in London, as well as the papyrological content expected to be released by the Integrating Digital Papyrology project.

Methodology

For newly digitized resources, we have sought to publish on the World-Wide Web in a manner open to browsing by users worldwide and automated indexing by third-party search engines. This technological openness, coupled with Creative Commons licensing for all content, ensures the widest possible dissemination and reuse of content, as well as discovery by all available means (not just a resource-specific search utility).

Behind the HTML formatted web pages of the epigraphic publications, users will also have access to the XML files in which the epigraphic editions are natively authored. These (governed by the same open licenses) are encoded according to the guidelines developed by the EpiDoc Community for the implementation of the Text Encoding Initiative tagset in digitizing ancient documents. As indicated above, EpiDoc is now the de facto international standard for the preparation of born-digital epigraphic and papyrological texts, thereby contributing to the potential longevity of these resources.

Pleiades is a historical-geographic database system that employs a revolutionary data model for the management of sparse and contested information about ancient places, features and geographic names. It eschews the "coordinate-pair tyranny" of traditional Geographic Information Systems, modeling the historian's method and cognitive framework as applied to the study of the ancient landscape, thereby permitting both geographic visualization and assessment of attested places that cannot now be located with precision. Pleiades surfaces its content to both users and automated processes in several formats: HTML, KML, Atom and JSON.

Web feeds are ubiquitous, having quickly emerged as the most effective way to keep track of changes to web resources. They also exemplify the emergence of "pull-centric," as opposed to "push-centric," web applications design; they provide a simple means of change notification that is invoked when the interested user or system needs it, rather than being transmitted by the originator at arbitrary times, as is the case with email notifications. Pull-centric designs are easy to implement and fault tolerant. Web feeds realized in XML using the Atom Syndication Protocol (see Atom, below) can do more than summarize the content of a website or blog. They can also assert relationships to other content online by providing links to arbitrary URLs. When combined with an agreed vocabulary for relationship types, these links can take on real meaning and provide a community of practice with a simple way to create and maintain semantic linkages between elements of online publications. For scholars, this means that chains of reasoning or dependency relationships can be described programmatically so as to facilitate semantic searching of documents. For example, an Atom web feed can be used to assert that a particular URL provides access to the text of a primary source, that that document was discovered at a place further described by information at a second URL, and that the text contains a toponym variant further discussed at a third URL.

GeoRSS has been embraced by the top 3 search engines (in Google Maps, Microsoft Live Local, and Yahoo Maps and Pipes) and is used in traffic, emergency response, geological, and social networking applications. In the near future, GeoRSS will be one of

the primary means for telling users about the location and geographic relevance of resources of interest (pages, services, reference information).

Implementation

IRT:

The digital re-publication of *Inscriptions of Roman Tripolitania* (IRT) was carried out in several stages to maximize the efficiency and the extent to which the tools and processes can be repurposed for related projects in the future (including the ongoing *Inscriptions of Roman Cyrenaica* [IRCyr]). The existing digital copies of *IRT*, in HTML format, were acquired from the British School at Rome, and hand-edited by the King's team to remove any departures from the 1952 text of Reynolds and Ward-Perkins. The HTML was then converted to EpiDoc TEI XML using the CHET-C conversion tool, repurposing some of the code written for the Mellon-funded (2007-2008) *Integrating Digital Papyrology* project.

The texts were also brought somewhat up to date by the incorporation of texts, readings, and corrections both from the Addenda to the 1951 volume, and from a 1953 *PBSR* article; we deliberately limited our interventions to this level, in order to be able to complete the work within the time available. The TEI editions were then further enriched and enhanced by the addition of markup for indexing (words, names, places) and other metadata (categories, location history, dimensions) by a team of encoders including student interns. We found that this was of great benefit to the students as well as to us: they acquired a deeper understanding both of Roman inscriptions, and of the processes of digitization. All contributors were involved in studying the texts closely and also thinking about the metadata, and the various categories which encoding requires: this ensured that they engaged with the texts themselves, the historical content, and the processes.

Further work enriching the texts was carried out by means of script-assisted markup—in particular the lemmatization of Latin and Greek words using the Morpheus web service (very usefully on the servers of the Max Planck Institute in Berlin). The British School at Rome helped us to obtain high-quality scans of 1400 or so photographs to illustrate this edition.

The web process and design for the IRT publication was developed from the framework behind the *Inscriptions of Aphrodisias* and *IRCyr*. The improved tooling, indices and search functionality, and enhancements to the standard EpiDoc style sheets (including conversion scripts for creating database output for the Heidelberg Epigraphische Datenbank) were collaborative achievements with the Leverhulme-funded *IRCyr* project, and will also enhance the forthcoming *IRCyr* publication.

Pleiades:

During the period of performance, Pleiades has seen a number of software improvements aimed at supporting better user interaction and at fitting its data model to the needs of the other Concordia team members. These improvements are now in beta test with key partners and will be rolled out during summer 2009. One major advance is the

implementation of "feature" records, which provide an intermediate level between our original "place" records and the underlying geographic locations and historical names. This enhancement permits the identification and mapping (where coordinates are known) of monuments, structures and areas within sites in order to provide more specific contexts for the indication of findspot, original location and the like. These features, like our places and names, are uniquely identified by stable URIs, thus providing the necessary references for feed-based linkages.

We have also gone through a major software migration, upgrading our platform from Plone 2.5 to Plone 3, which required revisions to most of our custom plugin software and a replacement of our entire deployment apparatus. The extent of work required for the version upgrade was unanticipated, a consequence of major architecture and tooling changes introduced by the Plone software development team. This transition, however, gave us the opportunity to significantly improve our map interface and to implement a server-side caching strategy that will result in faster performance.

We have also implemented the Barrington Atlas Identifiers and supporting "ID Resolver" service outlined as an additional aim during our first workshop. Information about the identifiers may be found here: http://horothesia.blogspot.com/2008/07/barrington-atlas-ids.html . The resolver works by providing an appropriate explanatory response to any browser that requests a Barrington Atlas ID, as well as a link to Pleiades search. When the latest upgrades to Pleiades are rolled out this summer, these linkages will be fully accurate. Meantime, an example of the current functionality may be examined here (via the BAtlas identifier for Aphrodisias in Turkey): http://atlantides.org/batlas/aphrodisias-ninoe-65-a2

Web feeds and thesaurus:

The original proposal identified the Atom feed format as the best carrier for metadata concerning the content of individual resources and the relationships between them and resources in other projects (http://tools.ietf.org/html/rfc4287). We also assumed that it would be necessary for us to define a concise vocabulary of relationships between resources so that we could express concepts of historical-analytic importance (evidence, attestation, place-of-finding, etc.; see now: http://www.atlantides.org/trac/concordia/wiki/ConcordiaThesaurus). These assumptions proved valid, but we arrived at that conclusion only after evaluating two alternative formats and an existing vocabulary of concepts and relationships.

The first alternative format, the Open Archives Initiative Object Reuse and Exchange (OAI/ORE) specification, was originally published concurrently with the start of our project (http://www.openarchives.org/ore/). It defines standards for the description and exchange of aggregations of Web resources. Although it initially appeared to us that OAI/ORE would be useful -- not least because its default implementation was defined as Atom feeds (using special conventions) -- we ultimately decided that we could express all of the relationships we needed to via plain Atom feeds, without the added OAI/ORE conventions. Our rationale was two-fold. Firstly, OAI/ORE incorporates a number of “beyond Atom” features that are good for institutional repositories but that confer no

extra value for interoperation between the King's digital epigraphic publications and Pleiades (e.g., packaging and aggregation of part-of works). Secondly, the major search engines index Atom but have no special indexing capacity for OAI/ORE; this would push the relationships between our resources into the hidden web, and it is one of our fundamental tenets that what we do should be broadly discoverable on the open web.

We also addressed the relevance of the Resource Description Framework (RDF) and web-crawling for "social" networks of object/name/place data (http://www.w3.org/RDF/). We concluded that because our new vocabulary of link relations bears some resemblance to a group of RDF predicates, Concordia graphs expressed in Atom could be transformed to RDF serializations for Semantic Web functionality in future. Since at present no collaborators are expressing concrete use cases for RDF, we will defer implementation: Concordia is not a Semantic Web application. We also clarified the definition and goals of Concordia with respect to "federated search" applications. Concordia approaches search from the web search engine angle. We are building an index from the data collected by a web crawler, and not creating a federated search space that is invisible to other search engines on the web.

We also explored the relevance of the CIDOC Conceptual Reference Model (CRM; http://cidoc.ics.forth.gr/), and in particular its extensive vocabulary of relationships used in cultural heritage documentation. This vocabulary is in use in a number of museum contexts, and is also being employed in the latest redesign of the Lexicon of Greek Personal Names. At the end of an extensive discussion and joint modeling exercise during our second workshop, Concordia team members concluded that there were a number of challenges inherent in trying to incorporate CIDOC CRM concepts and terms into our relationship model. Further consideration of these challenges were discussed and explored after the workshop, culminating in a decision in December 2008 that CIDOC CRM relationship models and terms would not be adopted for Concordia at this time. The rationale underlying this decision, as well as a concise explanation of Concordia's goals and methods, were published in an online white paper: http://concordia.atlantides.org/docs/concordia-crm.html

Outputs and Results

The most public output will be the publication of the enhanced electronic reprint of *Inscriptions of Roman Tripolitania*, due to be launched at the British School in Rome on 22 September 2009. Circumstances in Libya mean that a publication from 1952 is still of great value, and the illustrations which we have been able to include are of particular importance, since not all the materials can now be recovered. We would have liked to add translations: but this can only be done once Joyce Reynolds is able to undertake the work herself. She has been delayed by illness; but, if she cannot complete the work (which is currently on her desk) for this edition, she may be able to provide English translations for a subsequent edition of the site.

The functionality is of course the other enhancement which this publication offers: it will provide the fullest possible indices (in some cases richer than those that were possible in the volume), and a semantic search facility. It includes high-quality maps, which can be overlaid by the plans from the earlier edition, to help scholars used to the old edition to orient themselves. The editions in the web publication will also be connected to the place records in the *Pleiades* web application via Atom feeds that surface connections between resources in a manner inspired by the W3C Linked Data specification: references to findspots and other recorded locations, and mentions of places in the texts themselves will be linked via URI to the *Barrington Atlas* Identifiers made available by *Pleiades* in the course of this project. We shall also provide parallel Atom feeds that link between objects in this publication, other online resources, and in particular Pleiades identifiers using the vocabularies developed by the Concordia project.

This project has required a steady process of refinement and standardisation in the categories used for describing our data. These decisions will be disseminated for the use of other projects working in the area. There will undoubtedly be need for further discussions, but these are an important contribution to an ongoing debate. After the next Pleiades software upgrade, we will begin experimenting with ways to surface resource linkages—discovered from the feeds—in the Pleiades interface. We will also surface access to the search index.

Outcomes

Electronic publication will make this material widely available in Libya itself for the first time. We have had an enthusiastic response to our work from the Department of Antiquities in Libya, and we have been discussing with them how to fund an Arabic version of the site. This would be methodologically interesting, as we would need to explore how to retain the full functionality of the tagging: that methodology could well be of value to other projects.

An added enhancement, which we had not originally planned, is that the schema for publishing the texts, and their metadata, will enable the material to be transferred directly into the Epigraphische Datenbank Heidelberg. This is an internationally used resource for finding Latin inscriptions from everywhere outside Italy (which is covered by a separate, parallel, database. This should help scholars to exploit the Libyan material, as well as establishing a new way for other projects to contribute to the database.

It will also be possible to download the XML: we are already in discussions with scholars, particularly in Italy, working on this material, who may be able to download the inscriptions and enrich the publication with new data. This will provide an important opportunity for developing scholarly protocols for such procedures (which at present make classical scholars rather nervous!).

Another important outcome has been further community building, in discussions with a range of other projects. We don't always agree, but it has been extremely useful. There has been broad interest in the protocols and vocabularies that we are developing. The dialogues resulting from this interest have slowed down the work in the course of the project; but they have been building a community of stakeholders, which may turn out to be one of the most valuable long-term outcomes. Such engagement means that the eventual production services resulting from our work are likely to see valuable use beyond the immediate project team.

There is still a problem in reaching beyond the usual community of the digitally aware: but each publication of useful material brings a few more people in, and the interns who have worked with us have adopted a new way of working which they may even pass on to their supervisors.

Conclusions

The principal conclusion is that in a small and specialist field the expertise is scattered across the world. It is hugely important to have opportunities such as the one afforded by this grant to work in international consortia.

One focus of the project was to bring together diverse materials. One of the fundamental principles which has evolved from this work is the overriding need to keep things simple, and avoid the complexities of the specific, even at the apparent cost of some granularity.

Our original idea that feeds could act as a transport medium for summaries of and linkages between published articles and objects has been borne out by our experiences.

Likewise, the idea that we needed our own link-type thesaurus also proved true (see http://concordia.atlantides.org/docs/concordia-crm.html for documentation). We have also concluded that these decisions need to be made across a large community. The point of our work was to surface information that is already in effect in the source documents, but to do it in a way that would have potentially large application across a variety of projects.

As far as we know, only one major project is using RDF/Semantic Web for this purpose (nomisma.org). In our opinion, there is not yet a ready use case for RDF, but we can reserialize our feeds in future if it becomes highly valuable. This is one of many reasons that we shall continue to discuss these issues in blogs and other online fora. The project site concordia.atlantides.org will continue to serve as a platform for publication and ongoing discussion of work in this area (for instance the DFG/NEH-funded *Epigraphic Interoperability Workshops*).

Implications

The publication of *IRT* should help to establish the centrality, and respectability, of digital publications of ancient texts and artefacts. There is still considerable resistance to such publication in some quarters of the academic community; but the involvement of a well-known and universally respected scholar, Joyce Reynolds, should help to overcome some of the current prejudices.

The simplest outcome, therefore, may be that it will encourage others to do similar things: and during the process we have been developing more and more tools to make it easy for them to do so. That the format allows far richer presentation is clear. The concept of 'sharing data' is one that makes some older scholars very uncomfortable: but data of this kind do lend themselves to sharing, and we hope that we can soon demonstrate that this can be done without loss of integrity. The linkup with the Epigraphische Datenbank Heidelberg should help epigraphers to understand more about such processes. Most important, however, will be the publication of more ancient documentary material and literary texts online, in accessible formats. The true value of the tools and methodologies which we have created will become steadily more apparent to scholars as more materials appear in this way. At present, we can only demonstrate functionality in relationship to a relatively arbitrarily selected body of material: this will change as more and more scholars make use of our tools.

The Pleiades Project is currently seeking further funding, in part to implement production services to aggregate and index web feeds of the kind proposed by this project. The Institute for the Study of the Ancient World has undertaken to make these feeds a standard feature for all applicable digital projects and services in the future. A first example of this implementation will be the use of stand-off web feeds to express metadata and relationships alongside the photographic archives delivered through Flickr.

Recommendations

Projects should be encouraged to draw in graduate students to their work. It might be useful to have small bursaries - say 3000 pounds or so - to remunerate students for working with projects. It is essential to widen the pool of young academics who feel comfortable with these technologies.

We have mentioned several times the problems created by pre-existing attitudes to online publication among humanities scholars. It is becoming clear that one way to break down this barrier would be to develop criteria and methologies for creating print versions (probably print-on-demand) of stable online resources. We would urge the JISC to encourage this approach.

References

- The **Atom** Syndication Format: RFC 4287 (http://tools.ietf.org/html/rfc4287)
  an XML-based Web content and metadata syndication format commonly used for web feeds
- **GeoRSS**: http://georss.org/
  a format that facilitates the addition of geographic information to standard web-feed metadata
- The Open Archives Initiative Object Reuse and Exchange

Appendixes

Appendix A: Digital Publications in the Concordia Testbed

The following publications were identified by the Concordia team in the initial proposal as items for inclusion in the testbed:

- Advanced Papyrological Information System (APIS)
- Aphrodisias in Late Antiquity (eALA)
- Duke Databank of Documentary Papyri (DDBDP)
- Heidelberger Gesamtverzeichnis der griechischen Papyrusurkunden Ägyptens (HGV)
- Inscriptions of Aphrodisias 2007 (IAph2007)
- Inscriptions of Roman Cyrenaica (IRCyr)
- Inscriptions of Roman Tripolitania (IRT)
- Pleiades: http://pleiades.stoa.org

The following additional publications have begun working with the Concordia team during the course of the grant and are expected to produce, in time, feed-based implementations that integrate with the Concordia tooling:

- American Numismatic Society
- Lexicon of Greek Personal Names
- Portable Antiquities Scheme

Appendix B: Study Area

We chose a contiguous but heterogeneous stretch of the ancient world, covering more than 830,000 square kilometers: from Tripolitania (southern Tunisia and western Libya) along the coast eastward to the Nile delta and then southward up the river to include the Fayum and several of the best documented ancient administrative regions (the Oxyrhynchite, Kynopolite, Herakleopolite and northern Arsinoite nomes).

- Map 35: Tripolitania
- Map 37: Syrtica
- Map 38: Cyrene
- Map 73: Ammon
- Map 74: Delta
- Map 75: Memphis-Oxyrhynchus
- Map 77: Hermopolis Magna
- Map 79: Oasis Magna
- Map 80: Coptos-Berenice