

The Pleiadic Gaze: Looking at Archaeology from the Perspective of a Digital Gazetteer

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Pleiades is an on-line, open gazetteer and graph of ancient places, spaces, and peoples.¹ Unlike traditional gazetteers it includes not only named features, but also geographic entities whose historical names are lost and even geographic entities that may never have had a name. Unlike traditional geographic information systems, *Pleiades* catalogs not only those places that can be abstracted into a point, a line, or a polygon on a map, but also those whose locations are lost, uncertain, disputed, or comprehended only through the aggregate locations of other, related places.

This flexibility arises from fundamental decisions taken at an early stage in the project (that is, between 1999 and 2006 when the project received its first grant from the US National Endowment for the Humanities).² We were certainly at pains to preserve and extend the information that had been carefully gathered during the Classical Atlas Project's 12-year, 200-person quest to produce the *Barrington Atlas of the Greek and Roman World*, which was published by Princeton University Press in the year 2000.³ Some digital techniques had been used in the preparation of the Atlas (not least email!), but given the transformation in data management and geospatial computing technologies that transpired during the lifetime of the Atlas project, there could be no question that newer techniques would be needed in any follow-on effort to keep the information underpinning the atlas up-to-date.

In thinking about a follow-on effort, we were influenced then in no small way by the recent emergence of the so-called "wiki way."⁴ We wondered if the crowd-sourcing approach being pioneered by Wikipedia could be adapted to the task of updating and expanding all our atlas information. The era of steady funding for *longue durée* academic projects was ending. Maybe we could use a wiki approach to assemble a globally distributed nerd army to succeed that Atlas Project warrior band. But if web-mediated, incremental, and asynchronous content creation could be a way forward for any descendant of this great atlas, it was obvious that we would have to change the fundamental structure of the information. The Atlas and its maps would have to be digitized, reorganized into little, discrete pieces, and somehow surfaced on line in a readily edited format. And we would need processes for both pre- and post-publication review of changes. Beyond data management, there were more and different user needs. How would one work effectively and economically with the restructured data? How would it appear online for human use? Could it be made available for other projects, digital or otherwise? How much could be done automatically?

It was clear by the turn of the century that a paper atlas and its twelve-hundred-page, two-volume companion directory could not adequately serve the users of new media and new computing tools. Indeed, in a laudatory (but critical) review of the Atlas

for the *Journal of Roman Archaeology* in 2001, Susan Alcock, Hendrick Dey, and Grant Parker imagined a digital *Barrington Atlas* – more portable and less constrained by the limitations of map frame and scale.⁵ Such a thing exists now, thanks to Princeton University Press, who brought out an iPad version of the *Barrington Atlas* in 2013 and has issued technical updates to same as recently as 2017.⁶ It is a beautiful and wonderful thing, as far as it goes, but I think that if you’ve used it at all, you’ll agree that it doesn’t do much other than saving you from having to carry around a big double folio of dead trees.

Those of us gathered around the Atlas’ birthplace in Chapel Hill, North Carolina, wanted portability and digital versions of the maps too. But we also wanted an environment in which other, more conceptual issues could be addressed. Among these was a concern also raised by Alcock, Dey, and Parker: the Atlas’s selective omission in many areas of the results of archaeological survey.⁷ In their view, the Atlas could be forgiven somewhat since “to replicate survey data to scale in hard copy would be an ordeal” but “(electronic formats ... will have no such excuse).”⁸

No pressure!

We would need something that would let us add new features and refine existing coordinate pairs; to record finer or different temporal characteristics; to classify places more flexibly and indicate change in use over time; to add toponyms; to indicate relationships between places; to express uncertainty; to link information to scholarly literature, primary sources, physical objects, and archaeological data. And so, in the midst of a technological phase of the widely remarked, twentieth-century “spatial turn” in the humanities – a moment that most people equated with on-line maps, historical GIS, and spatial computing – we took the road less traveled.⁹ We pushed the map to the side and put places themselves first. In pursuing place, we had helpful guides in Yi-Fu Tuan and other human geographers of the late 20th century who explored the idea of place as a cognitive or experiential construct.¹⁰ In *Pleiades*, therefore, places are conceptual entities: we apply the term to any locus of human attention, material or intellectual, in a real-world geographic context, whether or not it can be named or mapped or visited today. The spatial aspects of *Pleiades* places (that is, latitude and longitude coordinates in space), as well as their ancient and modern names, are subordinated to this idea of place, becoming optional attributes in the information construct, rather than first-class entities.¹¹

Various technical architectures and associated editorial processes were considered for dealing with these demands. You’ll perhaps be happy to hear that we do not have time today to discuss any of them in detail, because I want to talk about a topic that Ortwin Daly introduced earlier in this panel. Suffice it to say that we decided to use and customize an open-source, web-based content management system named *Plone* in order to put *Pleiades* on line.¹² It was this plan that earned us our first round of funding and that attracted Sean Gillies to the project. Sean served as *Pleiades*’ chief engineer for over 7 years. Now employed by Mapbox.com, he still deserves credit for the shape and

function of the *Pleiades* web application as it appears today, as well as its underlying data. This credit is especially due in three areas. First, Sean designed and built the code we needed to support geospatial indexing and mapping, functions that our content management framework didn't handle natively. Second, Sean led work on the linked data and export formats we needed to meet user needs, including one that evolved into one of the most widely used web formats for spatial data today: GeoJSON.¹³ Thirdly, Sean kept a relentless focus on clean, clear data structures and the paths to them, hiding implementation detail and privileging stability.

I'll be focusing my remarks for a bit on these last two areas: the formats in which we surface *Pleiades* data and the mechanisms whereby our users – both sentient and algorithmic – interact with the data. Why? Because it turns out that the way we do this is what makes *Pleiades* worthwhile. It's what makes us more than a big encyclopedia of not-very-consistent information about ancient places. It makes us more than a data management tool for a particular scholarly endeavor. It's all about citation.

Citation – the glue that holds together so much of the scholarly enterprise – was particularly ill served in the so-called “web GISs” of the late 90s and early 2000s.¹⁴ Whereas at least with a paper atlas, one could refer to map number, grid square, and label in order to cite a specific place, most early on-line map systems seemed almost hermetically sealed. Despite the ubiquity of hyperlinks – the central affordance of the World-Wide Web and arguably its only distinguishing feature – one could not count on making a stable link to a particular place, map view, zoom level, or coordinate location.¹⁵ All the specifics of these interactions were hidden behind the user interface and a simple, top-level web address or some kind of nasty, ephemeral search string. Would that such barbarism had been just a passing fad! But now, twenty years on, many online GIS and mapping environments still behave this way. They mimic desktop mapping software, embodying the assumption that whatever the system can do, it should only do it for the individual person interacting with it right now. Discovery, reference, and review, as well as collection and reuse of information: these are all fundamental scholarly activities that are completely dependent on stable citation. They cannot function under a regime like this. Moreover, the tantalizing possibility of computationally actionable citation – the idea that computer programs might exploit links and connected resources to do complex discovery, correlation, and even reasoning without direct human supervision – seemed in 2006 like a dream straight out of science fiction.¹⁶

On the world-wide-web, the identifiers necessary for citation should be front-and-center: they are the strings of characters that you put into the location bar of your browser in order to retrieve a web page. They are the essential magic in a hyperlink. Their technical name is “Uniform Resource Identifier,” a phrase usually abbreviated with the acronym URI.¹⁷ URIs (or yoo-ahr-ees, as they're sometimes pronounced) are cool.¹⁸ They're cool because, if you construct them sensibly and connect them to interesting information and take care of them so they don't rot into uselessness, they make citation happen. In throwing off the normalizing tyranny of a single map view to embrace the

radical equality of all places, *Pleiades* was born citation-ready. Because Sean Gillies and others present at the creation paid attention to emerging best practice and cared about scholarly communication, *Pleiades* was born citation-friendly.

May I present a *Pleiades* URI?

<https://pleiades.stoa.org/places/570182>

This URI identifies the *Pleiades* place resource for the ancient site of Corinth in Greece. You can think of *Pleiades* URIs as the passport numbers for ancient places. They're simple. Each one uniquely identifies a *Pleiades* place resource. And we promise to keep them stable for as long as *Pleiades* exists. We embed them into all our export formats so that even when *Pleiades* does die, or when the World-Wide Web is replaced by something else that does things differently, a copy of our dataset can be retrieved from one of several digital archives and put back together with any other data that used our URIs for citation.

There's a growing body of such data. The *Peripleo* search engine demonstrates geographic connections between items in scores of different datasets concerned with ancient places and objects.¹⁹ *Peripleo* is a demonstration tool, developed under the auspices of an international project known as the "Pelagios Commons" and funded by the Andrew W. Mellon Foundation. *Peripleo*'s principal developer is Rainer Simon, a Senior Scientist at the Austrian Institute of Technology. The datasets indexed by *Peripleo*, helpfully listed on its "about" page, include not only *Pleiades* and a number of other digital gazetteers, but also several numismatic databases; epigraphic websites; university and museum collections; textual resources; and archaeological repositories. The gazetteers that have been indexed by *Peripleo* are not just reference points for other datasets. They cite each other, using URIs on the same standard model employed by *Pleiades*. With the place entries in the gazetteers collated, it's then possible to present together all the records from the other databases that cite one of those gazetteer entries. Because the contents of the other databases also use stable URIs to identify each record they contain or object they describe, data from several can be combined, reused, and interrogated on the basis of common geographic referents with minimal fuss.

So, is *Peripleo* the tool you need for in-depth research and analysis on every archaeological topic? Unlikely, given its focus on visualization and demonstration. But its success brings home a very important fact with significant implications for future research work in archaeology: computationally actionable citation is here. We have scores of datasets on a variety of useful archaeological themes that can be quickly assessed for interrelationships of interest and then combined, as needed, to support a variety of research tasks. Geography is just one of the axes of citation we can exploit. "Gazetteers" for other things like named time periods, prosopography, materials, or building techniques already exist too or are being built. The opportunities and consequences should be obvious: if you use comparative or connective data in your work, learn how to exploit these new tools. If you produce datasets in the course of your research, define URIs for items of interest therein, publish the data on-line

under open license, and liberally cite the URIs from other datasets whenever it is appropriate to do so.²⁰

There are several ways in which the *Pleiades* community is working to make this network of actionable citation more robust and more useful for the study of the ancient world. I'd like to use my remaining time to touch on a few of those that have specific bearing for archaeology.

One of our earliest and biggest efforts has been in increasing the precision and improving the accuracy of the spatial coordinates we provide. The scales used in the *Barrington Atlas* limited the effective precision of any coordinates digitized from the maps to a range between two and ten kilometers.²¹ New *Pleiades* coordinates have come from a variety of sources, but increasingly, we've come to rely on *Open Street Map*.²² OSM is a global collaborative resource for high-resolution, real-world mapping that often captures archaeological monuments, structures, and districts that remain in situ. And, despite its name, it takes in much more than just streets.

The data we inherited from the *Barrington Atlas* also had limits on the types of features mapped because of the available space on a given page and the density of features in a given area. These limitations necessarily percolated into *Pleiades* at the beginning. Things like temples, sanctuaries, churches, monuments, and tombs only appeared in the *Barrington* when they lay outside settlements. *Pleiades* has no such limitations, and so our contributors have begun adding these more compact places in many areas and connecting them to each other using a prototype vocabulary of topographical and thematic relationship types.²³ Recent work on the place resource for Nineveh demonstrates what's possible.²⁴ Jamie Novotny and colleagues, working under the auspices of Karen Radner at Munich, have added new place resources for palaces, temples, and other features attested at Nineveh, connecting to the place resource for the settlement itself.

What about – as Alcock, Dey, and Parker labeled it – “the small stuff” that the *Barrington* omitted?²⁵ That is, what about the findspots of coins and inscriptions, the kilns, olive presses, and *agglomeration rurale*? What about the interpreted results of regional survey? We're making a start by working with scholars like Alessandro Battisti on the data published at rusafricum.org.²⁶ This data derives from the joint Italian and Tunisian Thugga survey directed by Mustapha Khanoussi, Samir Aounallah, and Mariette de Vos. *Rus Africum* records have cool URIs and the data has already been put into *Peripleo*. The graph view in *Peripleo* demonstrates that, where a *Rus Africum* site matches up with a *Pleiades* place, Alessandro and his colleagues have already noted the equivalence and made an appropriate citation. Alessandro has also been working with Jeffrey Becker, one of *Pleiades*' volunteer Associate Editors, to improve *Pleiades* coordinates on the basis of *Rus Africum*'s data, which, by virtue of its origin and mode of collection, displays much greater accuracy and precision. Where appropriate, they're adding the locations first to OSM, and through it, to *Pleiades*. What remains to sort out are the *Rus Africum* features not in *Pleiades*. Here are a few examples. How much

should come into *Pleiades* (with appropriate citation and provenance, of course) and how much should remain solely in the *Rus Africum* dataset? I don't know the answer to that question yet, but I'm confident of one thing. As a community, we'll weigh carefully factors like citation reliability and long-term utility as we work toward a solution.

These are a few of the ways in which the *Pleiades* community is working to support citation, to make *Pleiades* more useful for archaeologists, and to better use and reflect the results of archaeological work. But my time is up, so I'll conclude with a recruiting pitch. The *Pleiades* nerd army is an all-volunteer force. If you're interested in helping build and maintain Open Linked Data for Ancient Studies, please consider joining us. There are many ways to help, either by working on the content in the *Pleiades* gazetteer itself or by publishing datasets or software applications that use or link to it.

Notes

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¹ Bagnall et al. 2006.

² NEH Grant PA-51873-06 2008.

³ Talbert 2000; Talbert 2018.

⁴ Leuf – Cunningham 2001.

⁵ Alcock et al. 2001, 461.

⁶ Talbert 2017; Foss 2013; Ayer 2014.

⁷ Alcock et al. 2001, 458–459.

⁸ Alcock et al. 2001, 459.

⁹ Guldi 2011; Gillies 2010.

¹⁰ Tuan 1975; Tuan 1990.

¹¹ Gillies et al. 2017.

¹² Plone CMS n.d.

¹³ Butler et al. 2016; Sean Gillies 2007.

¹⁴ GIS = Geographic Information System; Fu et al. 2011.

¹⁵ Shneiderman – Plaisant 2018; Wikipedia s.v. Hyperlink 2018.

¹⁶ Elliott – Gillies 2009.

¹⁷ Wikipedia s.v. Uniform Resource Identifier 2018; URI Planning Interest Group, W3C/IETF 2001.

¹⁸ Berners-Lee 1999; Sauermann – Cyganiak 2008.

¹⁹ Peripleo 2018; Simon et al. 2016.

²⁰ Berners-Lee 2009.

²¹ Gillies 2005.

²² OSM 2004.

²³ Pleiades Connection Types 2018.

²⁴ Roaf et al. 2018.

²⁵ Alcock et al. 2001, 459.

²⁶ de Vos Raaijmakers et al. 2017.

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