



Sunoikisis Digital Classics 2016



Session 14: Annotation of geographical data

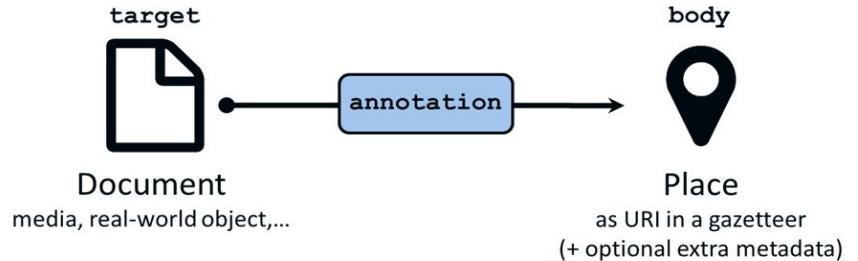
May 4, 2016

Chiara Palladino
Maxim Romanov

General introduction

Key-concepts: annotation, georeferencing

Annotation: a quick recap

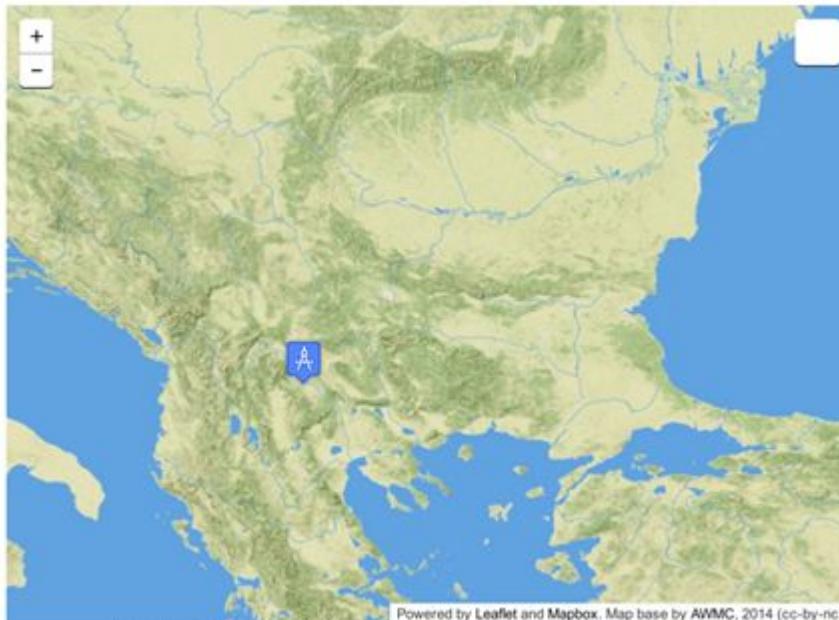


- An annotation is a statement that someone makes about something
- Open Annotation: connects a target (document, object, anything) to a body (something related to the target)
- Annotation on texts:
 - Text = target
 - Body = URI (of a Named-Entity in a gazetteer, for example)
- Annotation as stand-off/inline markup:
 - Stand-off markup is placed in a different location than the data being annotated
 - In inline markup, data and annotations are stored together

We started with “places...”

Argos

An ancient place, cited: BAtlas 50 A1 Argos



Show place in AWMC's *Antiquity A-la-carte*, Google Earth, or Pelagios' Perigeia.

Show area in GeoNames, Google Maps, or OpenStreetMap.

Canonical URI for this page:

<http://pleiades.stoa.org/places/491527>

Locations:

Gazetteers

PASTPLACE
The global historical gazetteer, putting the past into place.

Dividing the Realm Visualization Methodology Data Structure Data About Overview Subscribe

The Digital Gazetteer of the Song Dynasty
a digital history project at the University of California, Merced



The GeoNames geographical database covers all countries and contains over eight million placenames that are available for download free of charge.

Digital Atlas of the Roman Empire

Department of Classical Studies, Lund University
and the Department of History and Archaeology, University of Lund

The Digital Atlas of the Roman Empire will be transferred permanently to Lund University Sweden at <http://digilatin.lund.se/>. The current website will no longer be in operation after the 30th of April 2016. Please note that the URL of the new website will change to <http://digilatin.lund.se/>. The new website is already online. Please do use them!

- Geolibri API for reuse of the geodata of the Digital Atlas.
- All data is open data.
- Recently changed places.

News about the project on Twitter: [@digilatin](#)

The project is part of Pelagios - the networking alliance for ancient places.

al-Thurayyā
a Gazetteer of the Classical Islamic World

PLEIADES

about blog places credits download

search the 34,975 places

Enter a search term, Pleiades ID, or URL

Welcome to The Syriac Gazetteer

Editors: Thomas A. Carlson (Oklahoma State University) and David A. Michelson (Vanderbilt University)

The Syriac Gazetteer is a geographical reference work of [Syriaca.org](#) for places relevant to Syriac studies. It is growing from an initial publication of over two thousand place records.

- Index page: an alphabetical index of places in the gazetteer.
- About page: an overview of the gazetteer and its contributors.
- Help page: documentation, editorial guidelines, and technical definitions.
- Browse maps: browse places on an interactive map.
- Edessa: featured place.

[learn more »](#)

China Historical GIS

Gazetteer Search Engine

List of Free Datasets

Skinner Map Collection

«SPACE»: a broader concept of geography

- We aim not just at representing «space», but at representing spatial practice: how spaces are constructed, how they are linked through human and natural transformations
- What is «geography», and what «geographical data» are we talking about?
- How do we annotate relevant spatial data?
- How do we use them, and why are they important?

Understanding space through premodern sources: Graeco-Roman geography as a case-study

Geographical literature for Greeks and Romans

- Geographical sources:
 - *Peripli* (πέριπλοι): lists of places along the coastal line
 - *Periegeseis* (περιηγήσεις) or *Periodoi*: «guided tours around»
 - *Chorographia* (χωρογραφία)
 - *Itineraria*: lists of stations and distances along Roman routes
- Geographical authors:
 - «Major» geographers: Ptolemy, Pausanias, Strabo, Pliny, Pomponius Mela
 - «Minor» geographers: short opuscules by various authors

Beyond the map: Cartography vs. Hodological space

- Premodern societies are not map-based
- Cartography was used for different purposes than travelling
- Hodological space was empirical: functional to travel and spatial practice in general

How did they find the way?

➤ Distances

- The numerical estimate depended on the concrete conditions of travel
- Several units of measurement (in the widest way possible)

➤ Systems of orientation

- Fixed: winds, stars, cardinal points, etc.
- Unfixed: unsystematic, environmental, cultural references

➤ Spatial knowledge as a «mental model»:

- Cultural aspects of spatial practice: associations between places and concepts (e.g. boundaries)
- Place definition: what «is» a place in the ancient world, and when something is considered a «place»?

From Leptis to Thermae sail for 60 stades; it is a town, and here in the same way the shoals make the sailing difficult. From Thermae sailing 40 stades you see the promontory against which are two islands staked out with pilings; there is an anchorage. From Adramyte to Aspis 500 stades. It is a high and conspicuous promontory, shaped like a shield. From there sail north so that the promontory appears on the left, for there are many shoals and rocks in this sea. And then Aspis and Neapolis upon it will appear. From the bay of Neapolis to Aspis, sail for 200 stades. It is a high place and the city is on it. It has a harbor looking toward the west, 10 stades beyond the city.

(*Stadiasmus of the Great Sea*, 114-117).

From Leptis to Thermae sail for 60 stades; it is a town, and here in the same way the shoals make the sailing difficult. From Thermae sailing 40 stades you see the promontory against which are two islands staked out with pilings; there is an anchorage. From Adramyte to Aspis 500 stades. It is a high and conspicuous promontory, shaped like a shield. From there sail north so that the promontory appears on the left, for there are many shoals and rocks in this sea. And then Aspis and Neapolis upon it will appear. From the bay of Neapolis to Aspis, sail for 200 stades. It is a high place and the city is on it. It has a harbor looking toward the west, 10 stades beyond the city.

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(*Stadiasmus of the Great Sea*, 114-117).

➤ A spatial system defined by relations

- Place A
- Distance estimate
- Direction (conventional system of orientation)
- Underspecified indication (unconventional system of orientation): various degrees of relations between places
- Place B

Geographical information in the digital environment:

Annotating geographical entities

- Semantic issues:
 - Annotating different systems of place-relatedness: distances, directions, orientation
 - Annotating different categorizations of places
- Representational issues:
 - How do we visualize a «spatial system»?
 - What do we use it for?

What we already know: annotating place-names

Polybius: Histories (Book XXXIV fragments) (145 – 118 BCE)

Text Geo-Resolution Document Stats

Argos

Mark as toponym?

OK Cancel

4 Polyibus is right in his notion about the wanderings of Ulysses. 5 For he says that Aeolus, the man who gave sailing directions for the seas near **the Straits**, which have a current setting both ways and are difficult to pass owing to the tides, was supposed to be the dispenser of the winds and a king, just as Danaus, who first showed them how to make the reservoirs in **Aeolis**. 6 He also adds that the motion of the sun was contrary to that of the heavens, and seers and those who practised divination from sacrifices, were said to have been able to foretell the future by means of the stars. 7 And he adds that the Chaldaeans and the Magi, who were d
by some special science, enjoyed in early times a certain reputation for their knowledge of the stars. 8 Having thus prepared his way, he does not allow any elements to be added, as in the case of the **strait** of **Haly** and **Sicily**. 11 Neither does he applaud the bag of the winds. 12 And it is, he says, quite in accordance with the facts about the **peisoncylaeon** rock, and the method of fishing for about **Scylla** –

13 Her heads, with which the ravening monster dives
In quest of dolphins, dog-fish, or prey
More bulky.
14 For when the tunnies swimming in shoals along the Italian coast are carried out of their course and are unable to approach the **sea** larger animals, such as dolphins, sharks, and other marine monsters. 15 By preying on them the sword-fish (galeotae), also called xip

Argos

An ancient place, cited: BAtlas 50 At Argos

Powered by Leaflet and Mapbox. Map base by AWMC, 2014 (cc-by-nc).

Show place in AWMC's [Antiquity à-la-carte](#), [Google Earth](#), or [Pelagios' Periplos](#).

Show area in [GeoNames](#), [Google Maps](#), or [OpenStreetMap](#).

Canonical URI for this page:
<http://pleiades.stoa.org/places/491527>

Locations:

<http://pelagios.org/recogito/?collection=greek+tradition>

Encoding spatial data in TEI/EpiDoc

Encoding external geographical information: EpiDoc

Provenance of the text-bearing object:

<http://www.stoa.org/epidoc/gl/latest/supp-history.html>

```
<history>
<origin>
  <origDate>Second to third centuries C.E.</origDate>
  <origPlace>
    <placeName type="ancient">Aphrodisias</placeName>: probably in the grounds of the
      Temple of Aphrodite.</origPlace>
  </origin>
  <provenance type="found" when="1968">
    <p>Re-used in the City Walls of <placeName type="ancient">Aphrodisias</placeName>.</p>
  </provenance>
  <provenance type="observed" when="2012">
    <p>Aphrodisias Museum.</p>
  </provenance>
</history>
```

Encoding spatial information as inline markup

TEI manual: 13. Names, Dates, People, and Places

<http://www.tei-c.org/release/doc/tei-p5-doc/en/html/ND.html>

<placeName>

<placeName> contains an absolute or relative place name. [[13.2.3 Place Names](#)]

<placeName ref="http://pleiades.stoa.org/places/550696">Lesbos</placeName>

<offset>

```
<placeName key="NRPA1">
  <offset>50 metres below the summit of</offset>
  <geogName>
    <geogFeat>Mount</geogFeat>
    <name>Sinai</name>
  </geogName>
</placeName>
```

<measure>

```
<placeName ref="tag:projectname.org,2012:Duncan">
  <measure unit="km" quantity="17.7">11 miles</measure>
  <offset>Northwest of</offset>
  <settlement type="city">Providence</settlement>, <region type="state">RI</region>
</placeName>
```

<geo>

```
<location>
  <geo>53.226658 -0.541254</geo>
  <bibl>
    <title>Roman Inscriptions of Britain</title>, <idno>262</idno>
  </bibl>
</location>
```

<**relation**> (relationship) describes any kind of relationship or linkage amongst a specified group of places, events, persons, objects or other items. [[13.3.2.3 Personal Relationships](#)]

```
<listPlace>
  <place xml:id="MASC">
    <placeName>Mascarene islands</placeName>
    <placeName>Mascarenhas Archipelago</placeName>
  </place>
  <place xml:id="MRU">
    <placeName>Mauritius</placeName>
  <!-- ... -->
  </place>
  <place xml:id="ROD">
    <placeName>Rodrigues</placeName>
  </place>
  <place xml:id="REN">
    <placeName>Réunion</placeName>
  </place>
  <relation name="contains" active="#MASC"
            passive="#ROD #MRU #REN"/>
</listPlace>
```

Annotating semantic categories

Trismegistos Places: (not only) for papyri and inscriptions, (not only) for place-names

The screenshot shows the homepage of the Trismegistos Places (GEO and GEOREF) website. At the top left is the Trismegistos logo. The main title "Trismegistos Places (GEO and GEOREF)" is centered above a blue navigation bar with links for "Places", "TM Home", "About", and "Contact". On the right of the bar is a search field with placeholder text "Search Trismegistos" and a "Search" button. The main content area has a grey header "Places (GEO and GEOREF)". Below it, a message states "Currently 47670 place records (GEO) and 197357 place attestation records (GEOREF)". The central text reads "A database of places related to the ancient world by Trismegistos". A note below mentions the project's foundation on the Fayum Project and its rework by the Hercules Foundation, expanded to include Egypt and the CIP Europeana EAGLE project. The footer contains credits for general coordination, database structure, online version, data processing, and data processing for Trismegistos, all listing Mark Depauw, Herbert Verreth, Willy Clarysse, Katrijn Vandorpe, Bart Van Beek, Jeroen Clarysse, Bart Van Beek, Mark Depauw, Bart Van Beek, formerly Hans Proost, Inge Utterhoeven, and Herbert Verreth respectively. The footer also includes a "KULeuven Fayum Project" link and a small logo.

<http://www.trismegistos.org/geo/index.php>

Spoiler alert...

Recogito 2 for semantic annotation on texts and maps

The screenshot shows the Recogito 2 interface for semantic annotation. On the left, a sidebar lists chapters: Book 1, Book 2, Book 3, Book 4, and Book 5. The main content area displays the first chapter of Homer's The Odyssey, with the title "Homer: The Odyssey" and the date "800 - 700 BC". It also shows "42 Annotations" and "No Other Contributors". Below this, there are tabs for "ANNOTATION MODE: NORMAL", "QUICK", and "BULK", and "COLOR: BY TYPE" and "BY STATUS". The text of the first chapter is shown in a large font:

Tell me, O muse, of that ingenious hero who travelled far and wide after he had sacked the famous town of Troy. Many cities did he visit, and many were the nations with whose manners and customs he was acquainted; moreover he suffered much by sea while trying to save his own life and bring his men safely home; but do what he might he could not save his men, for they perished through their own sheer folly in eating the cattle of the Sun-god Hyperion; so the god prevented them from ever reaching home. Tell me, too, about all these things, O daughter of Jove, from whatsoever source you may know them.

Annotations are visible in the text, such as "Ulysses", "Calypso", "Ithaca", and "Neptune", which are highlighted in red. The bottom of the page continues with the text: "Now Neptune had gone off to the Ethiopians, who are at the world's end, and lie in two halves, the one looking West and

Another way of annotating geographical entities: mARKdown

mARkdown

The main goal of mARkdown is to provide a simple system for tagging structural elements in Arabic texts that would facilitate algorithmic analysis in the same way as more complex TEI XML does. *Additionally, it can be used as a non-standard annotation scheme for collecting data required by research purposes.*

HERE: Toponymic hierarchies (how provinces divided into regions)

Clip collection		Shamela_0023696*	
GEO	#\$#PROV #\$#REG1 #\$#REG2 #\$#REG3 #\$#REG4 #\$#REG5 #\$#STTL --- #\$#FROM	~~ وقد جعلناه . اربع . كور . جليلة . واربع . نواح . نفيسة . والكور . ~~ الحجاز . ثم . اليمن . ثم . عمان . ثم . هجر . ~~ جزيرة العرب # REG1#\$\$# TYPE#\$\$# كورة # اليمن # عمان # هجر ~~ والنواحي . الأحقاف . والأشجار . ~~ قرطاج . ~~ سفاما . الحجاز . فقصبه . مكة . ~~ ومن . مدنها . يثرب . وينبع . وقرح . ~~ والحراء . ~~ وجدة . والطائف . والجار . والسيقا . ~~ هذه . امهات ، ~~ الحجاز # REG1#\$\$# TYPE#\$\$# مدن . امهات # STTL#\$\$# يثرب # ينبع # قرطاج # خيبر # المروءة ~~ الحمراء # جدة # الطائف # الجار # السيقا # العونيد # الجحفة # والعشيرة ~~ دونهن . بدر . خليص . أمج . الحجر . بدا . يعقوب ~~ السوارقية . NoteV01P069N07 ~~ الفرع . السيره . NoteV01P069N06 ~~ جبلة . مهایع . حادة . NoteV01P069N09 ~~ بدا . يعقوب # السوارقية # الفرع # جبلة # مهایع # حادة # ~~ REG1#\$\$# TYPE#\$\$# مدن . دون . امهات # STTL#\$\$# بدر # خليص # أمج # الحجر #	1329 1330 1331 1332 1333 1334 1335 1336 1337 1338 1339 1340 1341 1342 1343

mARkdown

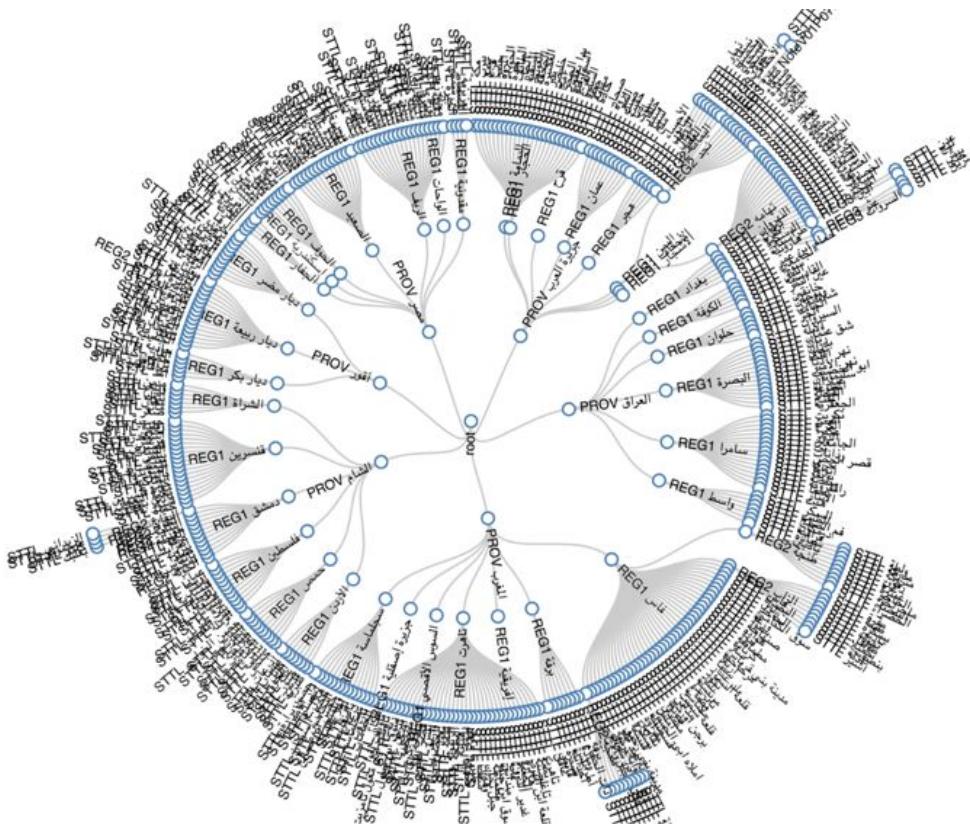
TEXT: and the regions (*kura*) [of Arabia]: the first of them is al-Hijaz, then al-Yaman, then ‘Uman, then Hajar.

ANNOTATION: #\$\$#PROV Arabia #\$\$#TYPE kura #\$\$#REG1 al-Hijaz # al-Yaman # ‘Uman # Hajar

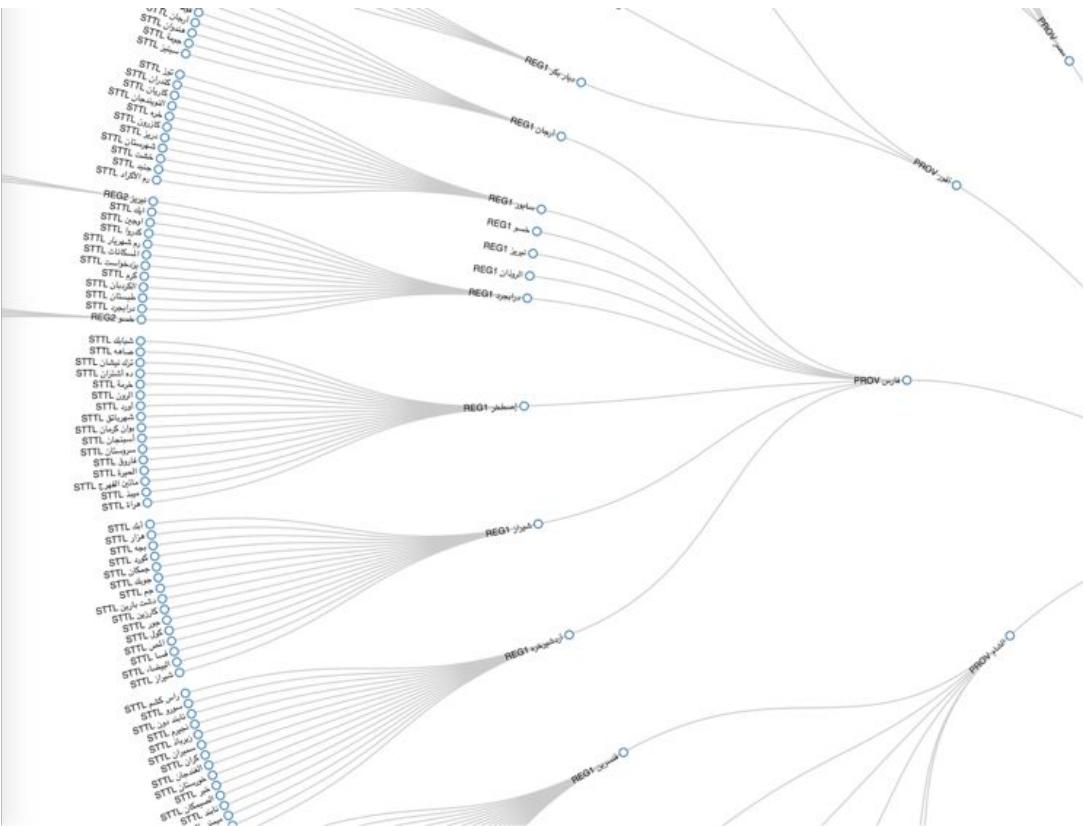
NB: extraction ans co

clip collection		Shamela_0023696*	
GEO	#\$\$#PROV #\$\$#REG1 #\$\$#REG2 #\$\$#REG3 #\$\$#REG4 #\$\$#REG5 #\$\$#STTL ---	~~ وقد جعلناه . اربع . كور . جليلة . واربع . نواح . نفيسة . والكور . NoteV01P068N07	1329
		~~ الحجاز . تم . اليمن . تم . عمان . ثم . هجر . أولها . NoteV01P068N08	1330
		~~ جزيرة العرب #\$\$# TYPE#\$\$# REG1#\$\$# كورة الحجاز # عمان # اليمن # هجر . NoteV01P068N09	1331
		~~ والنواحي الاحقاف . والاشجار . اليمامة . NoteV01P068N10	1332
		~~ قرطاج . NoteV01P069N01	1333
		~~ سفاما . الحجاز . فقصبه . مكة . NoteV01P069N02	1334
		~~ ومن . مدنها . يثرب . وينبع . وقرح . NoteV01P069N03	1335
		~~ والحراء . امهات ، وجدة . والطائف . والجار . والسيقا . NoteV01P069N04	1336
		~~ هذه امهات ، دونهن . NoteV01P069N05	1337
		~~ # الحجاز # مدن امهات # STTL#\$\$# يثرب # ينبع # قرطاج # خيبر # المروة . NoteV01P069N06	1338
		~~ # جدة # الطائف # الجار # السيقا # العونييد # الجحفة # العشيرة . NoteV01P069N07	1339
		~~ # دونهن . بدر . خليص . أمج . الحجر . بدا . يعقوب . NoteV01P069N08	1340
		~~ السوارقية . الفرع . السيره . NoteV01P069N09	1341
		~~ جبلة . مهایع . حادة . REG1#\$\$# TYPE#\$\$# مدن دون امهات # STTL#\$\$# بدر # خليص # أمج # الحجر # بدا . يعقوب # السوارقية # الفرع # جبلة # مهایع # حادة . NoteV01P069N10	1342
		~~ # بدأ . يعقوب # السوارقية # الفرع # جبلة # مهایع # حادة # الحجر # بدا . يعقوب # السوارقية # الفرع # جبلة # مهایع # حادة . NoteV01P069N11	1343

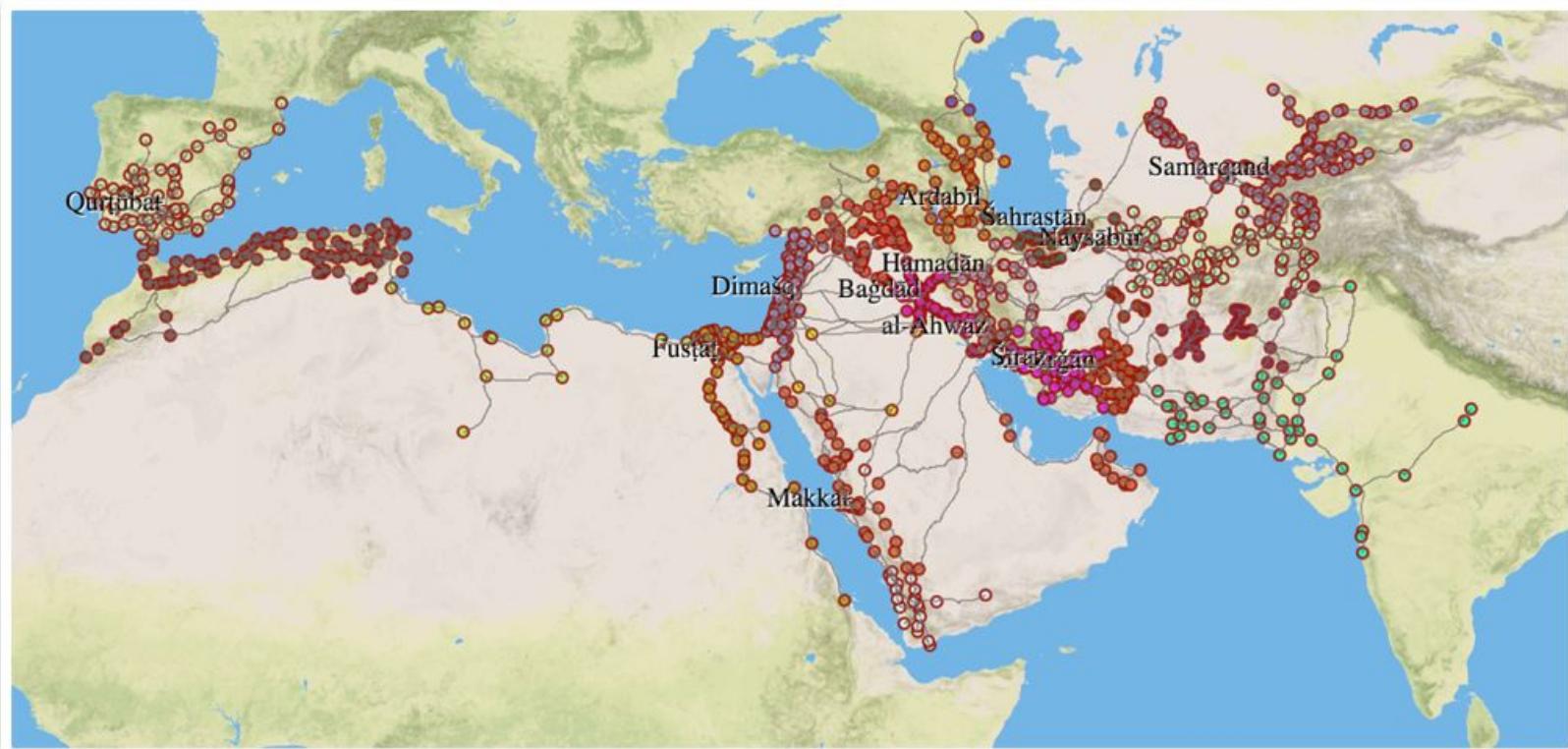
mARkdown > visual representations



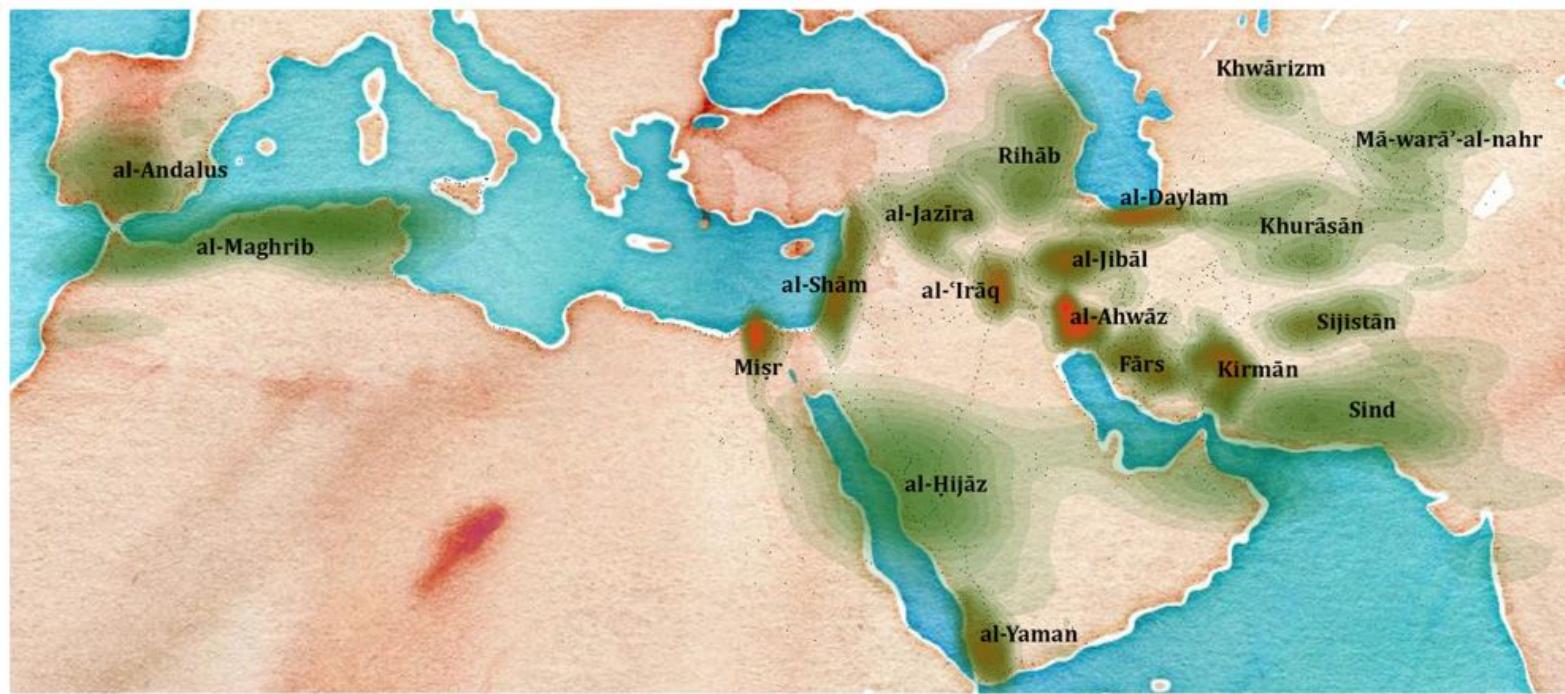
mARkdown > visual representations



mARkdown > visual representations



mARkdown > visual representations



https://github.com/maximromanov/geo_dh/

Creating geographical data: *georeferencing printed maps*

Printed Maps > Digital Data

(coordinates for long gone places)

QGIS PRACTICUM

Version: 2015/11/02 @ 11:26:47



18. Save your work in QGIS: Project > Save. Do not forget to open this project when you georeference your next map!



Using geography to understand other things

Place-relatedness in Hestia

<http://www2.open.ac.uk/openlearn/hestia/index.html#book/1>

Hestia Home · About · Blog

The Histories of Herodotus
Search or download the full text via the Perseus Classical Library

Reading View, showing the text of Herodotus alongside a map of places mentioned in that section. Viewing may also be navigated by a narrative "timeline" bar underneath the map.

This is the display of the inquiry of Herodotus of **Halicarnassus**, so that things done by man not be forgotten in time, and that great and marvelous deeds, some displayed by the Hellenes, some by the barbarians, not lose their glory, including among others what was the cause of their waging war on each other.

The Persian learned men say that the Phoenicians were the cause of the dispute. These (they say) came to our seas from the sea which is called Red, and having settled in the country which they still occupy, at once began to make long voyages. Among other places to which they carried Egyptian and Assyrian merchandise, they came to **Argos**, which was at that time preeminent in every way among the people of what is now called **Hellas**. The Phoenicians came to **Argos**, and set out their cargo.

On the fifth or sixth day after their arrival, when their wares were

Mapa Satellite

Asia Minor (Zoom In)
View Details >>
122 references

Map data ©2016 - I Termini e condizioni d'uso - Segnala un errore nella mappa

● Argos ● Aegyptus ● Hellas ● Asia
● Hellas ● Aegyptus ● Aegyptus ● Europa
● Tyrus/Col. Septimia Severa ● Colchis/Lazike ● Phasis/Rheon fl.
● Phoenice ● Phoenice ● Phoenice ● Asia Minor
● Colchis/Lazike ● Colchis/Lazike ● Colchis/Lazike ● Europa
● Phasis/Rheon fl. ● Phasis/Rheon fl. ● Phasis/Rheon fl. ● Asia Minor

Timeline © SINGLE

Least referenced ● ● ● ● ● Most referenced

Show: English | Ancient Greek | << previous 1.1 next >>

GapVis (c) 2011 Nick Rabinowitz / Google Ancient Places. Hosting by AlexandriaArchive.org. Funding by Google

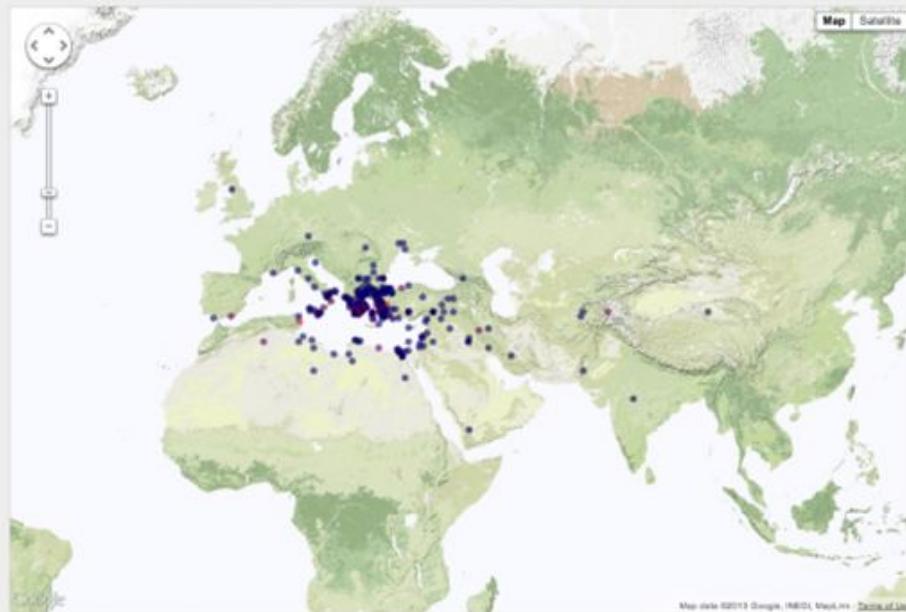
The Histories

By Herodotus (Translated by A. D. Godley)

Published 1920 · View on Google Books

The Google Books version of "The Histories", by Herodotus (Translated by A. D. Godley), was published in 1920. It references 307 identified ancient places. The place most frequently referenced is Miletus, followed by Hellas, Lacedaemon/Laconia, and Asia.

[Go to Reading View](#) >



[Book Summary](#) [Reading View](#) [Place Detail](#)

Top Places

[Most referenced](#) | [Alphabetical](#)

Miletus	27
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Sax	7
Die/Dionysos	6
Crete	6
Hellenes/Hellenes	6
Athenians	6
Praesus R.	6
Asia	6

Landing page: comprehensive view of all places mentioned in the text

Herodotus

By Herodotus (translated by W. Beloe)

Published 1830 · [View on Google Books](#)

CLIO. 15 Amphiaraus, Tropbonius, and the Milesian Branchidae. The above-mentioned are the oracles which Croesus consulted in **Greece**: he sent also to the Lybian Ammon. His motive in these consultations, was to form an idea of the truth of the oracles respectively, meaning afterwards to obtain from them a decisive opinion concerning the propriety of an expedition against the Persians.**XL VII.** He took this method of proving the truth of their different communications. He computed with his Lydian messengers, that each should consult the different oracles on the hundredth day of their departure from **Sardis**, and respectively ask what Croesus the son of Alyattes was doing: they were to write down, and communicate to Croesus, the reply of each particular oracle.* Of the oracular answers in general we have no account remaining; but the Lydians had no sooner entered the temple of **Delphi**, and proposed their questions, than the Pythian* answered thus, in heroic verse: I count the sand, I measure out the sea; The silent and the dumb are heard by me: E'en now the odours to my sense that rise, A tortoise boiling with a lamb supplies, Where brass below and brass above it lies.**XL VIII.** They wrote down the communication of the Pythian, and returned to **Sardis**. Of the answers which his other messengers brought with them on their return,

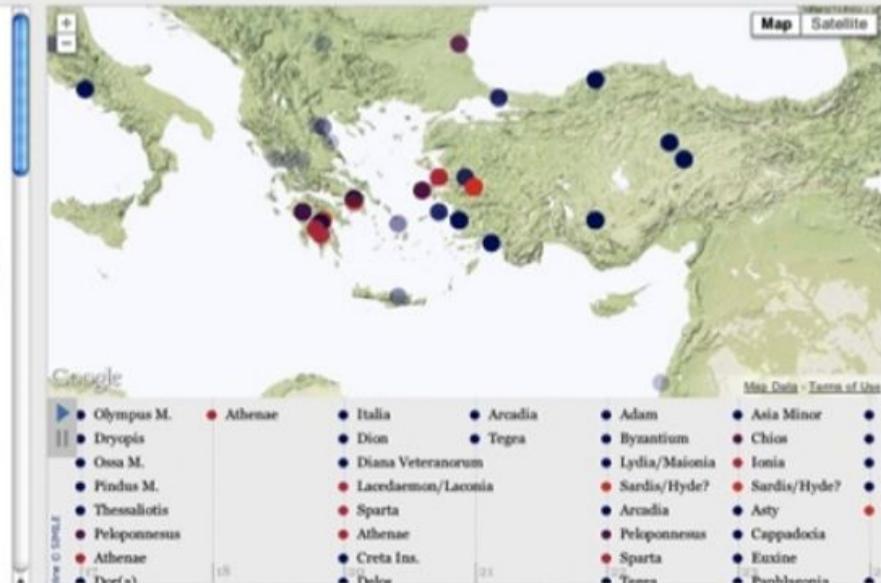
Show: Text | Scan

<< previous 15 next >>

Book Summary

Reading View

Place Detail



Reading View

HERODOTUS

By Herodotus (translated by W. Beloe)

Published 1830 · View on Google Books

Athenae

88 references

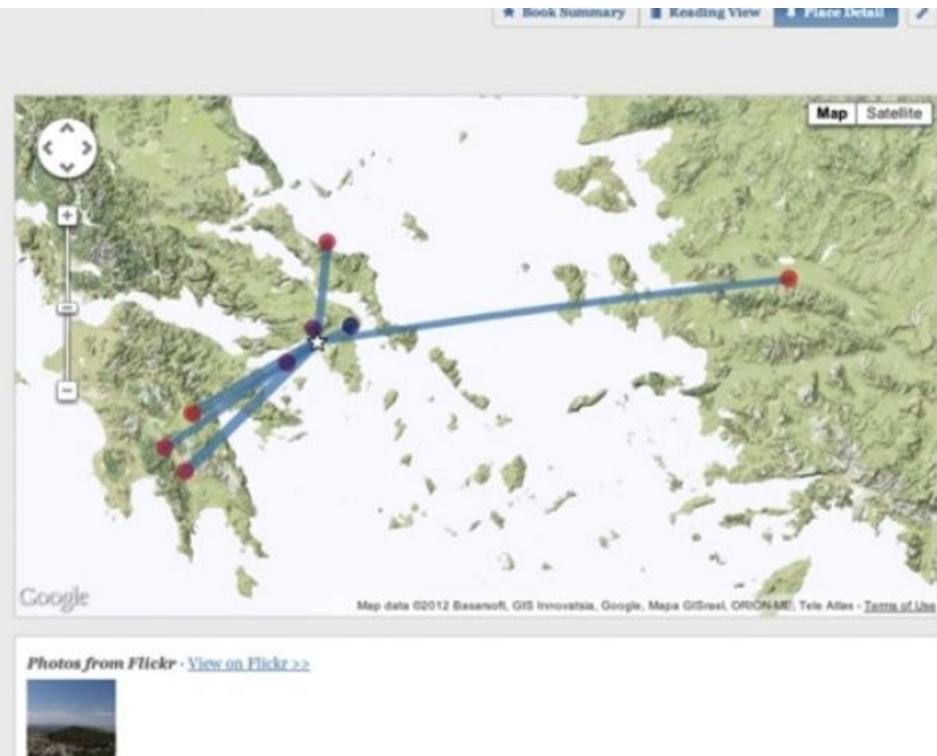
Report a problem with this record

External Resources

- Place page on Pleiades
- Books referencing Athenae
- Pelagios Graph Explorer

Top Related Places

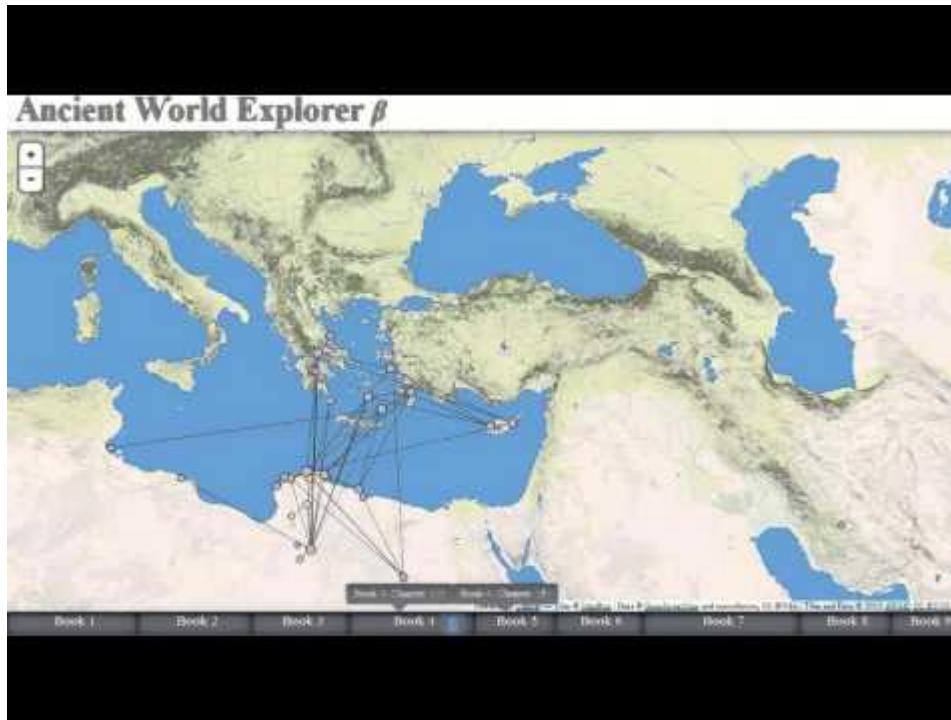
- Hellas (39)
- Sparta (35)
- Attica (32)
- Salamis Ins. (29)
- Dirphys M. (18)
- Lacedaemon/Laconia (25)
- Sardis/Hyde? (23)
- Marathon (16)



Place view: network of the most frequent connections with one selected place

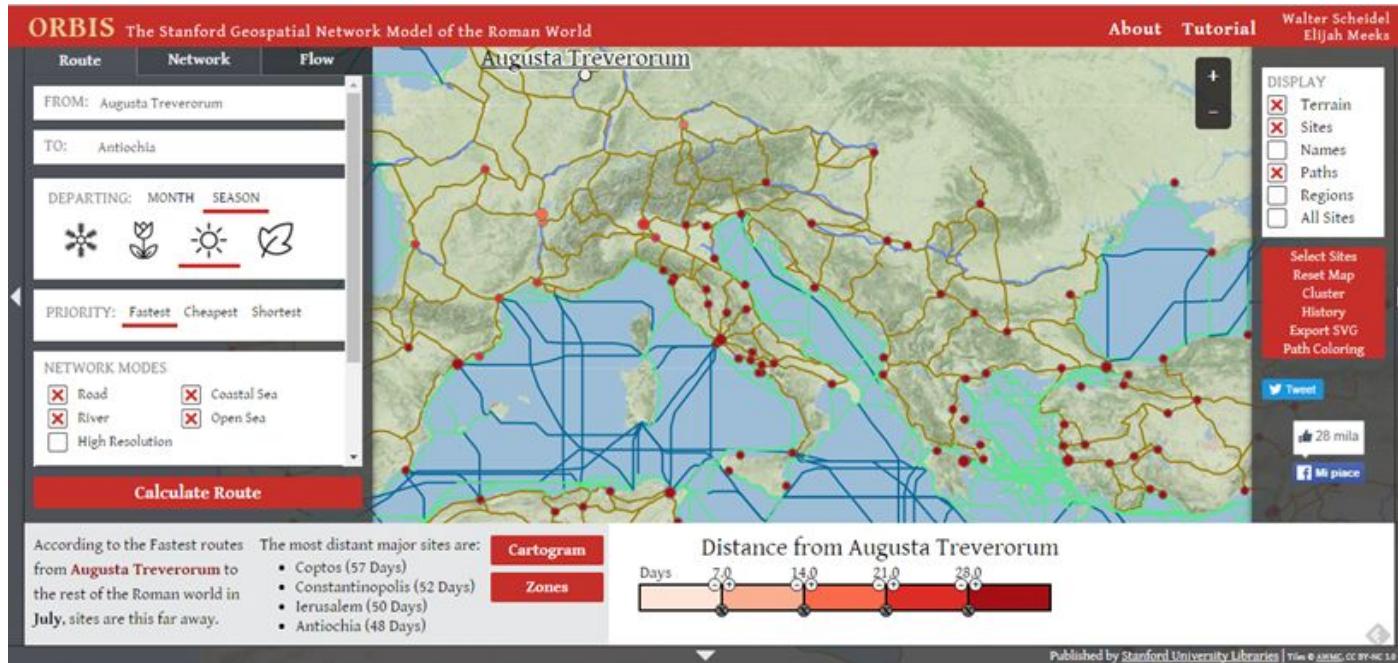
Thomas Efer: Herodotus in under a minute....

<https://www.youtube.com/watch?v=EcHUIj1Otsk>



How did they travel? Orbis

<http://orbis.stanford.edu/>



ORBIS

 The Stanford Geospatial Network Model of the Roman World[About](#) [Tutorial](#)Walter Scheidel
Elijah Meeks

Route

Network

Flow

FROM:

Roma

TO:

Puteous

Pyramos (river)

Qasr Farafra

Raphia

Ratae

Ravenna

Reate

Regium

Rhodos

NETWO

Rome

River

High Resolution

 Open Sea**Calculate Route**

According to the Fastest routes from **Roma** to the rest of the Roman world in **July**, sites are this far away.

The most distant major sites are:

- Londinium (27 Days)
- Coptos (27 Days)
- Constantinopolis (21 Days)
- Corduba (20 Days)



DISPLAY

 Terrain Sites Names Paths Regions All Sites

Select Sites

Reset Map

Cluster

History

Export SVG

Path Coloring

[Tweet](#)

28 mila

[Mi piace](#)

Cartogram

Zones

Distance from Roma



In attesa di risposta da orbis.stanford.edu...

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Route

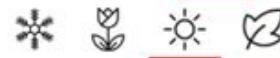
Network

Flow

FROM: Roma

TO: Sirmium

DEPARTING: MONTH SEASON



PRIORITY: Fastest Cheapest Shortest

NETWORK MODES

- | | |
|---|--------------------------------------|
| <input checked="" type="checkbox"/> Road | <input type="checkbox"/> Coastal Sea |
| <input checked="" type="checkbox"/> River | <input type="checkbox"/> Open Sea |
| <input type="checkbox"/> High Resolution | |

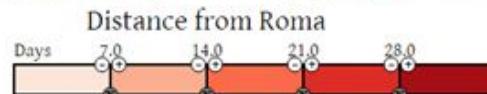
Calculate Route

According to the Fastest routes from **Roma** to the rest of the Roman world in **July**, sites are this far away.

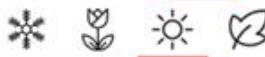
- The most distant major sites are:
- Londinium (27 Days)
 - Coptos (27 Days)
 - Constantinopolis (21 Days)
 - Corduba (20 Days)

Cartogram

Zones



Route Network Flow

PRIORITY: Fastest Cheapest Shortest

NETWORK MODES

- | | |
|---|---|
| <input checked="" type="checkbox"/> Road | <input checked="" type="checkbox"/> Coastal Sea |
| <input checked="" type="checkbox"/> River | <input checked="" type="checkbox"/> Open Sea |
| <input type="checkbox"/> High Resolution | |

MODE	TRANSFER COST
ROAD	Foot (30km/day)
RIVER	Civilian
SEA	Fast

Calculate Route

According to the Fastest routes from **Roma** to the rest of the Roman world in **July**, sites are this far away.

- The most distant major sites are:
- Londinium (27 Days)
 - Coptos (27 Days)
 - Constantinopolis (21 Days)
 - Corduba (20 Days)

Transfer Cost

Accounts for the cost involved in transfers between different types of transportation by adding the selected number of days or denarii to any change from or to travel by road, river and sea.

**DISPLAY**

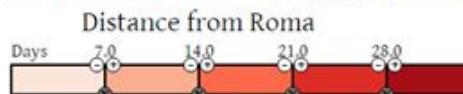
- Terrain
- Sites
- Names
- Paths
- Regions
- All Sites

Select Sites
Reset Map
Cluster
History
Export SVG
Path Coloring

Tweet

28 mila

Mi place



ORBIS

The Stanford Geospatial Network Model of the Roman World

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Elijah Meeks

Route Network Flow

PRIORITY: Fastest Cheapest Shortest

NETWORK MODES

<input checked="" type="checkbox"/> Road	<input checked="" type="checkbox"/> Coastal Sea
<input checked="" type="checkbox"/> River	<input checked="" type="checkbox"/> Open Sea
<input type="checkbox"/> High Resolution	

MODE

ROAD	Foot (30km/day)
RIVER	Civilian
SEA	Fast

TRANSFER COST

ROAD	0
RIVER	0
SEA	0

Calculate Route



The Fastest journey from **Roma** to **Sirmium** in **July** takes **21.2 days**, covering **888 kilometers**.

Prices in *denarii*, based on the use of a faster sail ship and a civilian river boat (where applicable), and on these road

Per kilogram of wheat (by donkey): 14.59
Per kilogram of wheat (by wagon): 18.18
Per passenger in a carriage: 751.4



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ORBIS The Stanford Geospatial Network Model of the Roman World

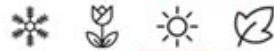
About Tutorial

Walter Scheidel
Elijah Meeks

Route

Network

Flow



PRIORITY: Fastest Cheapest Shortest

NETWORK MODES

- Road Coastal Sea
- River Open Sea
- High Resolution

MODE

- | | | |
|-------|----------|---------------|
| ROAD | Donkey | TRANSFER COST |
| RIVER | Civilian | 0 |
| SEA | Fast | 0 |

Calculate Route

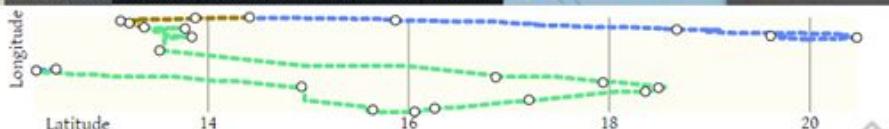
The Cheapest journey from Roma to Sirmium in July takes 42.9 days, covering 3075 kilometers.

Prices in *denarii*, based on the use of a faster sail ship and a civilian river boat (where applicable), and on these road

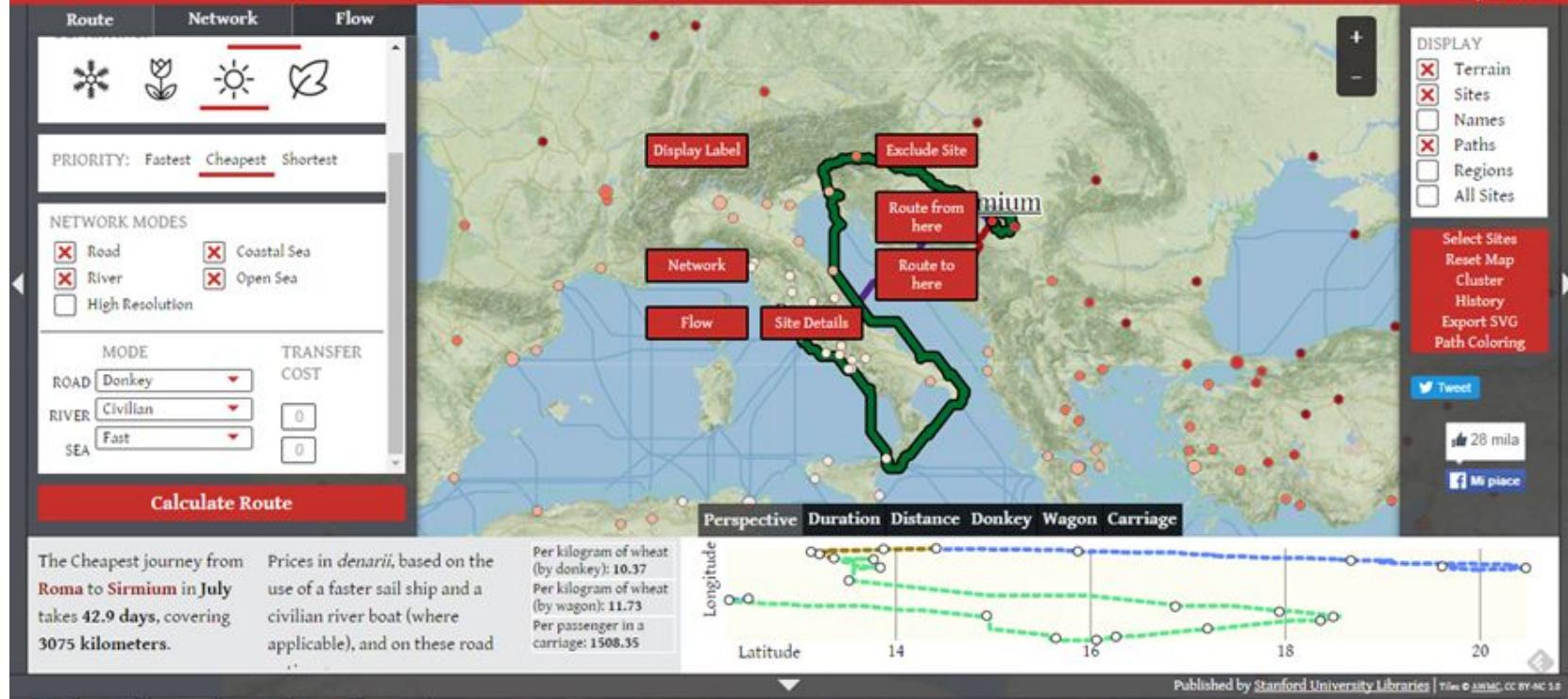
Per kilogram of wheat (by donkey): 10.37
Per kilogram of wheat (by wagon): 11.73
Per passenger in a carriage: 1508.35



Perspective Duration Distance Donkey Wagon Carriage



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ORBIS The Stanford Geospatial Network Model of the Roman World

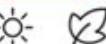
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Route

Network

Flow



PRIORITY: Fastest **Cheapest** Shortest

NETWORK MODES:

Road

Coastal Sea

River

Open Sea

High Resolution

MODE

ROAD **Donkey**

TRANSFER COST

RIVER **Civilian**

0

SEA **Fast**

0

Calculate Route

The Cheapest journey from Roma to Sirmium in July takes 42.9 days, covering 3075 kilometers.

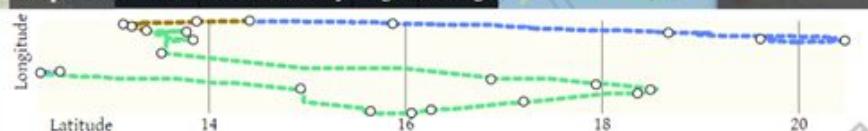
Prices in *denarii*, based on the use of a faster sail ship and a civilian river boat (where applicable), and on these road

Per kilogram of wheat (by donkey): 10.37
Per kilogram of wheat (by wagon): 11.73
Per passenger in a carriage: 1508.35

The network function calculates the cost between one site (center) and all other sites based on your selections.



Perspective Duration Distance Donkey Wagon Carriage



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Route **Network** **Flow**

PRIORITY: Fastest **Cheapest** Shortest

NETWORK MODES

<input checked="" type="checkbox"/> Road	<input checked="" type="checkbox"/> Coastal Sea
<input checked="" type="checkbox"/> River	<input checked="" type="checkbox"/> Open Sea
<input type="checkbox"/> High Resolution	

MODE **TRANSFER COST**

ROAD	Donkey	0
RIVER	Civilian	0
SEA	Fast	0

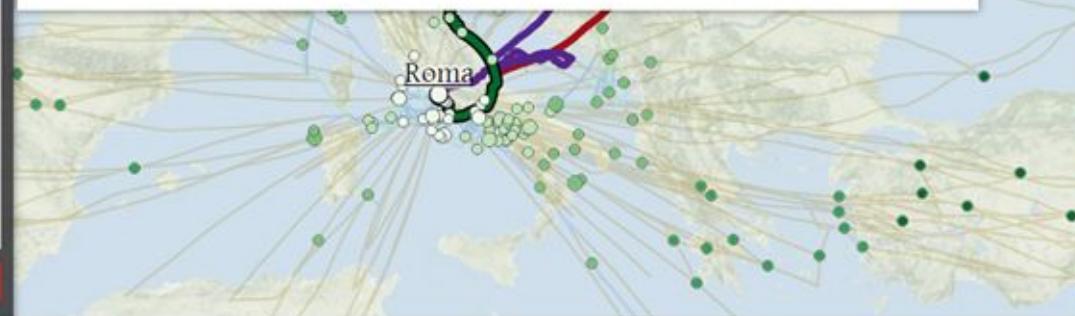
Calculate Network

According to the Cheapest routes from **Roma** to the rest of the Roman world in **July**, sites are this far away.

- The most distant major sites are:
- Coptos (7 Denarii)
 - Mediolanum (4 Denarii)
 - Londinium (4 Denarii)
 - Ierusalem (3 Denarii)

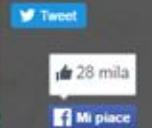
Dynamic Distance Cartogram

The cost cartogram function reconfigures the network by expressing the cost (in distance, time or expense) between the center and all other sites as distances: each unit of distance in the display corresponds to a unit of connectivity cost. For example, a site that is shown as being three times as far away from the center as another site is three times as costly (in terms of distance, time or expense) to reach from the center.

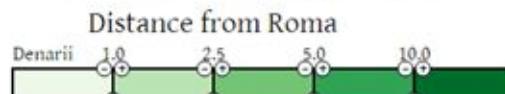


- DISPLAY**
- | | |
|-------------------------------------|-----------|
| <input checked="" type="checkbox"/> | Terrain |
| <input checked="" type="checkbox"/> | Sites |
| <input type="checkbox"/> | Names |
| <input checked="" type="checkbox"/> | Paths |
| <input type="checkbox"/> | Regions |
| <input type="checkbox"/> | All Sites |

- Select Sites
Reset Map
Cluster
History
Export SVG
Path Coloring
Georectify



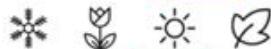
Cartogram
Georectify
Zones



Route

Network

Flow

PRIORITY: Fastest **Cheapest** Shortest

NETWORK MODES

- Road Coastal Sea
- River Open Sea
- High Resolution

MODE

TRANSFER COST

ROAD Donkey

0

RIVER Civilian

0

SEA Fast

0

Calculate Network

According to the Cheapest routes from **Roma** to the rest of the Roman world in **July**, sites are this far away.

The most distant major sites are:

- Coptos (7 Denarii)
- Mediolanum (4 Denarii)
- Londinium (4 Denarii)
- Ierusalem (3 Denarii)

Generating Zones

Once a network has been calculated, this function displays cost contours that show which sites share a specific range of transportation costs from or to the selected start or end point. The relevant costs are reported in the legend that appears in the lower right hand corner. This perspective helps capture the structural properties and logistical constraints of the Roman imperial system as a whole.

**Cartogram****Zones****Distance from Roma****DISPLAY**

- Terrain
- Sites
- Names
- Paths
- Regions
- All Sites

Select Sites
Reset Map
Cluster
History
Export SVG
Path Coloring
Zones off



28 mila



Mi piace

Route

Network

Flow

CENTER: Roma

DIRECTION: From To

DEPARTING: MONTH SEASON



PRIORITY: Fastest Cheapest Shortest

NETWORK MODES

- Road
- River
- High Resolution
- Coastal Sea
- Open Sea

Calculate Flow

The Cheapest routes from Roma to the rest of the Roman world in July share these common segments.

The most active segments are:

- Ostia/Portus to Roma (666)
- Ostia/Portus to Palinurus Pr. (419)
- Regium to Palinurus Pr. (418)
- Regium to Messana (298)

A Minard Diagram calculates all the most efficient routes from or to the selected site and aggregates them to show the most used paths.



Flow from Roma

1 2 4 8 16 32 64 128 256 666

- DISPLAY
- Terrain
 - Sites
 - Names
 - Paths
 - Regions
 - All Sites

Select Sites
Reset Map
Cluster
Flow Off
History
Export SVG
Path Coloring



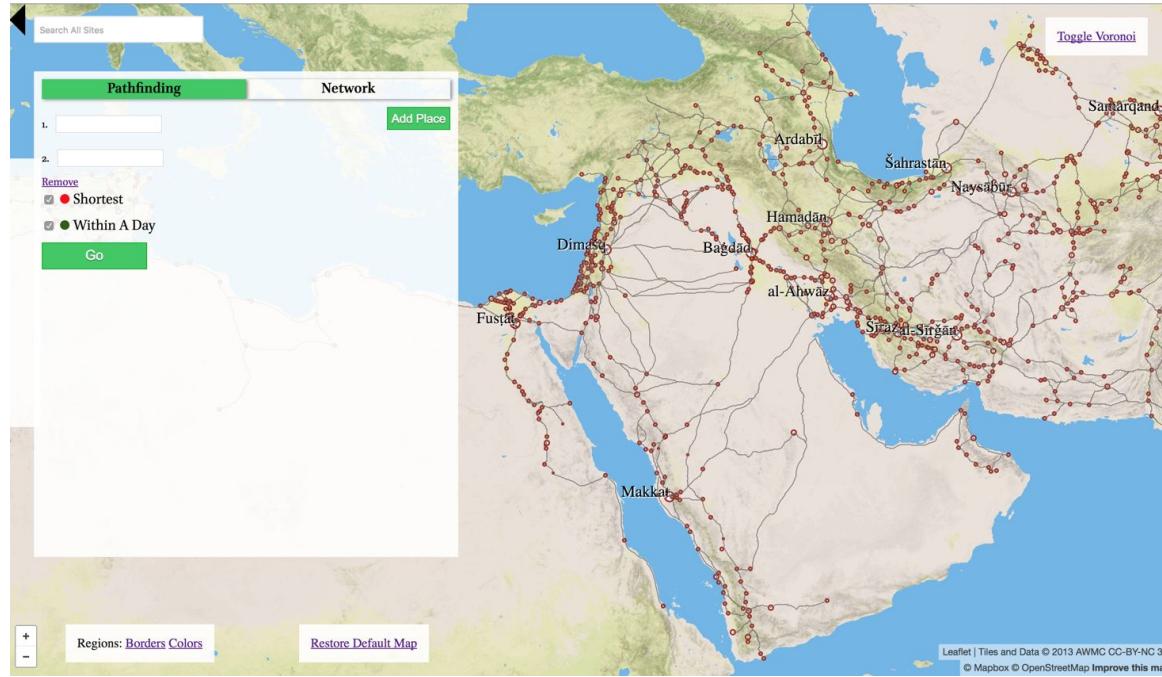
28 mila



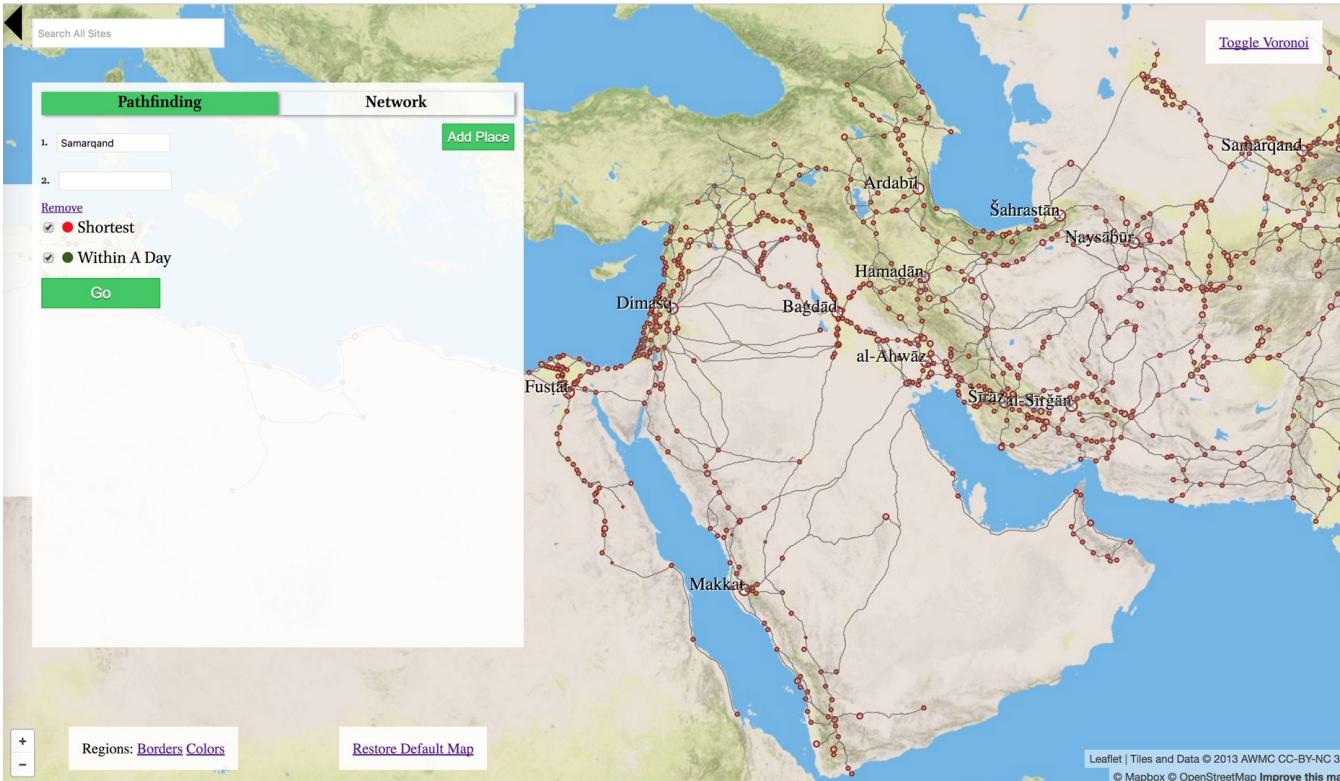
Mi place

How did they travel? *Surat al-Ard* (“Islamicate Orbis”)

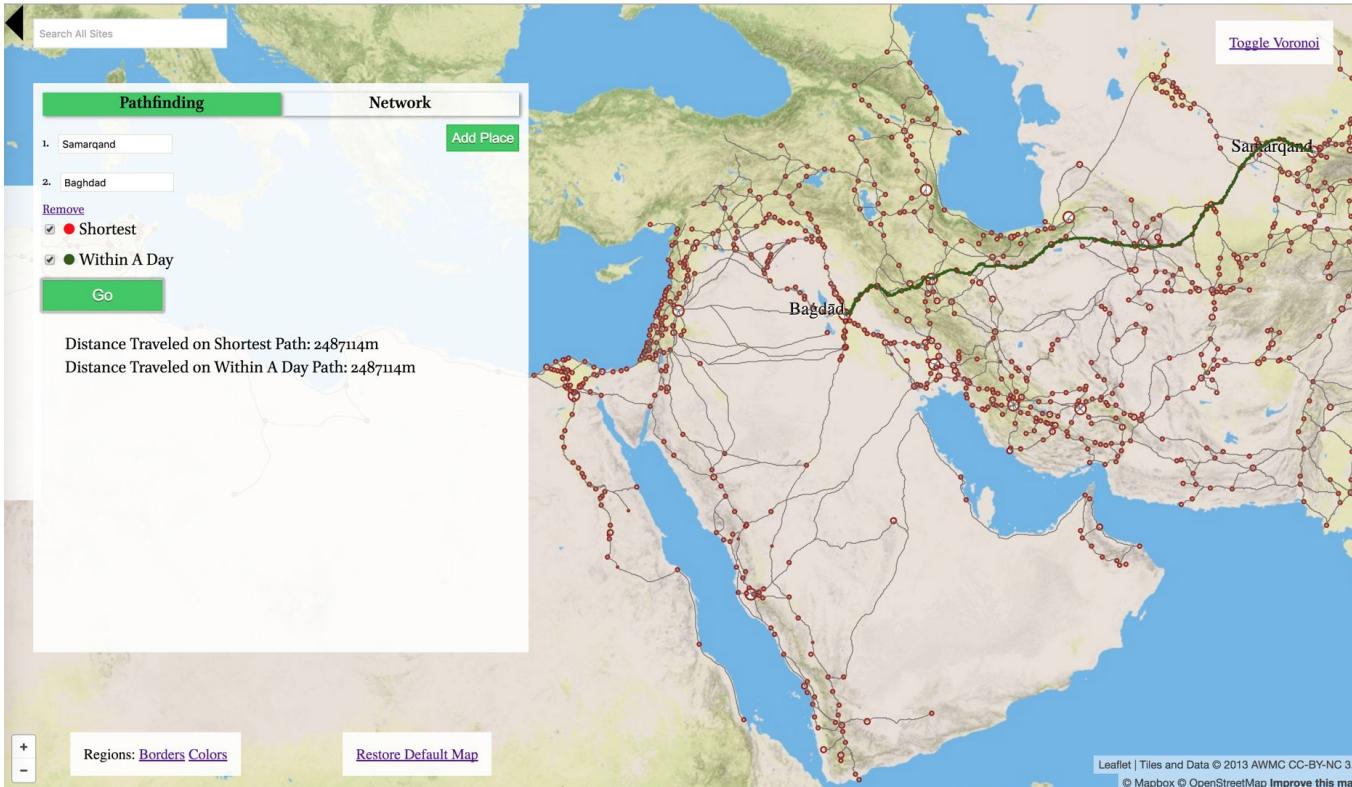
http://maximromanov.github.io/projects/althurayya_03/



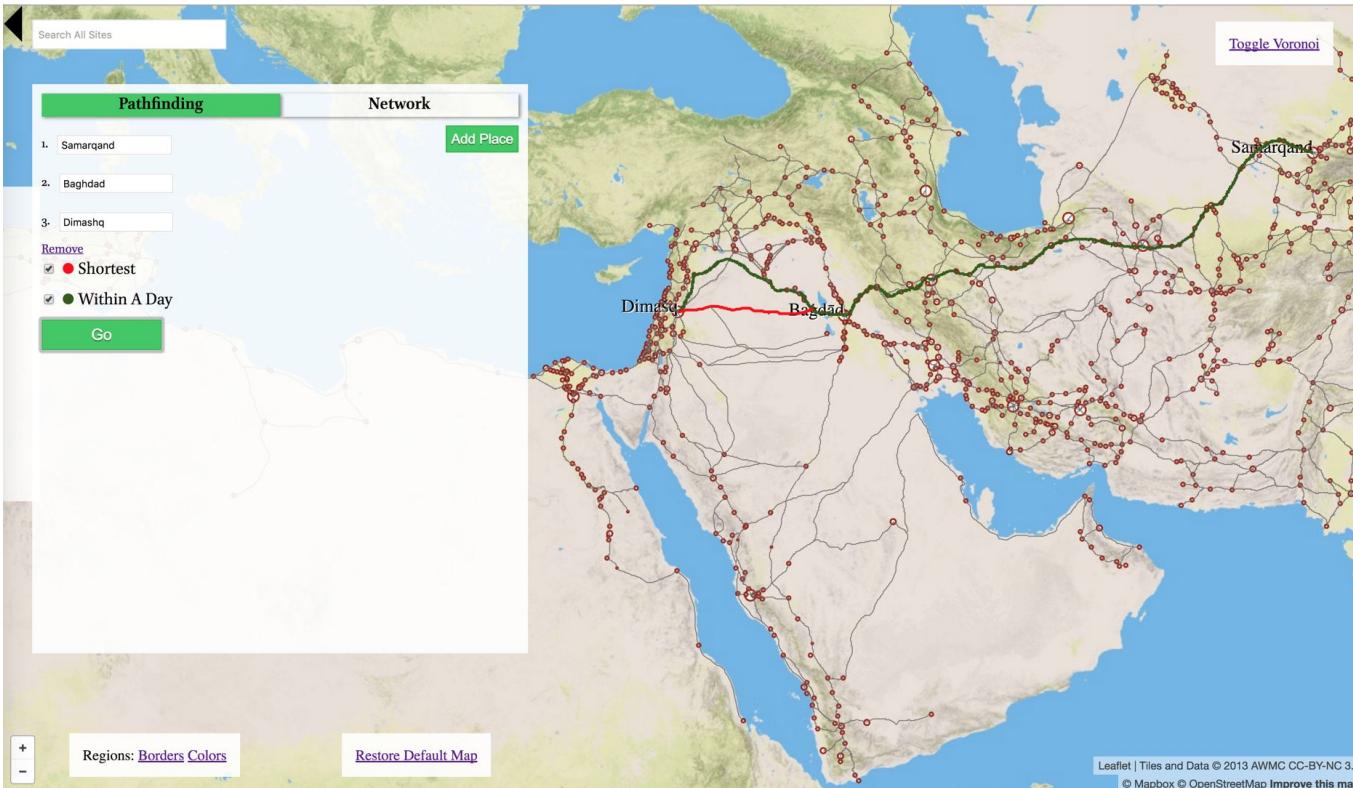
Traveling Itineraries



Traveling Itineraries



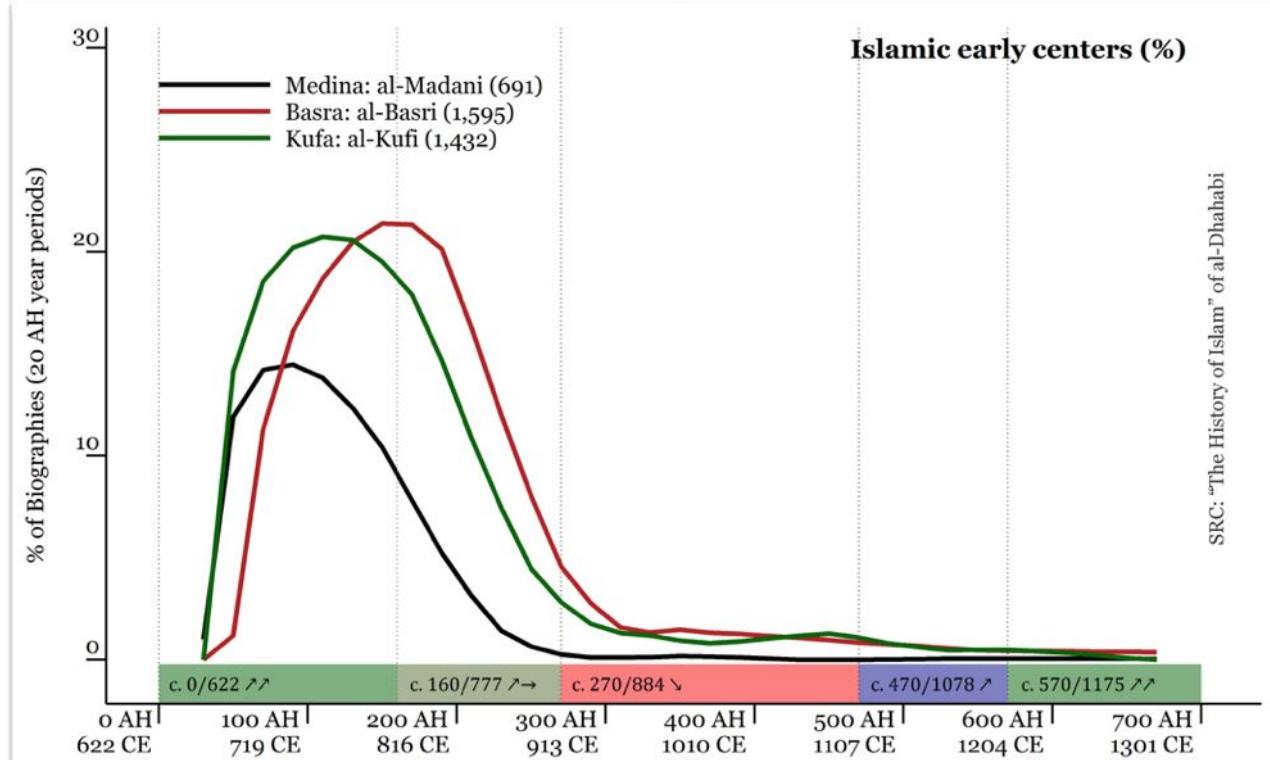
Traveling Itineraries



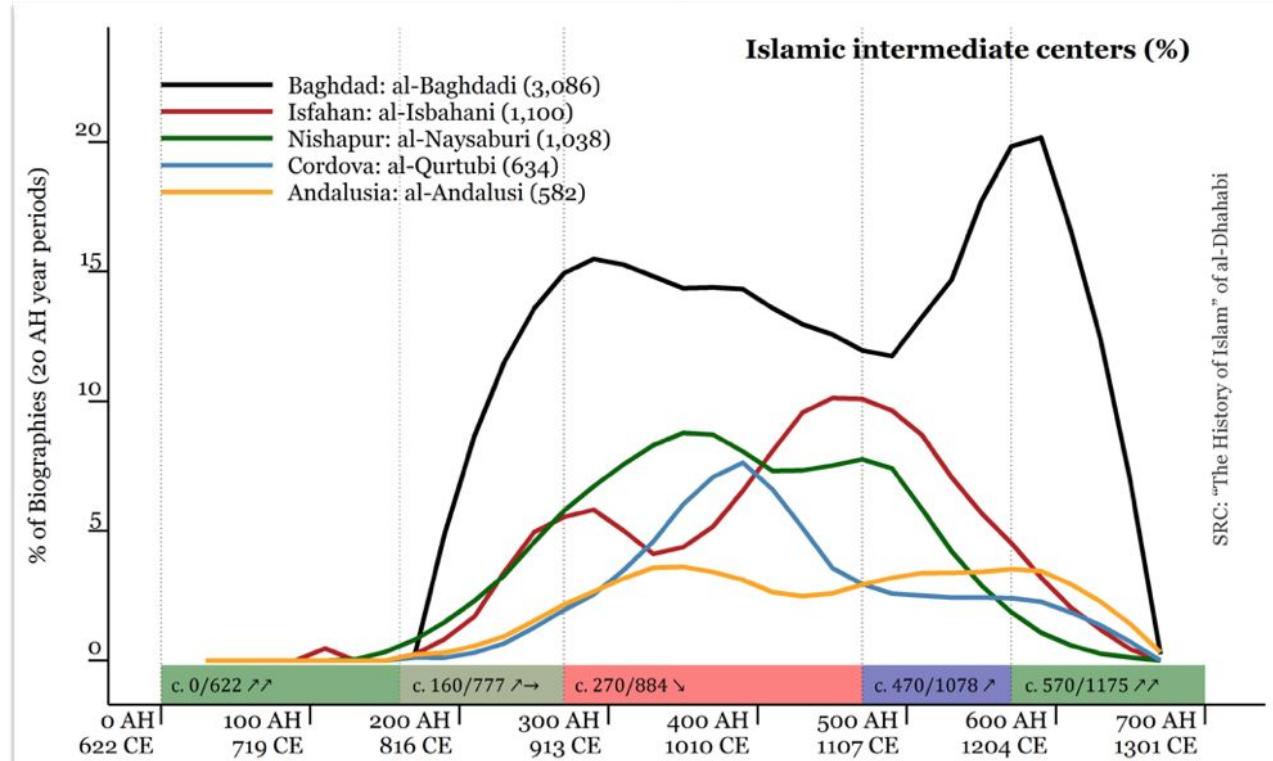
The Islamic world in 600-1300 CE

social geography of through biographical data

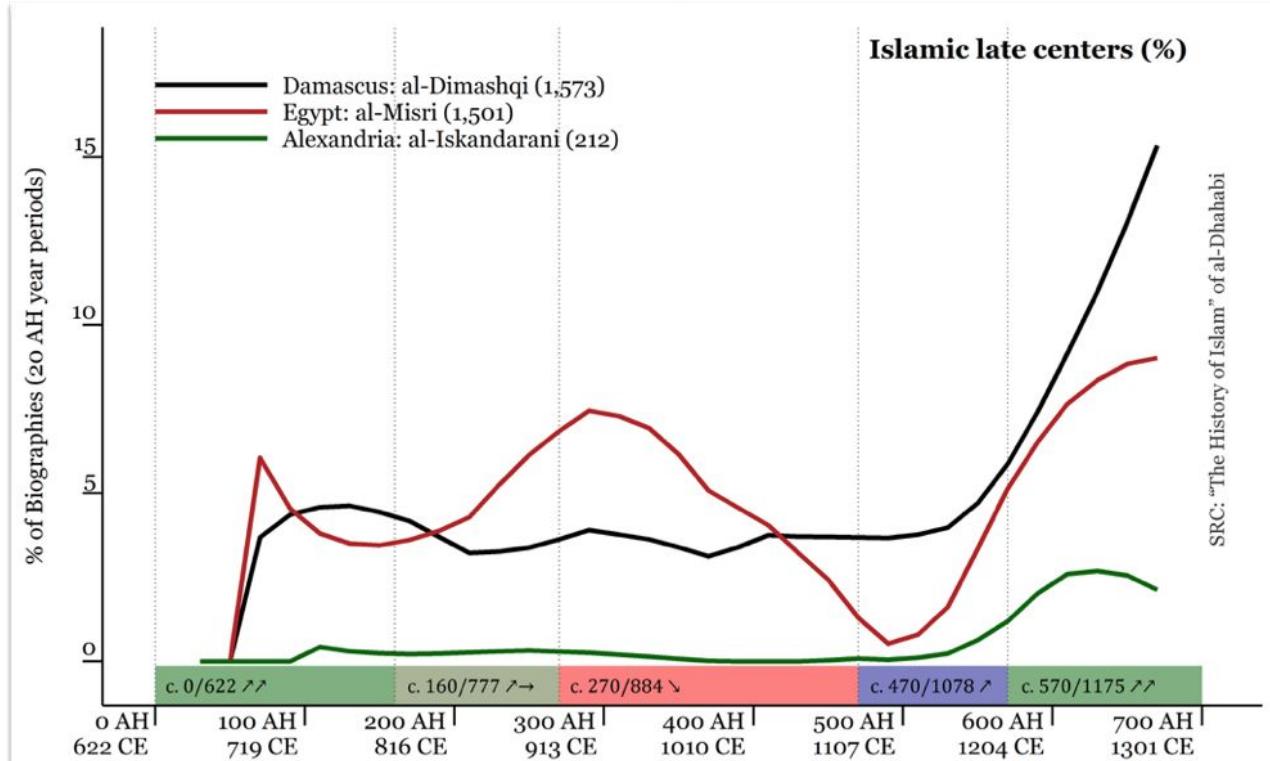
Cities over time



Cities over time



Cities over time



Mapping geographical networks of thousands people

