Crete Past and Present: Crete on Stage

ΠΑΝΕΠΙΣΤΗΜΙΟ ΚΡΗΤΗΣ
UNIVERSITY OF CRETE

Classics & AI:

Echoes of the Past, Engines of the Future

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AI4SSH

Horizon ERA Chair TALOS AI4SSH Project funded by the European Commission
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Tour de table - Roundtable

My name is….

I study….

My main interests are…

What I hope to gain from this workshop is…

Abstract

This hands-on introductory workshop will introduce students to **knowledge graphs**, focusing on their practical application in **knowledge representation**. Specifically, the session will center on extracting and **structuring information** from **Ancient Greek summaries of Classical tragedies**.

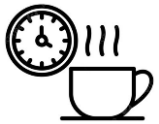
The workshop consists of two parts:

- **Theoretical Foundations**: Students will be introduced to the foundational concepts of knowledge graphs, their significance, Symbolic AI, ontologies, standards and their practical implications. This segment will also include a demonstration of the KGE (Knowledge Graph Editor) tool, showcasing how it can be used to represent such ancient text.
- **Practical Application**: Students will work in groups to construct knowledge graphs using the KGE. Each team will model selected summaries of Ancient Greek tragedies, identifying key entities and their relationships. The session will conclude with brief presentations of the generated graphs, followed by feedback and discussion. The session will conclude with a discussion of the Large Language Models products created from the data of the ancient summaries under evaluation.

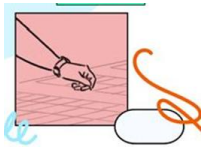
This hands-on approach will provide participants with both a conceptual understanding and practical experience in knowledge graph creation.

Program

10.00-11.30 Part 1



11.30-12.00 Break

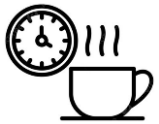


12.00-13.30 Part 2

- **Theoretical Foundations**: Students will be introduced to the foundational concepts of knowledge graphs, their significance, Symbolic AI, ontologies, standards and their practical implications. This segment will also include a demonstration of the KGE (Knowledge Graph Editor) tool, showcasing how it can be used to represent such ancient text.

Program

10.00-11.30 Part 1



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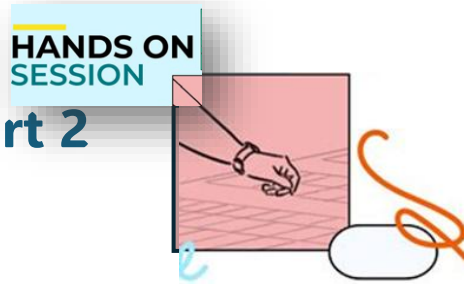
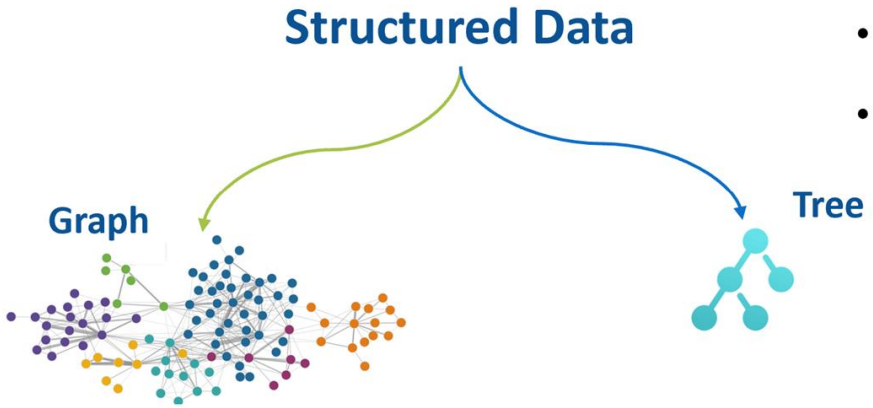


12.00-13.30 Part 2



- Unplugged (on paper)
- Plugged (with KGE)

- **Practical Application**: Students will work in groups to construct knowledge graphs using the KGE. Each team will model selected summaries of Ancient Greek tragedies, identifying key entities and their relationships. The session will conclude with brief presentations of the generated graphs, followed by feedback and discussion. The session will conclude with a discussion of the Large Language Models products created from the data of the ancient summaries under evaluation.

Concepts to be introduced…

- **Ancient Greek summaries of classical tragedies**
- knowledge graphs
- Symbolic AI
- ontologies
- standards

Part 1

1.1 It’s all about the text

- Timelines
- What is a ‘hypothesis’?
- Aristophanes of Byzantium

1.2 It’s all about the graph

- Aristophanes of Byzantium Knowledge Graph
- DBpedia – Wikidata – LOD
- RDF and other standards (for the SW, Ontologies) – KGE

Break

Part 2

2.1 Practical works (in groups)

2.2 Report back to the plenary

Part 1

1.1 It’s all about the text

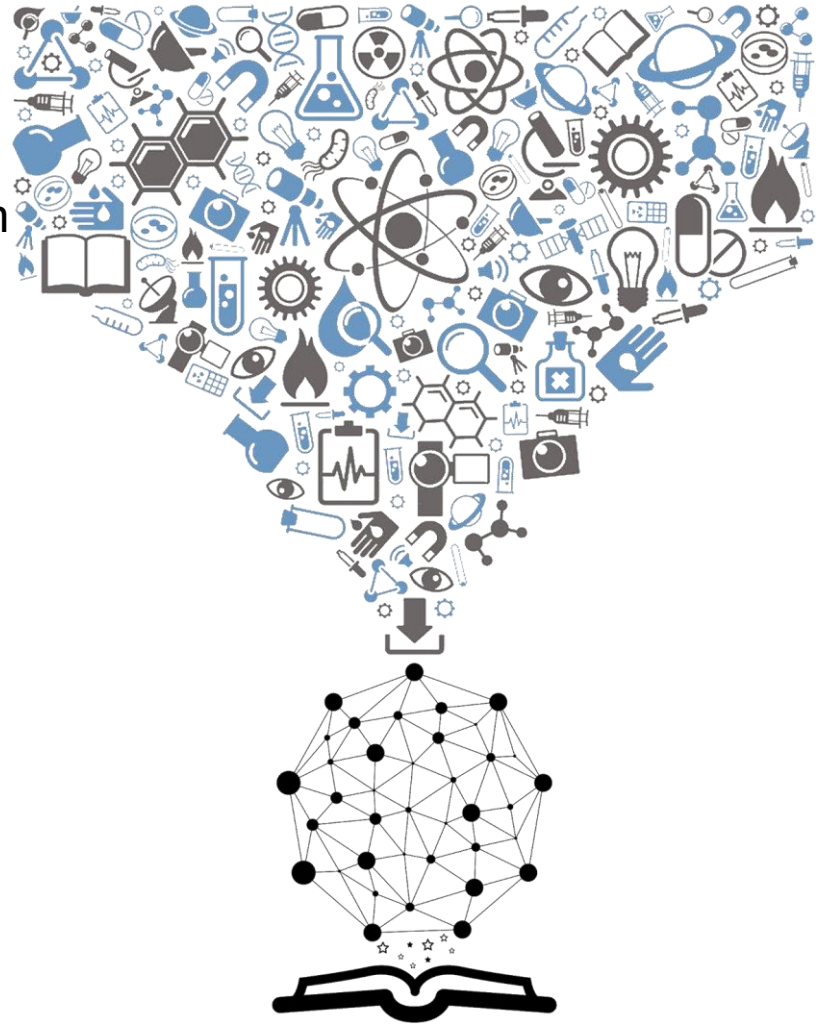
1.2 It’s all about the graph

Break

Part 2

2.1 Practical works (in groups)

- Work in groups of 4-6 : find a name for your team
- Choose 1 to 4 hypotheseis
- Model on paper
- Model with Knowledge Graph Editor (KGE)



2.2 Report back to the plenary

2.3 Conclusions

TIMELINES

By playwright

Aeschylus

- 467 BCE — *Seven Against Thebes*
- 458 BCE — *Eumenides* (part of the *Oresteia*)
- ~472 BCE — *Prometheus Bound (traditional but debated)*

Sophocles

- 441 BCE — *Antigone*
- ~429 BCE — *Oedipus Tyrannus (Rex)*

Euripides

- 438 BCE — *Alcestis*
- 431 BCE — *Medea*
- ~426–424 BCE — *Andromache*
- ~424–421 BCE — *Heracleidae*
- 415 BCE — *Trojan Women*
- 414 BCE — *Iphigenia in Tauris*
- 412 BCE — *Ion*
- 409 BCE — *Phoenician Women*
- 408 BCE — *Orestes*
- 405 BCE — *The Bacchae* †
- Unknown — *Cyclops* (satyr play)
- Unknown — *Rhesus* † *(doubtful authorship)*

By year & playwright

```
490 BCE ──────────────────────────────────────────────────────────────────────►

      ┌──────────────┐
      │Aeschylus     │
      └──────────────┘

      • 472*   Prometheus Bound
      • 467    Seven Against Thebes
      • 458    Eumenides

      ┌──────────────┐
      │Sophocles     │
      └──────────────┘

      • 441    Antigone
      • 429    Oedipus Tyrannus

      ┌──────────────┐
      │Euripides     │
      └──────────────┘

      • 438    Alcestis
      • 431    Medea
      • 426    Andromache
      • 424    Heracleidae
      • 415    Trojan Women
      • 414    Iphigenia in Tauris
      • 412    Ion
      • 409    Phoenician Women
      • 408    Orestes
      • 405†   Bacchae
      • ???    Rhesus †
      • ???    Cyclops (satyr)

(*) = Disputed authorship/date  (†) = Posthumous or doubtful attribution
```

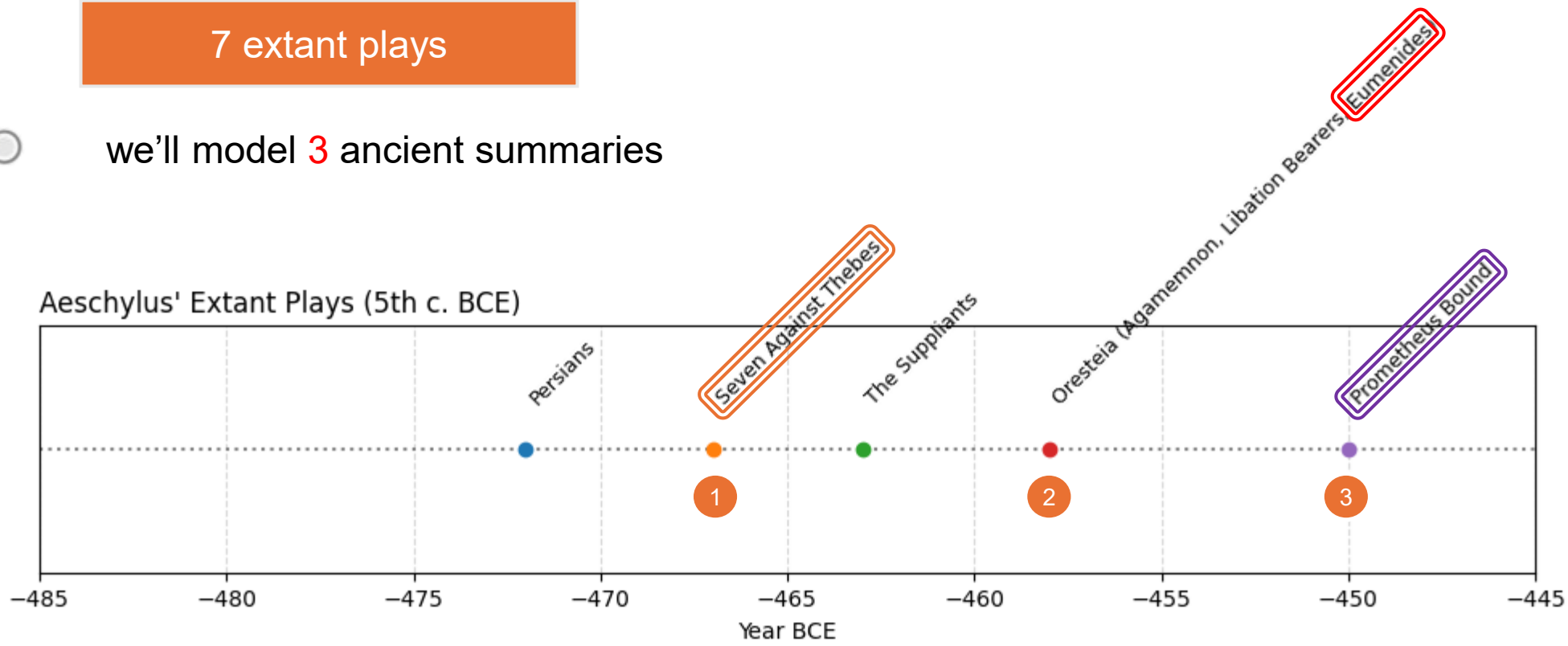
By year

```
470s BCE
├── 472: Prometheus Bound (Aeschylus) *
│

460s BCE
├── 467: Seven Against Thebes (Aeschylus)
│

450s BCE
├── 458: Eumenides (Aeschylus)
│

440s BCE
├── 441: Antigone (Sophocles)
├── 438: Alcestis (Euripides)
│

430s BCE
├── 431: Medea (Euripides)
├── 429: Oedipus Tyrannus (Sophocles)
│

420s BCE
├── ~426–424: Andromache (Euripides)
├── ~424–421: Heracleidae (Euripides)
│

410s BCE
├── 415: Trojan Women (Euripides)
├── 414: Iphigenia in Tauris (Euripides)
├── 412: Ion (Euripides)
├── 409: Phoenician Women (Euripides)
│

400s BCE
├── 408: Orestes (Euripides)
├── 405: Bacchae (Euripides) †
│

Unknown / Approximate
├── ? : Rhesus (attributed to Euripides) †
├── ? : Cyclops (Euripides – Satyr play)
```

TIMELINE – Aeschylus

7 extant plays

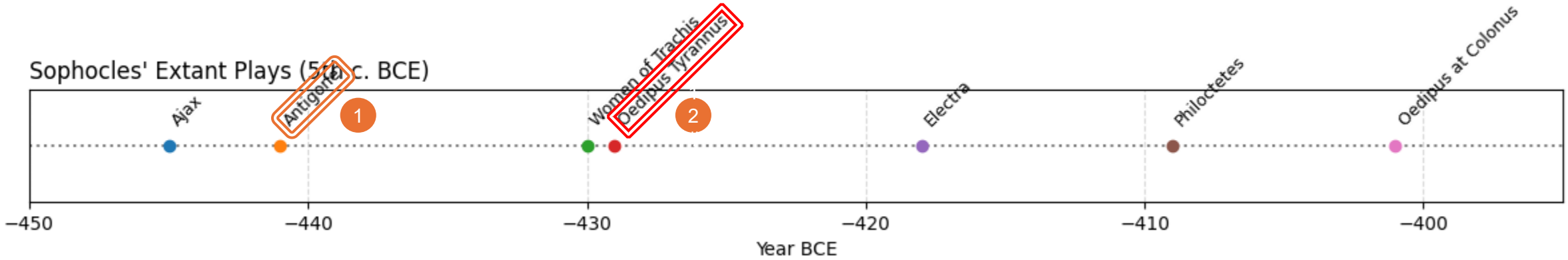
we'll model 3 ancient summaries



TIMELINE - Sophocles

7 extant plays

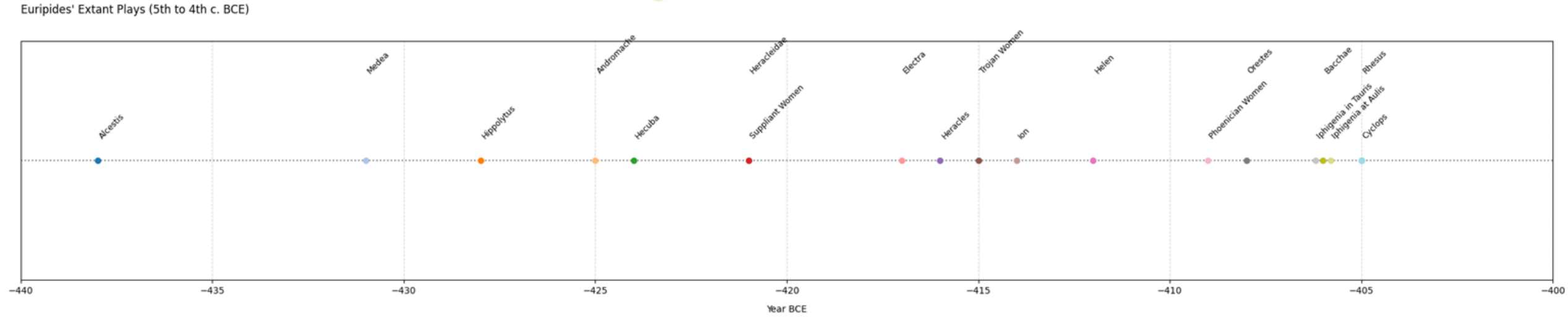
we'll model 2 ancient summaries



TIMELINE - Euripides

19 extant plays

we'll model 12 ancient summaries

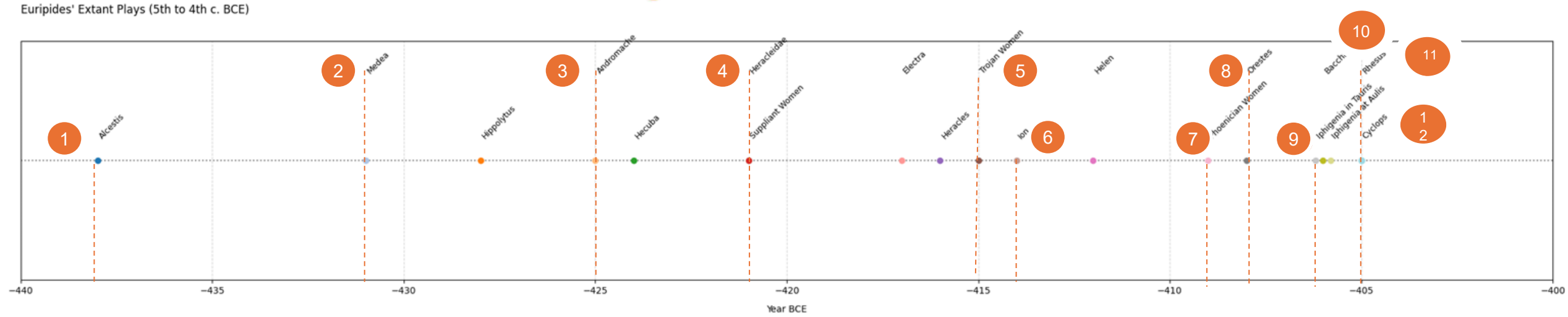


*Some dates are disputed.

TIMELINE - Euripides

19 extant plays

we'll model 12 ancient summaries



Plays whose hypotheseis we will model

What is a ‘hypothesis’?

Hypothesis (drama)

1 language

Article Talk | Read Edit View history Tools

From Wikipedia, the free encyclopedia

In its ancient usage, a **hypothesis** is a summary of the plot of a classical drama.[1] These hypotheses were often copied as a preface to the text of the surviving Athenian tragedies in Medieval manuscripts.[1] They also indicated whether any other tragic poets had dramatised the story, gave its setting, identified the chorus and the character who delivered the prologue, and indicated the date of its first production and the titles of the poet's other plays performed that year, as well as the poet's rivals in the dramatic competition and the prize awarded.[2]

hypothesis/hupothesis ancient scholar’s introduction to a play

References [edit]

1. ^ [a] [b] Easterling (1997, 202) and Gregory (2005, 271-272, 384).
2. ^ Gregory (2005, 384-385).

Sources [edit]

- Easterling, P. E., ed. 1997. *The Cambridge Companion to Greek Tragedy*. Cambridge Companion Cambridge: Cambridge UP. ISBN 0-521-42351-1.
- Gregory, Justina, ed. 2005. *A Companion to Greek Tragedy.* Blackwell Companions to the Ancient MA and Oxford: Blackwell. ISBN 1-4051-7549-4.

> Aristophanes of Byzantium and Aristarchus of Samos were the most important names in the next generation, the great age of Alexandrian scholarship. The former devoted his attentions to tragedy, and various material from his hand has come down to us in the scholia to Euripides, sometimes at one or two removes. Aristophanes is the source for the more scholarly kind of hypothesis copied as a preface to some of our tragedies in the medieval manuscripts. These hypotheses give the very briefest summary of the plot, usually a single sentence; they indicate whether the story was treated by other dramatists, and give the geographical location of the action, the identity of the chorus, the speaker of the prologue, and the date of the production
>
> together with the names of the poet’s other plays of that year, the names of his competitors, and whether the play received a first, second, or third prize. Whether this was intended to be prefixed to the plays in his edition or to stand in the commentary volume is unclear.

https://en.wikipedia.org/wiki/Hypothesis_(drama)

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https://en.wikipedia.org/wiki/Hypothesis_(drama)

Aristophanes of Byzantium Wikipedia page

1. Visit this webpage:
https://en.wikipedia.org/wiki/Aristophanes_of_Byzantium

2. What do you observe?
- In terms of:
  - other entities with the same name?
  - same article in other languages?
  - categorization of entities?

Aristophanes of Byzantium Wikipedia page

https://en.wikipedia.org/wiki/Aristophanes_of_Byzantium

- same article in other languages?

Aristophanes of Byzantium

30 languages

Article | Talk | Read | Edit | View history | Tools

From Wikipedia, the free encyclopedia

- other entities with the same name?

For other uses, see Aristophanes (disambiguation).

Aristophanes of Byzantium (Ancient Greek: Ἀριστοφάνης ὁ Βυζάντιος *Aristophánēs ho Buzántios*; Byzantium c. 257 – Alexandria c. 185–180 BC) was a Hellenistic Greek scholar, critic and grammarian, particularly renowned for his work in Homeric scholarship, but also for work on other classical authors such as Pindar and Hesiod. He soon moved to Alexandria and studied under Zenodotus, Callimachus, and Dionysius Iambus. He succeeded Eratosthenes as head librarian of the Library of Alexandria at the age of sixty. His students included Callistratus, Aristarchus of Samothrace, and perhaps Agallis. He was succeeded by Apollonius "The Classifier" (not to be confused with Apollonius of Rhodes, a previous head librarian of Alexandria).[1] Aristophanes' pupil, Aristarchus of Samothrace, would be the sixth head librarian at the Library of Alexandria.[2]

Aristophanes of Byzantium

Born	c. 257 BC Byzantium (modern-day Istanbul, Turkey)
Died	c. 185/180 BC Alexandria (modern-day Egypt)

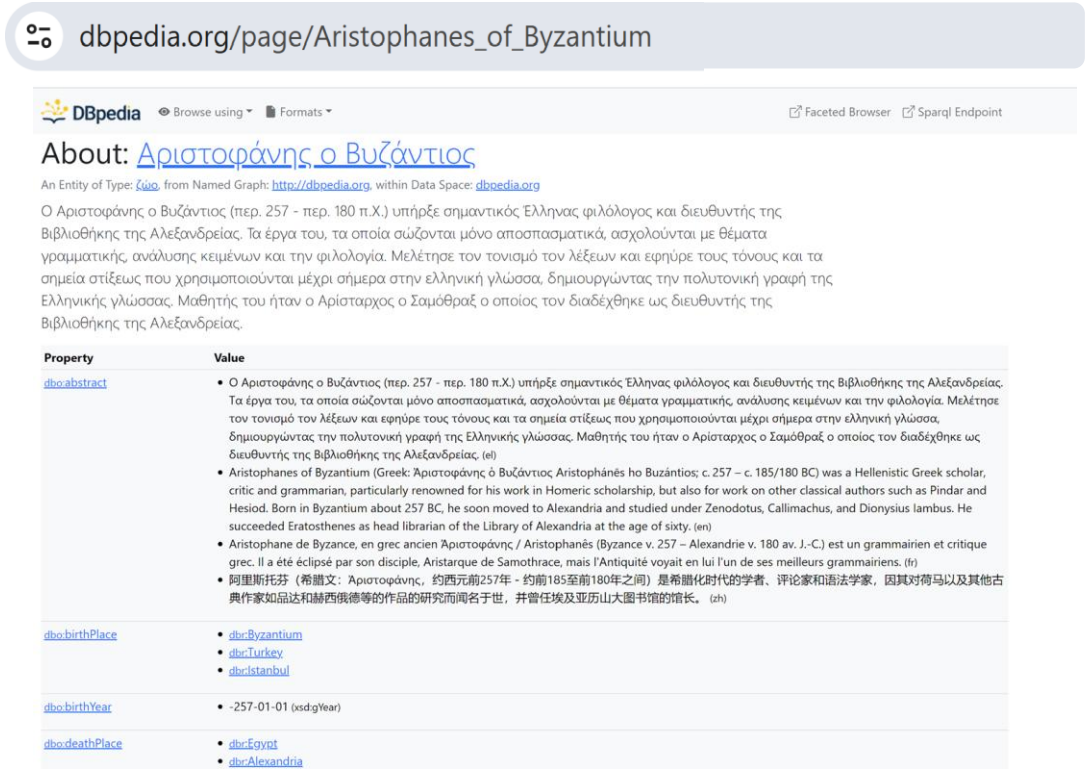
- categorization of entities?

Categories: 250s BC births | 180s BC deaths | 2nd-century BC Greek writers | 3rd-century BC Greek people | Ancient Byzantines | Ancient Greek grammarians | Ancient Greek lexicographers | Librarians of Alexandria | Homeric scholars

Aristophanes of Byzantium DBpedia page

1. Visit this webpage:
https://dbpedia.org/page/Aristophanes_of_Byzantium

2. What do you observe?
- In terms of:
  - type of entity?
  - properties & values?



Aristophanes of Byzantium DBpedia page

Type of entity

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About: Αριστοφάνης ο Βυζάντιος

https://dbpedia.org/page/Aristophanes_of_Byzantium

An Entity of Type: ζώο, from Named Graph: http://dbpedia.org, within Data Space: dbpedia.org

Ο Αριστοφάνης ο Βυζάντιος (περ. 257 - περ. 180 π.Χ.) υπήρξε σημαντικός Έλληνας φιλόλογος και διευθυντής της Βιβλιοθήκης της Αλεξανδρείας. Τα έργα του, τα οποία σώζονται μόνο αποσπασματικά, ασχολούνται με θέματα γραμματικής, ανάλυσης κειμένων και την φιλολογία. Μελέτησε τον τονισμό τον λέξεων και εφηύρε τους τόνους και τα σημεία στίξεως που χρησιμοποιούνται μέχρι σήμερα στην ελληνική γλώσσα, δημιουργώντας την πολυτονική γραφή της Ελληνικής γλώσσας. Μαθητής του ήταν ο Αρίσταρχος ο Σαμόθραξ ο οποίος τον διαδέχθηκε ως διευθυντής της Βιβλιοθήκης της Αλεξανδρείας.

Property	Value
dbo:abstract	• Ο Αριστοφάνης ο Βυζάντιος (περ. 257 - περ. 180 π.Χ.) υπήρξε σημαντικός Έλληνας φιλόλογος και διευθυντής της Βιβλιοθήκης της Αλεξανδρείας. Τα έργα του, τα οποία σώζονται μόνο αποσπασματικά, ασχολούνται με θέματα γραμματικής, ανάλυσης κειμένων και την φιλολογία. Μελέτησε τον τονισμό τον λέξεων και εφηύρε τους τόνους και τα σημεία στίξεως που χρησιμοποιούνται μέχρι σήμερα στην ελληνική γλώσσα, δημιουργώντας την πολυτονική γραφή της Ελληνικής γλώσσας. Μαθητής του ήταν ο Αρίσταρχος ο Σαμόθραξ ο οποίος τον διαδέχθηκε ως διευθυντής της Βιβλιοθήκης της Αλεξανδρείας. (el) • Aristophanes of Byzantium (Greek: Ἀριστοφάνης ὁ Βυζάντιος Aristophánēs ho Buzántios; c. 257 – c. 185/180 BC) was a Hellenistic Greek scholar, critic and grammarian, particularly renowned for his work in Homeric scholarship, but also for work on other classical authors such as Pindar and Hesiod. Born in Byzantium about 257 BC, he soon moved to Alexandria and studied under Zenodotus, Callimachus, and Dionysius Iambus. He succeeded Eratosthenes as head librarian of the Library of Alexandria at the age of sixty. (en) • Aristophane de Byzance, en grec ancien Ἀριστοφάνης / Aristophanês (Byzance v. 257 – Alexandrie v. 180 av. J.-C.) est un grammairien et critique grec. Il a été éclipsé par son disciple, Aristarque de Samothrace, mais l'Antiquité voyait en lui l'un de ses meilleurs grammairiens. (fr) • 阿里斯托芬（希腊文：Ἀριστοφάνης，约西元前257年 - 约前185至前180年之间）是希腊化时代的学者、评论家和语法学家，因其对荷马以及其他古典作家如品达和赫西俄德等的作品的研究而闻名于世，并曾任埃及亚历山大图书馆的馆长。 (zh)
dbo:birthPlace	• dbr:Byzantium • dbr:Turkey • dbr:Istanbul
dbo:birthYear	• -257-01-01 (xsd:gYear)
dbo:deathPlace	• dbr:Egypt • dbr:Alexandria

Aristophanes of Byzantium DBpedia page

Type of entity

Property

Value

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About: Αριστοφάνης ο Βυζάντιος

https://dbpedia.org/page/Aristophanes_of_Byzantium

An Entity of Type: ζώο, from Named Graph: http://dbpedia.org, within Data Space: dbpedia.org

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dbo:deathPlace	• dbr:Egypt • dbr:Alexandria

Aristophanes of Byzantium DBpedia page

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About: Αριστοφ ζάντιος

An Entity of Type: ζώο, from Named Gra with Data Space: dbpedia.org

https://dbpedia.org/page/Aristophanes_of_Byzantium

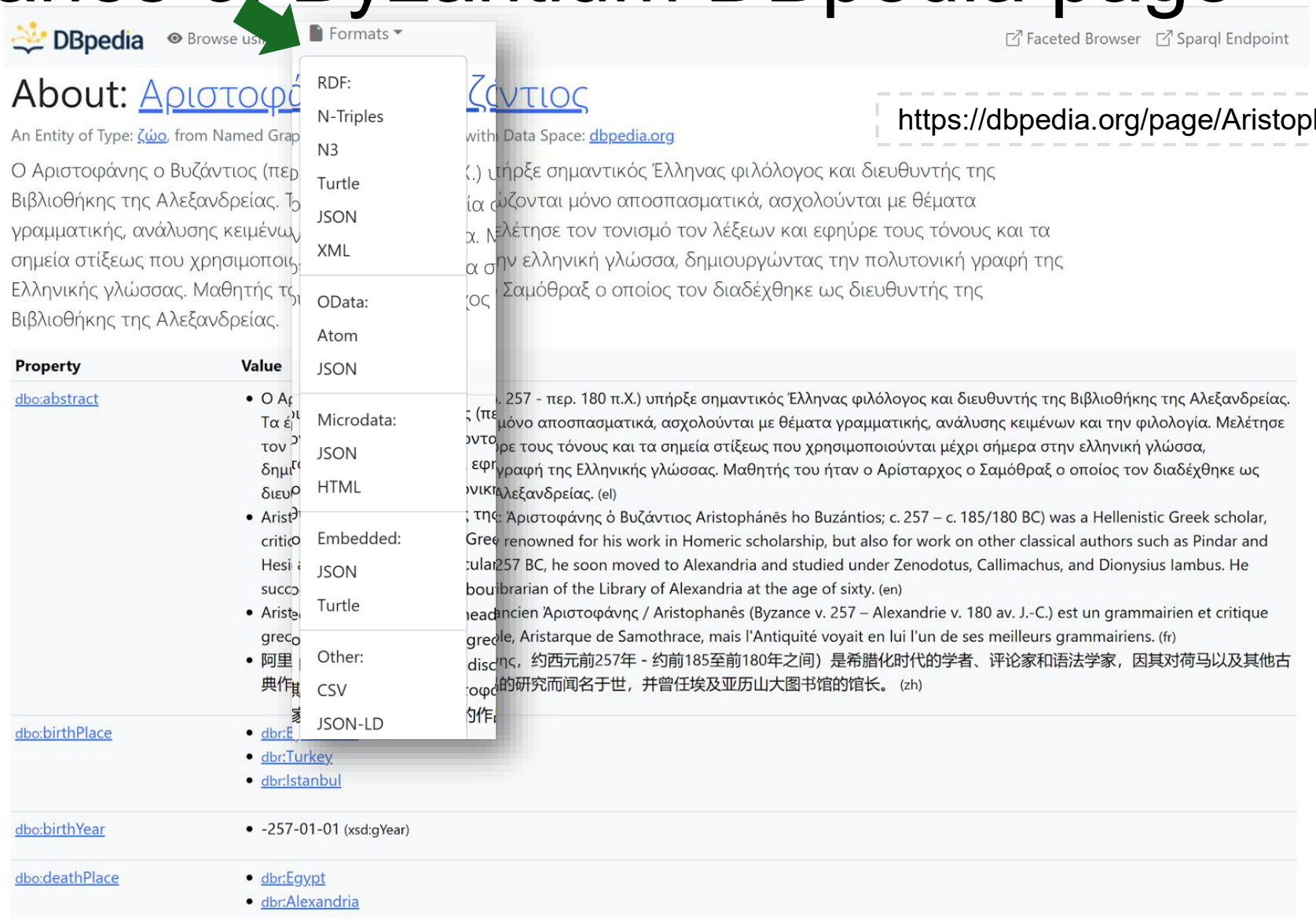
Ο Αριστοφάνης ο Βυζάντιος (πε .) ι τήρξε σημαντικός Έλληνας φιλόλογος και διευθυντής της Βιβλιοθήκης της Αλεξανδρείας. Τ ζώνται μόνο αποσπασματικά, ασχολούνται με θέματα γραμματικής, ανάλυσης κειμένω χ. Μ ελέτησε τον τονισμό των λέξεων και εφηύρε τους τόνους και τα σημεία στίξεως που χρησιμοποιο α σ ην ελληνική γλώσσα, δημιουργώντας την πολυτονική γραφή της Ελληνικής γλώσσας. Μαθητής τ ος Σαμόθραξ ο οποίος τον διαδέχθηκε ως διευθυντής της Βιβλιοθήκης της Αλεξανδρείας.

Formats menu: RDF: N-Triples, N3, Turtle, JSON, XML | OData: Atom, JSON | Microdata: JSON, HTML | Embedded: JSON, Turtle | Other: CSV, JSON-LD

Property	Value
dbo:abstract	• Ο Αρ . 257 - περ. 180 π.Χ.) υπήρξε σημαντικός Έλληνας φιλόλογος και διευθυντής της Βιβλιοθήκης της Αλεξανδρείας. Τα έ ς (πε μόνο αποσπασματικά, ασχολούνται με θέματα γραμματικής, ανάλυσης κειμένων και την φιλολογία. Μελέτησε τον ντο ρε τους τόνους και τα σημεία στίξεως που χρησιμοποιούνται μέχρι σήμερα στην ελληνική γλώσσα, δημι γραφή της Ελληνικής γλώσσας. Μαθητής του ήταν ο Αρίσταρχος ο Σαμόθραξ ο οποίος τον διαδέχθηκε ως διευ νικη Αλεξανδρείας. (el) • Arist της: Ἀριστοφάνης ὁ Βυζάντιος Aristophánēs ho Buzántios; c. 257 – c. 185/180 BC) was a Hellenistic Greek scholar, critic Gre renowned for his work in Homeric scholarship, but also for work on other classical authors such as Pindar and Hesi cular 257 BC, he soon moved to Alexandria and studied under Zenodotus, Callimachus, and Dionysius Iambus. He succ bou librarian of the Library of Alexandria at the age of sixty. (en) • Arist ancien Ἀριστοφάνης / Aristophanês (Byzance v. 257 – Alexandrie v. 180 av. J.-C.) est un grammairien et critique grec head le, Aristarque de Samothrace, mais l'Antiquité voyait en lui l'un de ses meilleurs grammairiens. (fr) • 阿里 gre 约西元前257年 - 约前185至前180年之间）是希腊化时代的学者、评论家和语法学家，因其对荷马以及其他古典作 disc 的研究而闻名于世，并曾任埃及亚历山大图书馆的馆长。 (zh)
dbo:birthPlace	• dbr:E • dbr:Turkey • dbr:Istanbul
dbo:birthYear	• -257-01-01 (xsd:gYear)
dbo:deathPlace	• dbr:Egypt • dbr:Alexandria

Aristophanes of Byzantium DBpedia page

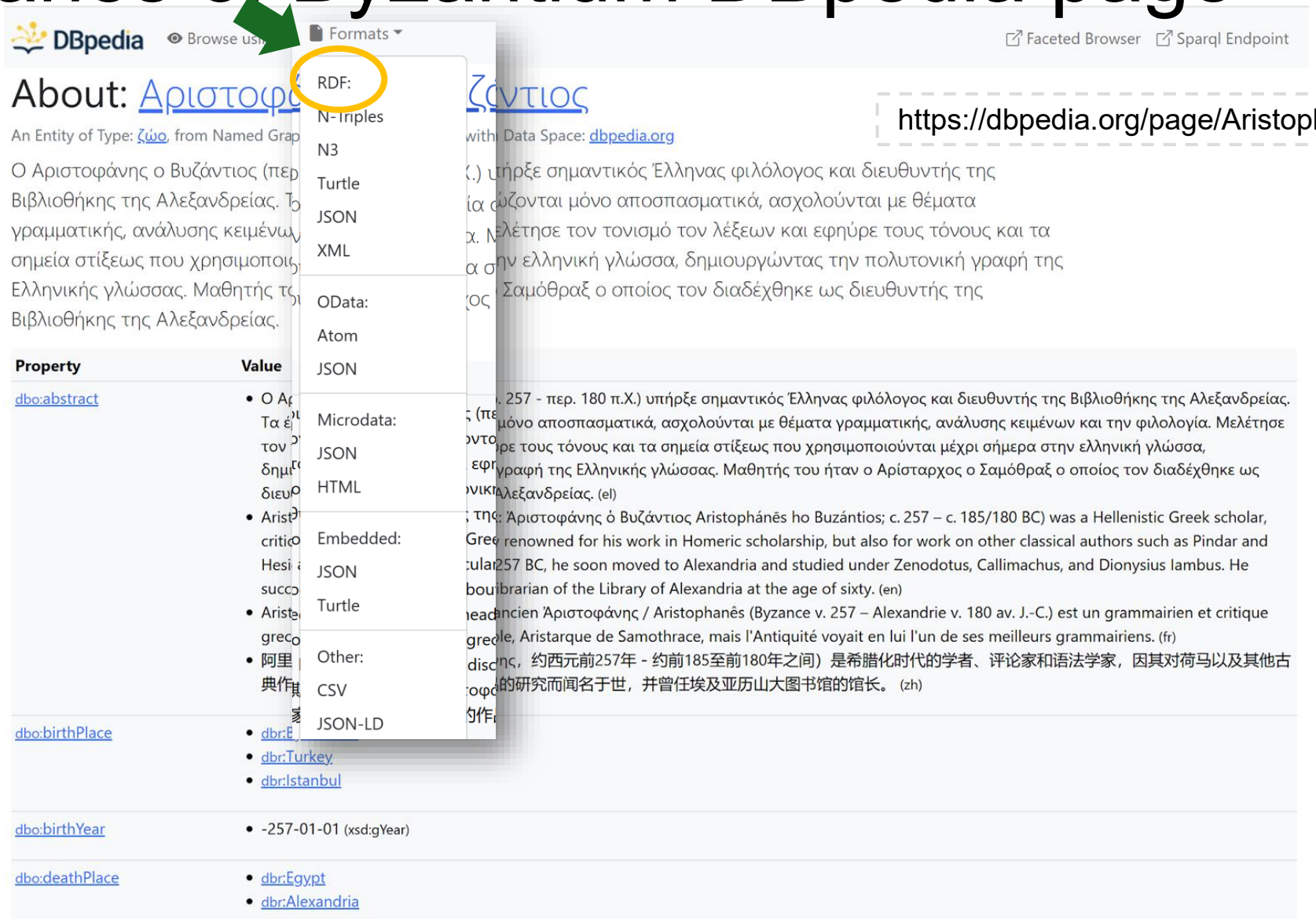
Click on Formats?



https://dbpedia.org/page/Aristophanes_of_Byzantium

Aristophanes of Byzantium DBpedia page

Click on Formats?



https://dbpedia.org/page/Aristophanes_of_Byzantium

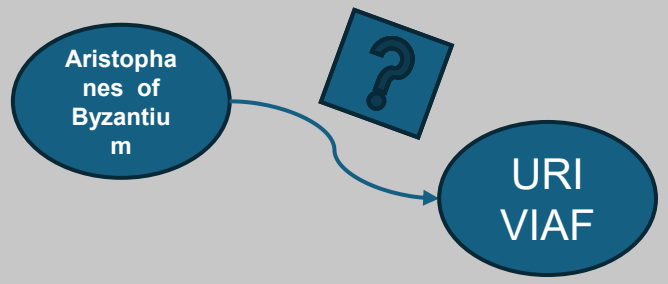
Aristophanes of Byzantium **DBpedia KG**

http://en.lodlive.it/?http%3A%2F%2Fdbpedia.org%2Fresource%2FAristophanes_of_Byzantium

lodlive http://en.lodlive.it/

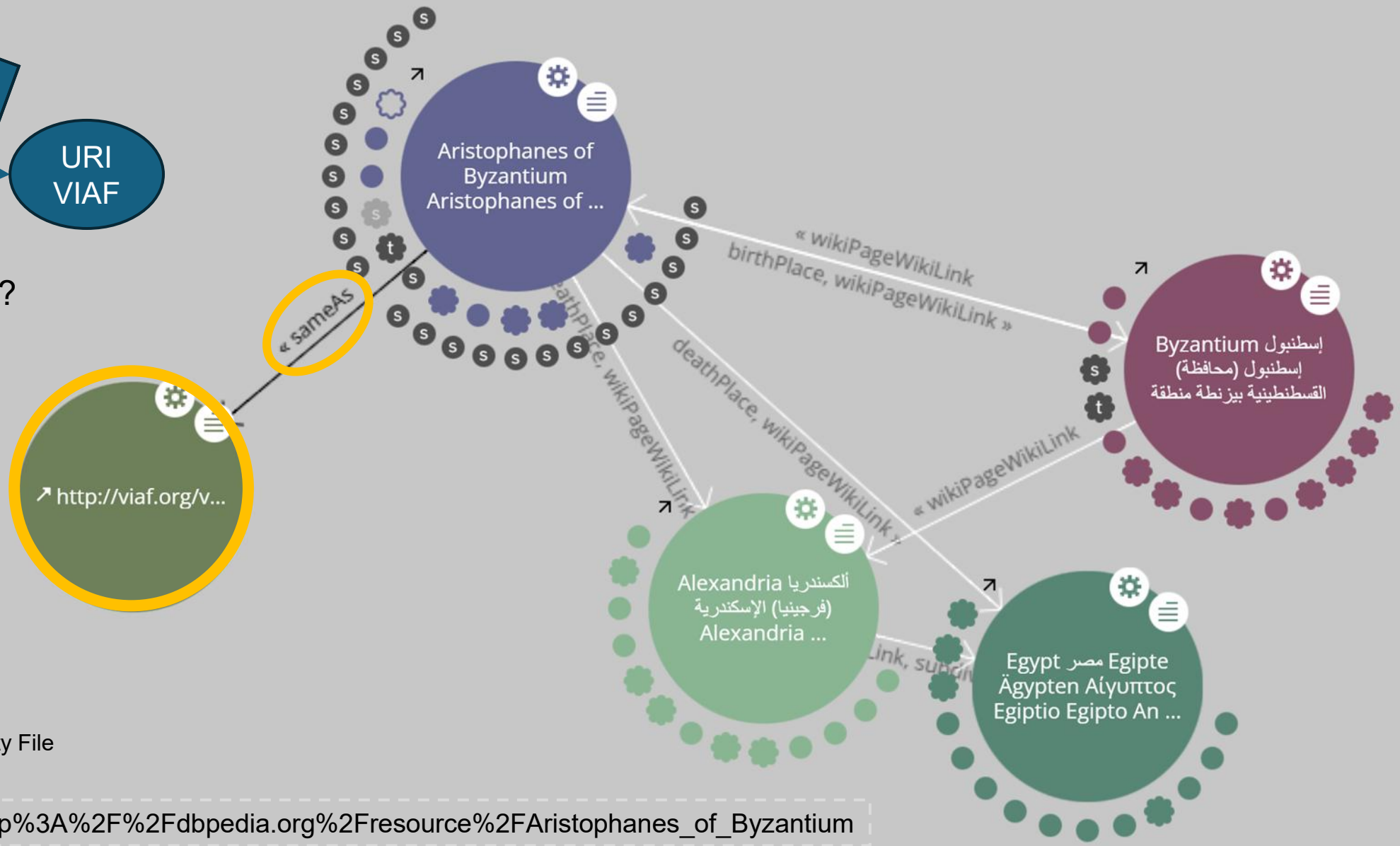
LodLive provides a simple and friendly interface to browse RDF resources (Linked Data).

Aristophanes of Byzantium **DBpedia KG**



What do you observe?

Virtual International Authority File



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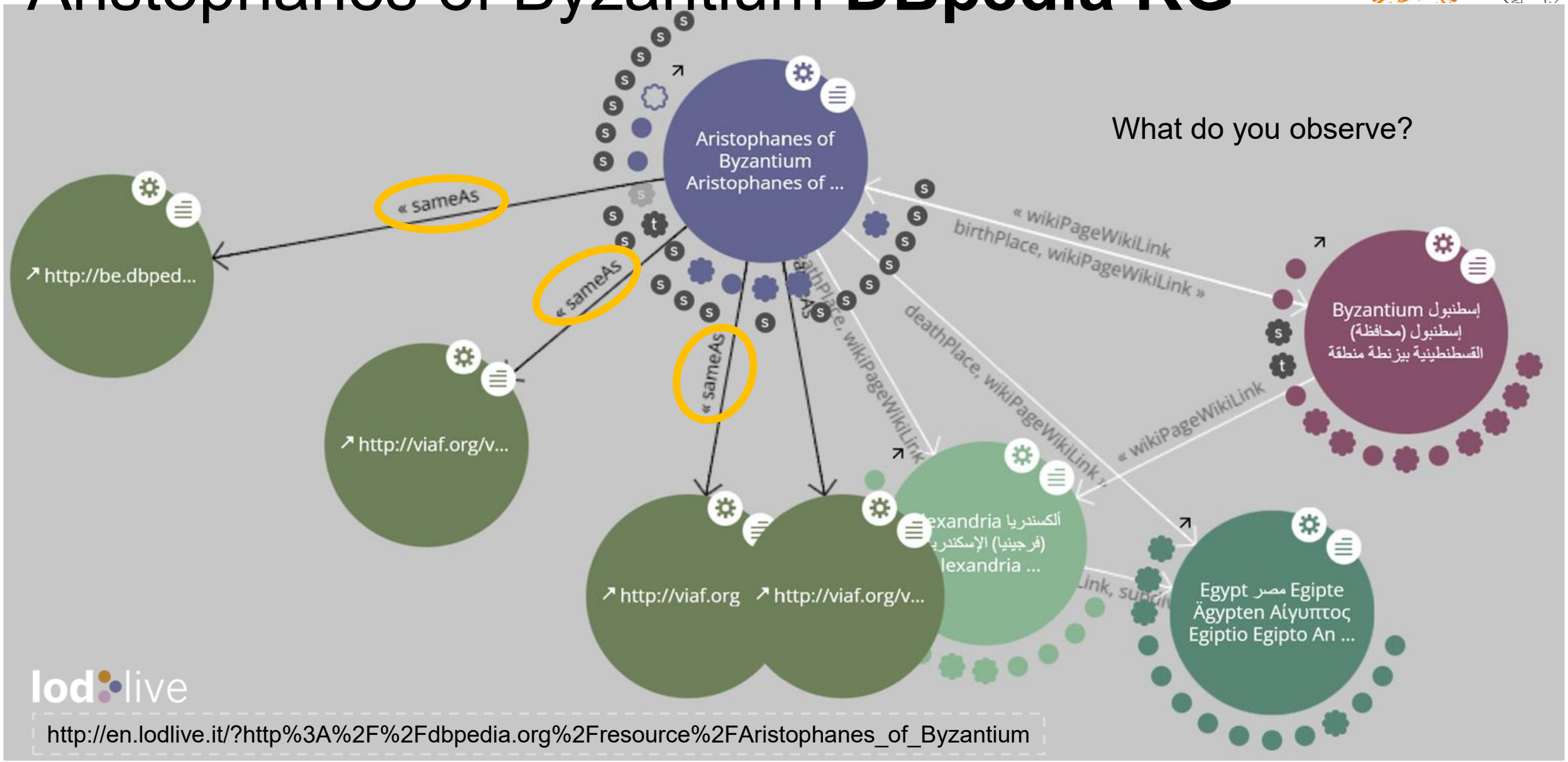
Aristophanes of Byzantium **DBpedia KG**



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Aristophanes of Byzantium DBpedia KG

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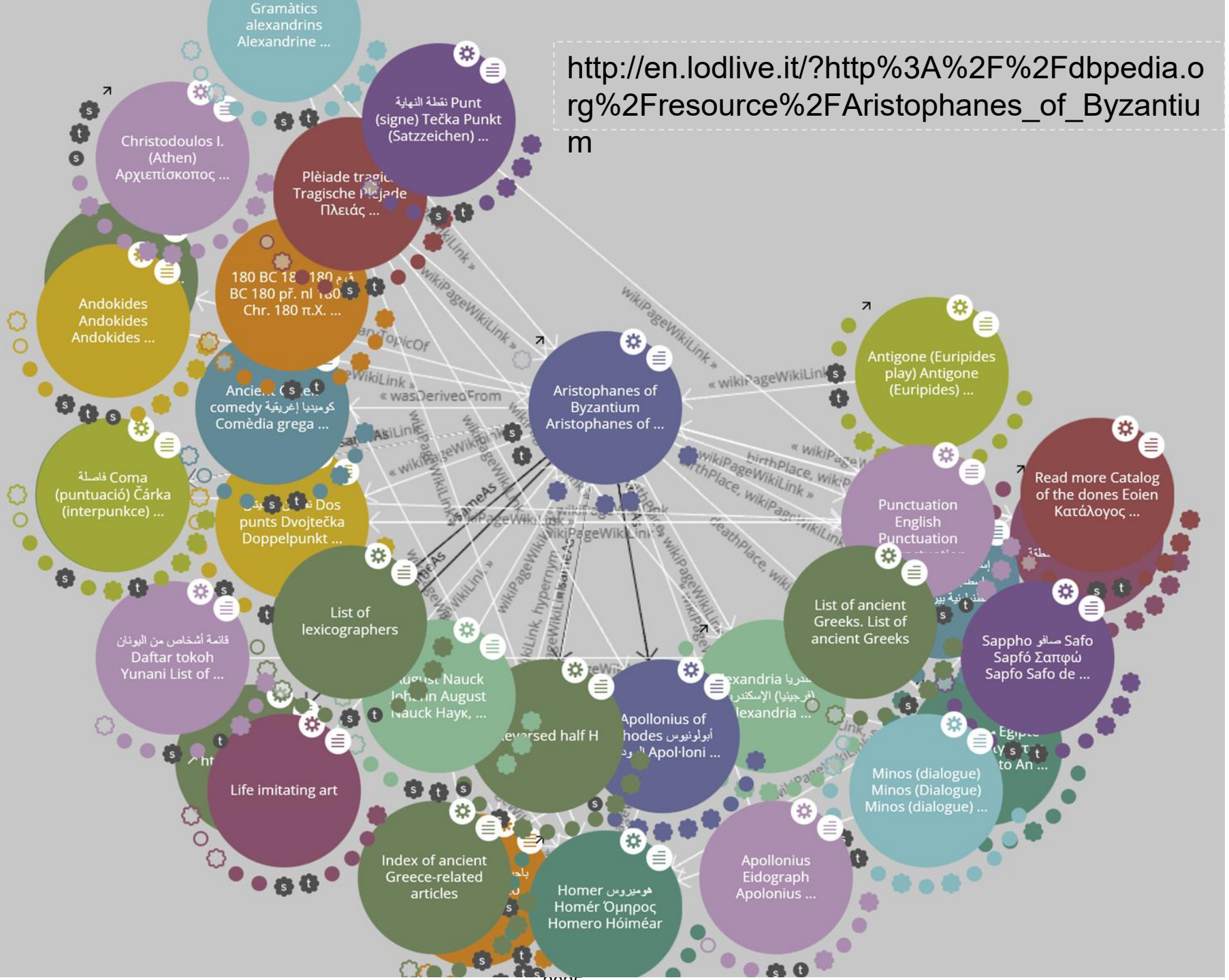
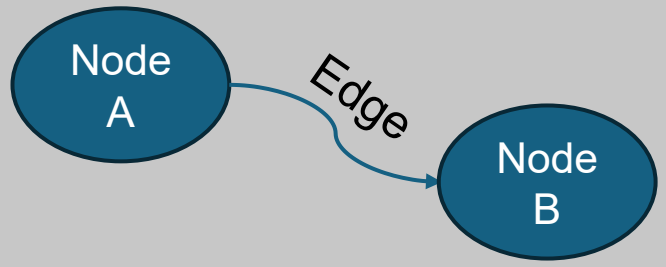


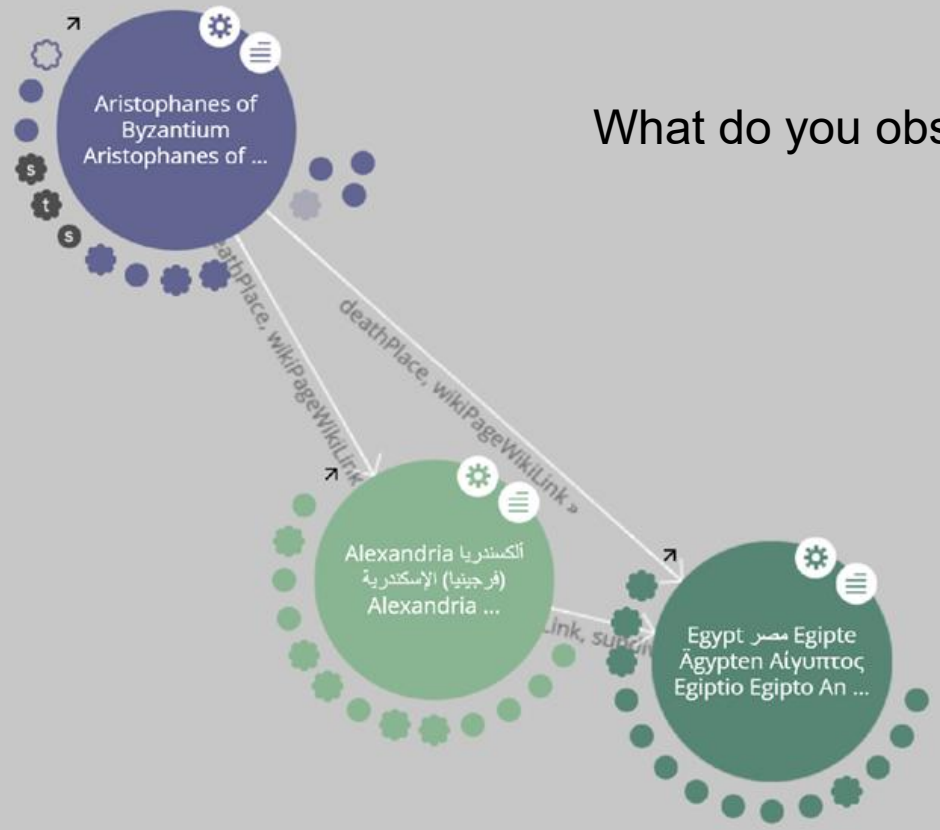
Aristophanes of Byzantium **DBpedia KG**

http://en.lodlive.it/?http%3A%2F%2Fdbpedia.org%2Fresource%2FAristophanes_of_Byzantium

Write down the statement!



Edge == Relation == Property



What do you observe?

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Aristophanes of Byzantium **DBpedia KG**

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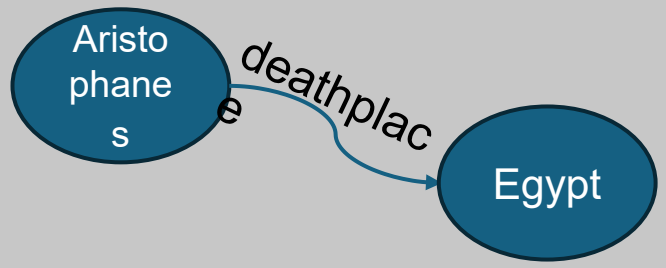
Write down the statement!



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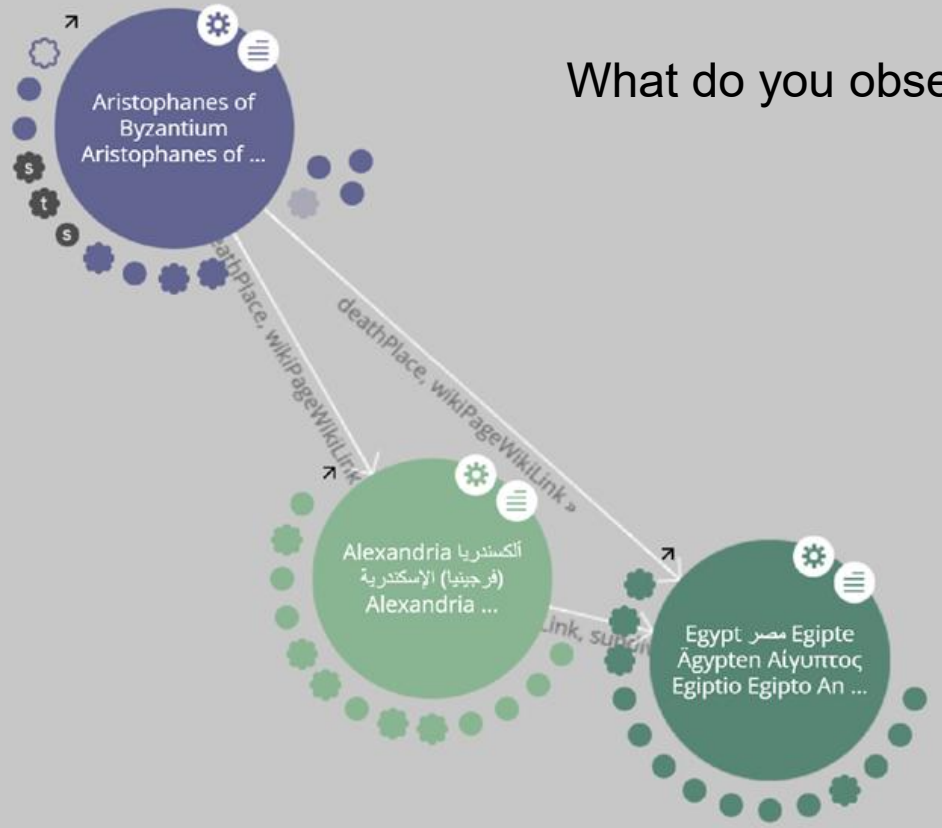

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Aristophanes of Byzantium **DBpedia KG**

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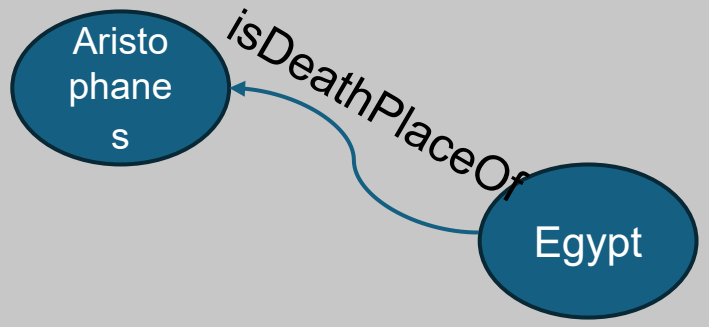
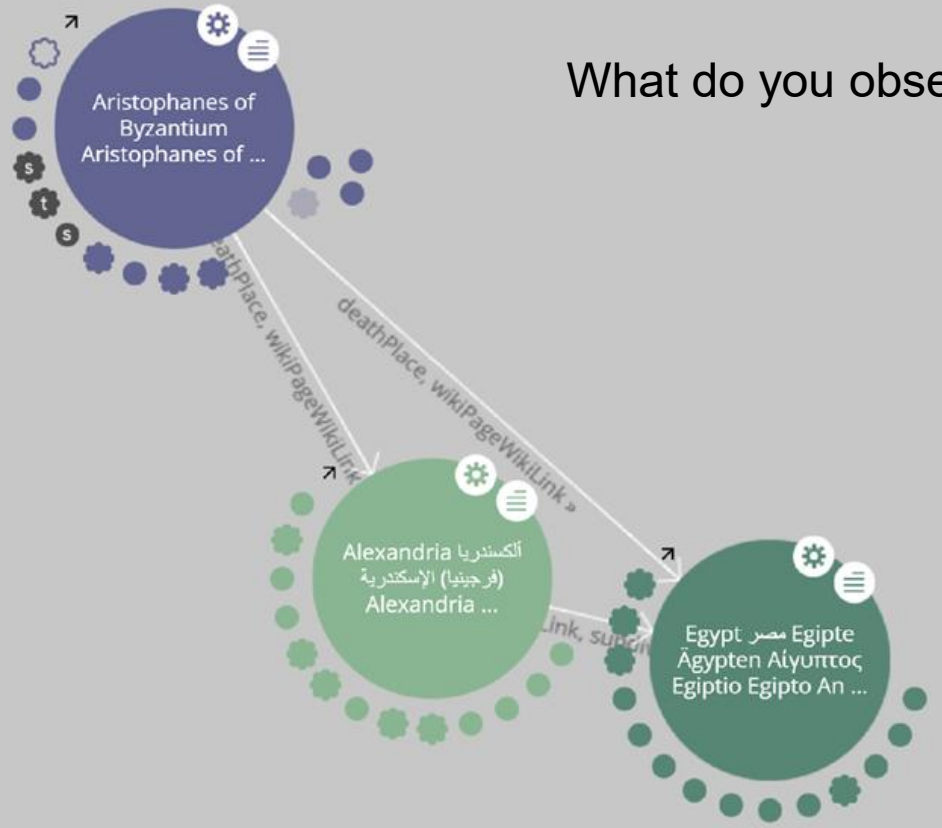


What do you observe?



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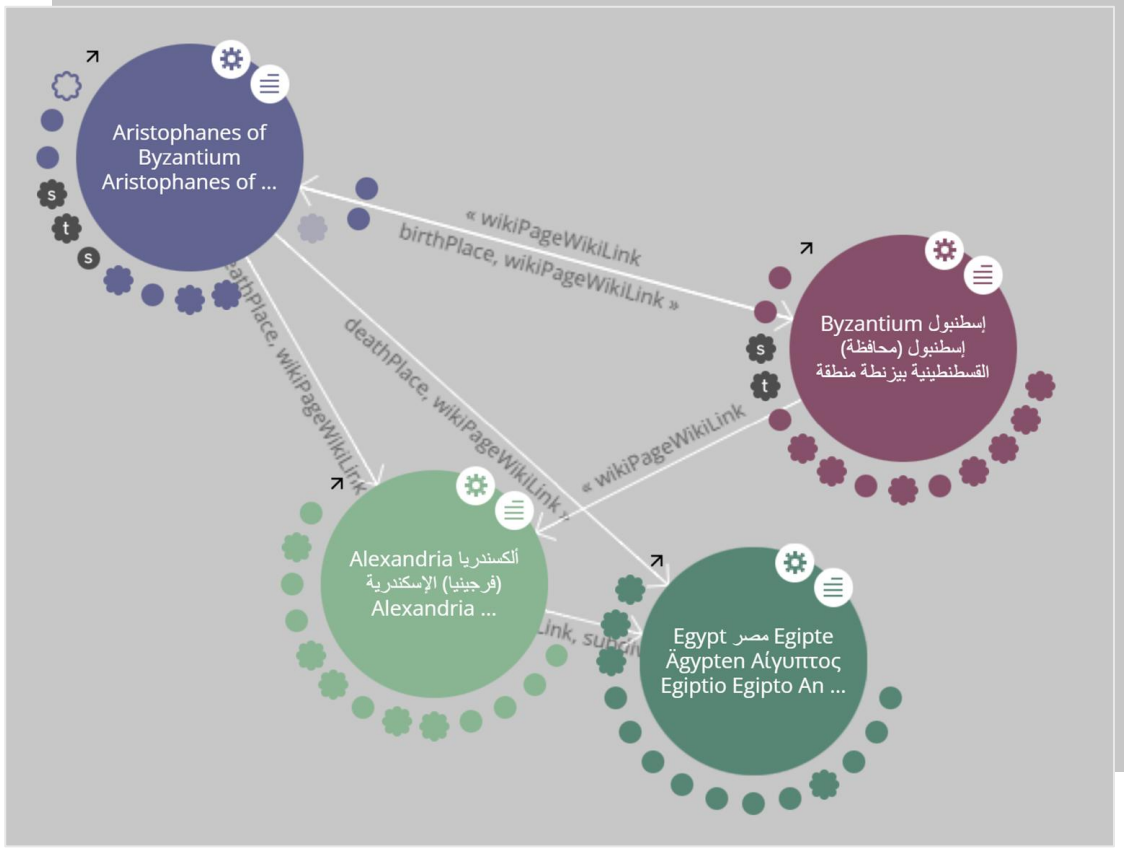

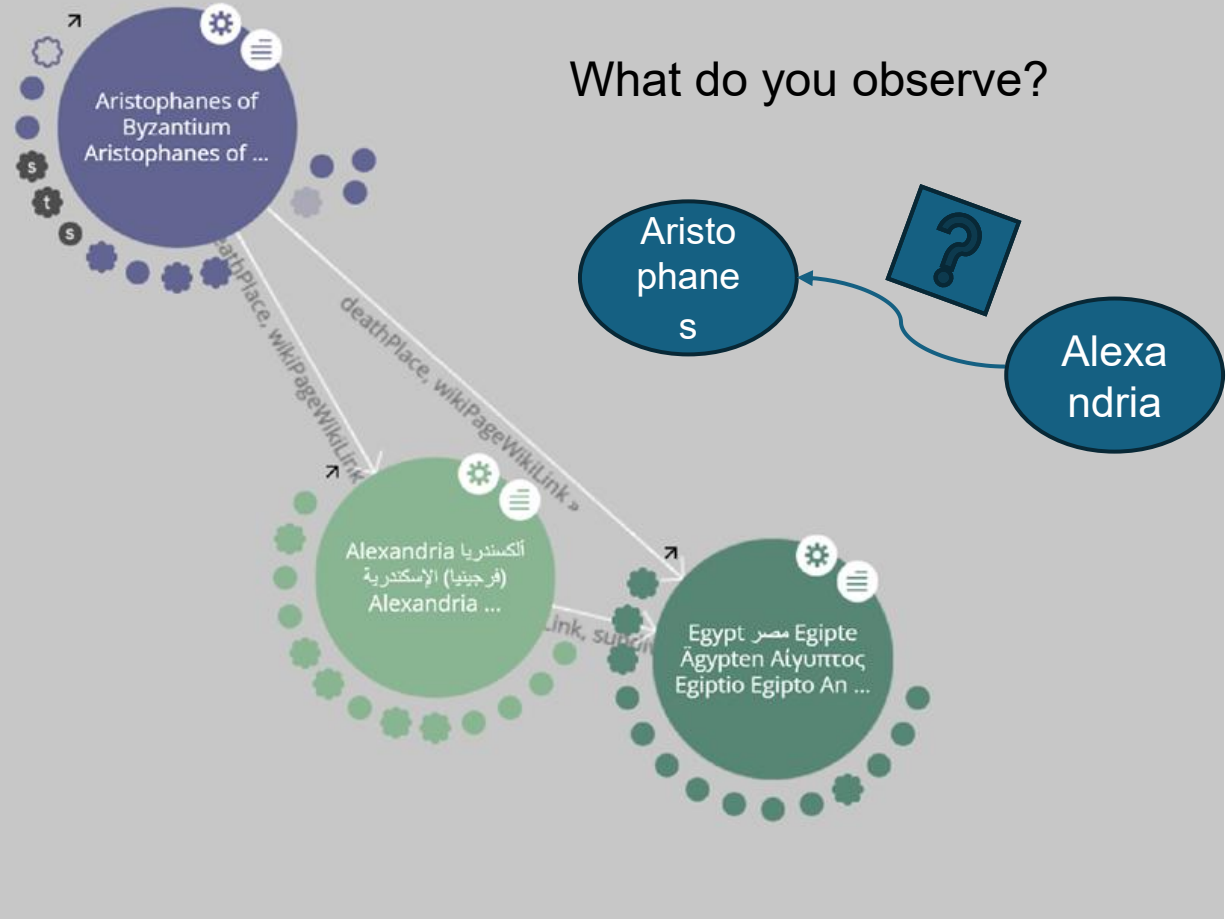

What do you observe?

Aristophanes of Byzantium **DBpedia KG**

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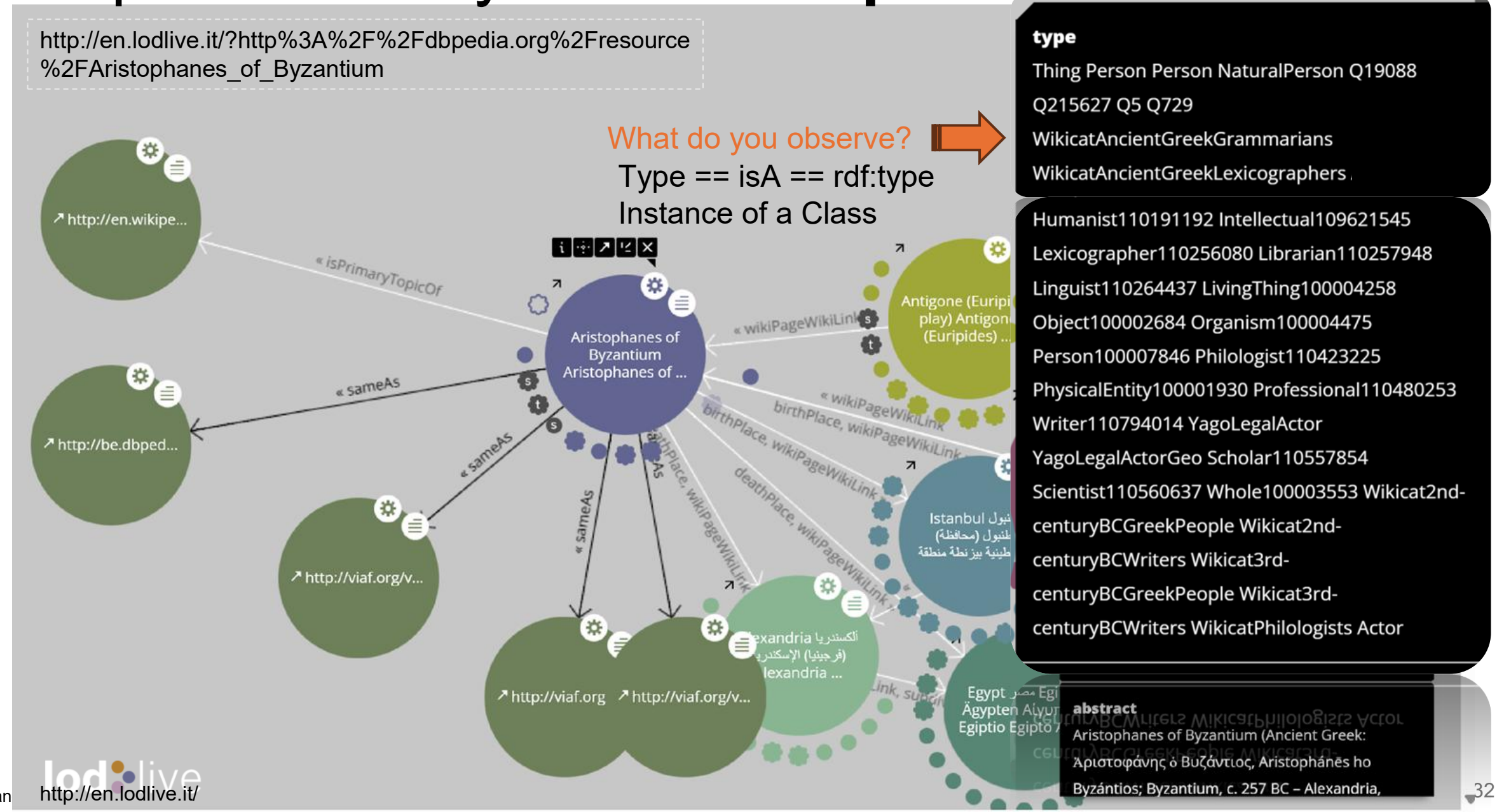

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Aristophanes of Byzantium Wikidata page

https://www.wikidata.org/wiki/Q313018

WIKIDATA Search Wikidata Search

Statements

instance of	human 1 reference
sex or gender	male 1 reference
country of citizenship	Ptolemaic Kingdom 0 references
given name	Aristophanes 0 references

Aristophanes of Byzantium (Q313018)

Item Discussion

third-century BC Greek literary scholar and grammarian in Alexandria

In more languages

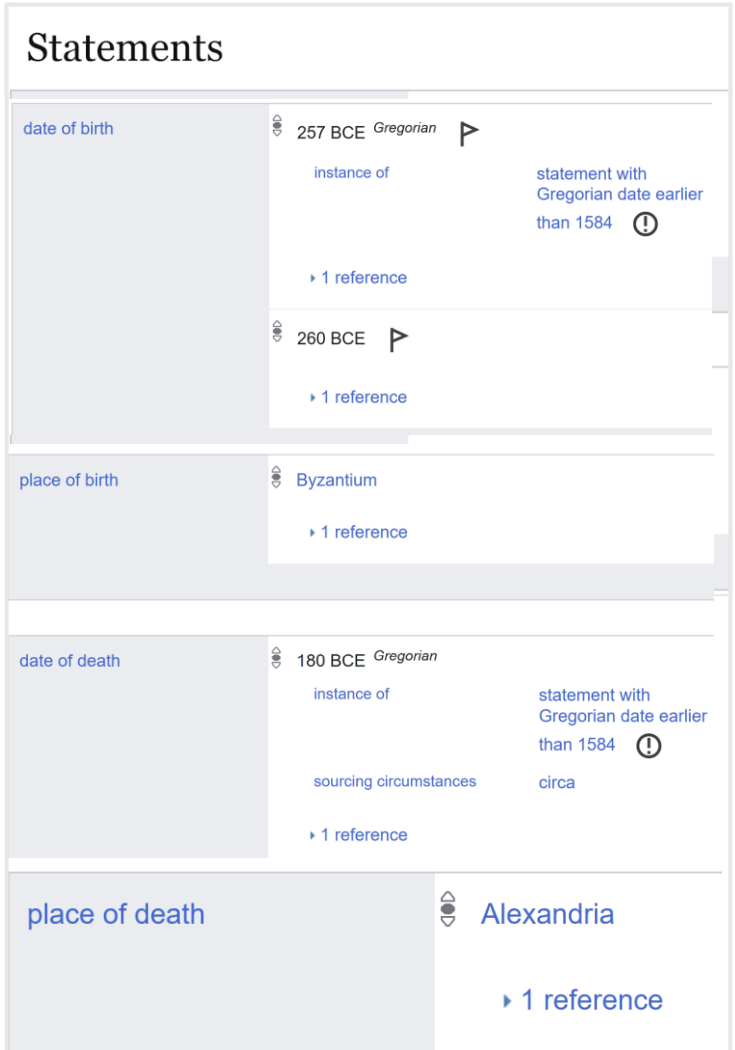
Configure

Language	Label	Description	Also
default for all languages	No label defined	–	
English	Aristophanes of Byzantium	third-century BC Greek literary scholar and grammarian in Alexandria	
Greek	Αριστοφάνης ο Βυζάντιος	No description defined	
French	Aristophane de Byzance	grammairien et critique grec de l'Antiquité	
Dutch	Aristophanes van Byzantium	lexicograaf uit Macedonisch Egypte en Ptolemeïsche rijk (257v Chr-180v Chr)	

All entered languages

Aristophanes of Byzantium Wikidata page

https://www.wikidata.org/wiki/Q313018



WIKIDATA

Search Wikidata

Search

Aristophanes of Byzantium (Q313018)

Item Discussion

third-century BC Greek literary scholar and grammarian in Alexandria

In more languages

Configure

Language	Label	Description	Alsc
default for all languages	No label defined	–	
English	Aristophanes of Byzantium	third-century BC Greek literary scholar and grammarian in Alexandria	
Greek	Αριστοφάνης ο Βυζάντιος	No description defined	
French	Aristophane de Byzance	grammairien et critique grec de l'Antiquité	
Dutch	Aristophanes van Byzantium	lexicograaf uit Macedonisch Egypte en Ptolemeïsche rijk (257v Chr-180v Chr)	

All entered languages

Aeschylus Wikidata page

Aeschylus (Q40939)

Item Discussion Read View history Tools

ancient Athenian playwright

Æschylus | Aeschylos

In more languages

Configure

Language	Label	Description	Also known as
default for all languages	No label defined	–	
English	Aeschylus	ancient Athenian playwright	Æschylus Aeschylos
Greek	Αισχύλος	αρχαίος Έλληνας δραματικός ποιητής	
French	Eschyle	tragique grec	Aiskhúlos Éschyle Échille
Dutch	Aeschylus	toneelschrijver uit Oude Athene (525v Chr-	Aischylos

WIKIDATA

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English

Aeschylus (Q40939)

Item | Discussion

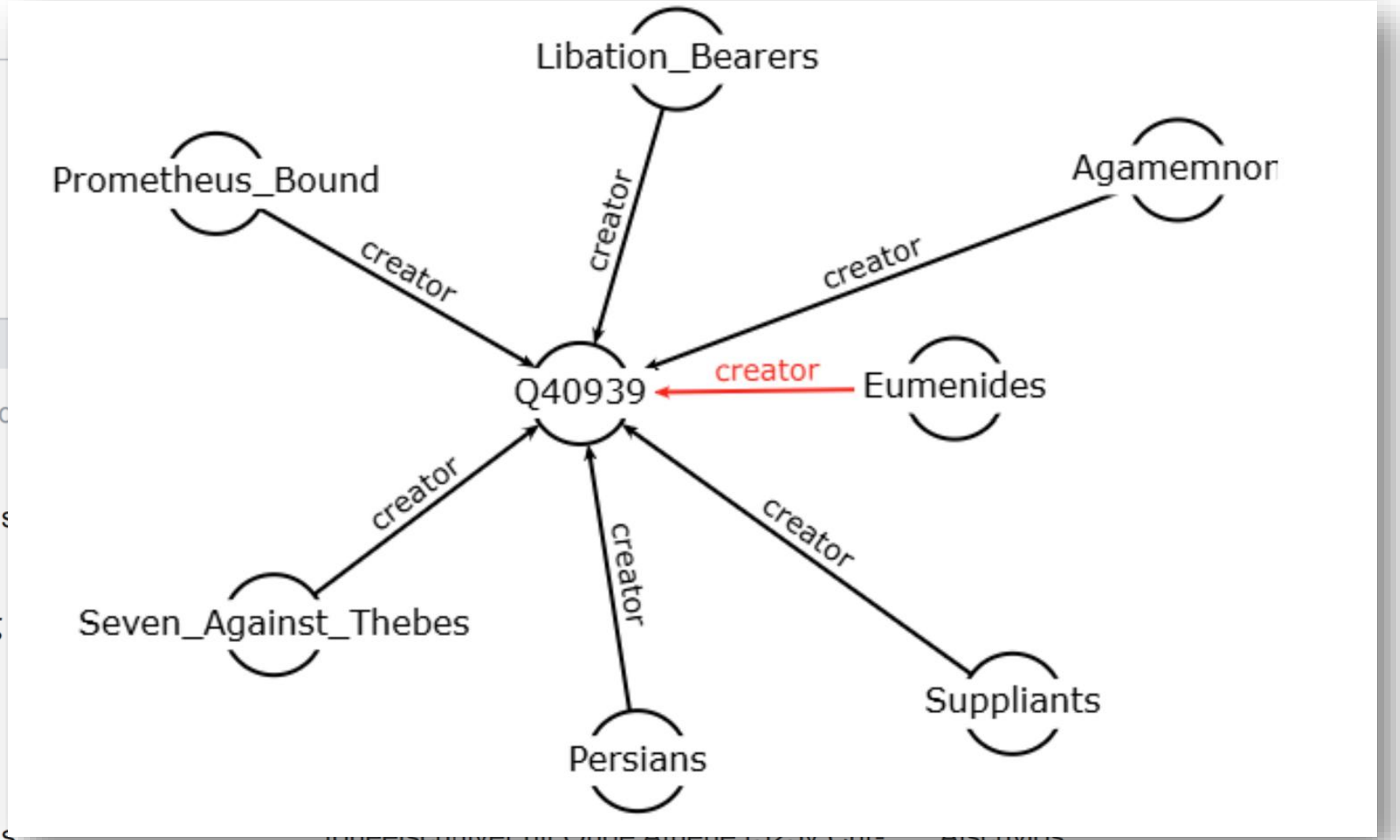
ancient Athenian playwright

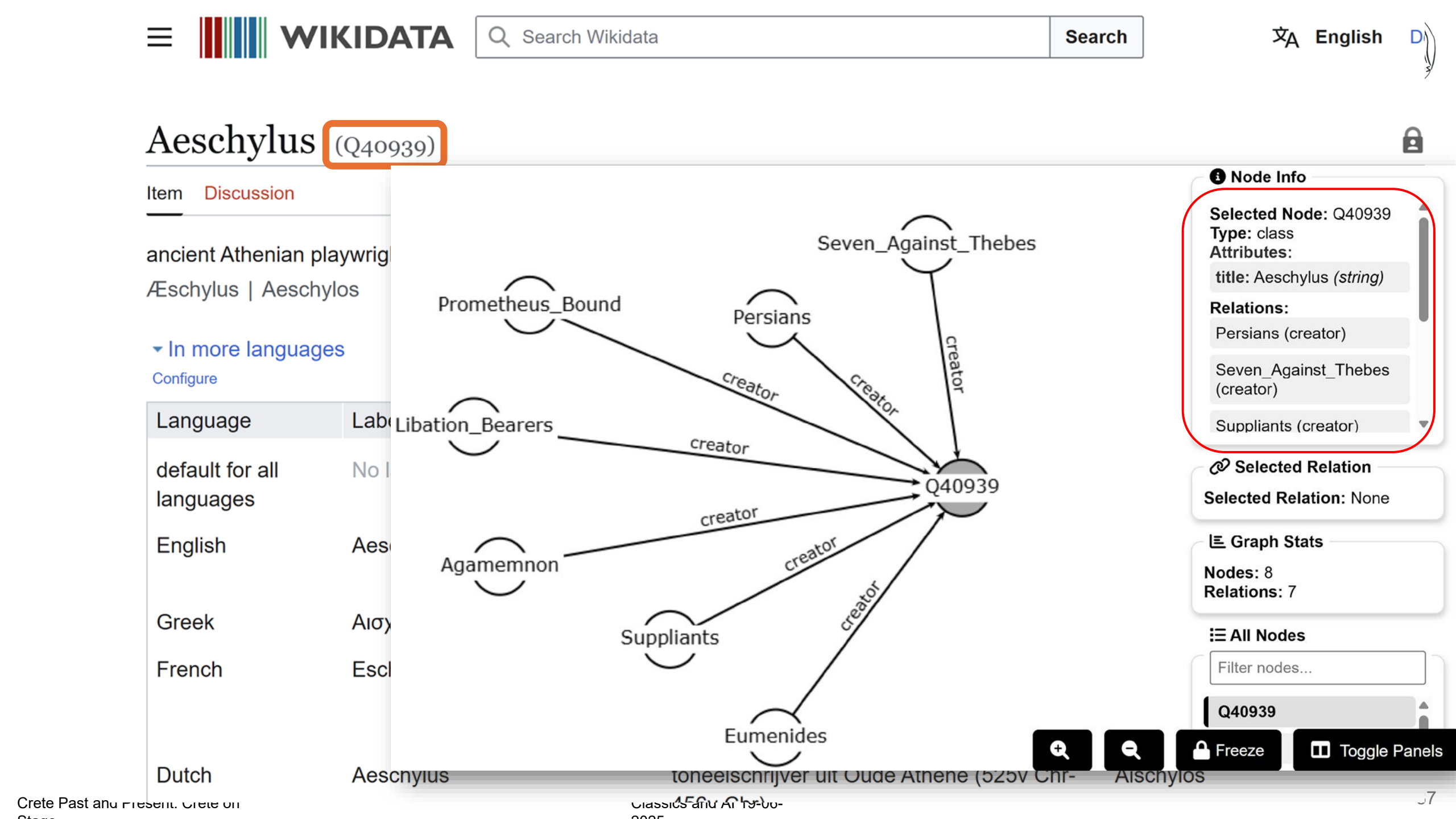
Æschylus | Aeschylos

In more languages

Configure

Language	Label
default for all languages	No label c
English	Aeschylus
Greek	Αισχύλος
French	Eschyle
Dutch	Aeschylus

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English
Aeschylus (Q40939)
Item
Discussion
ancient Athenian playwrig
Æschylus | Aeschylos
In more languages
Configure
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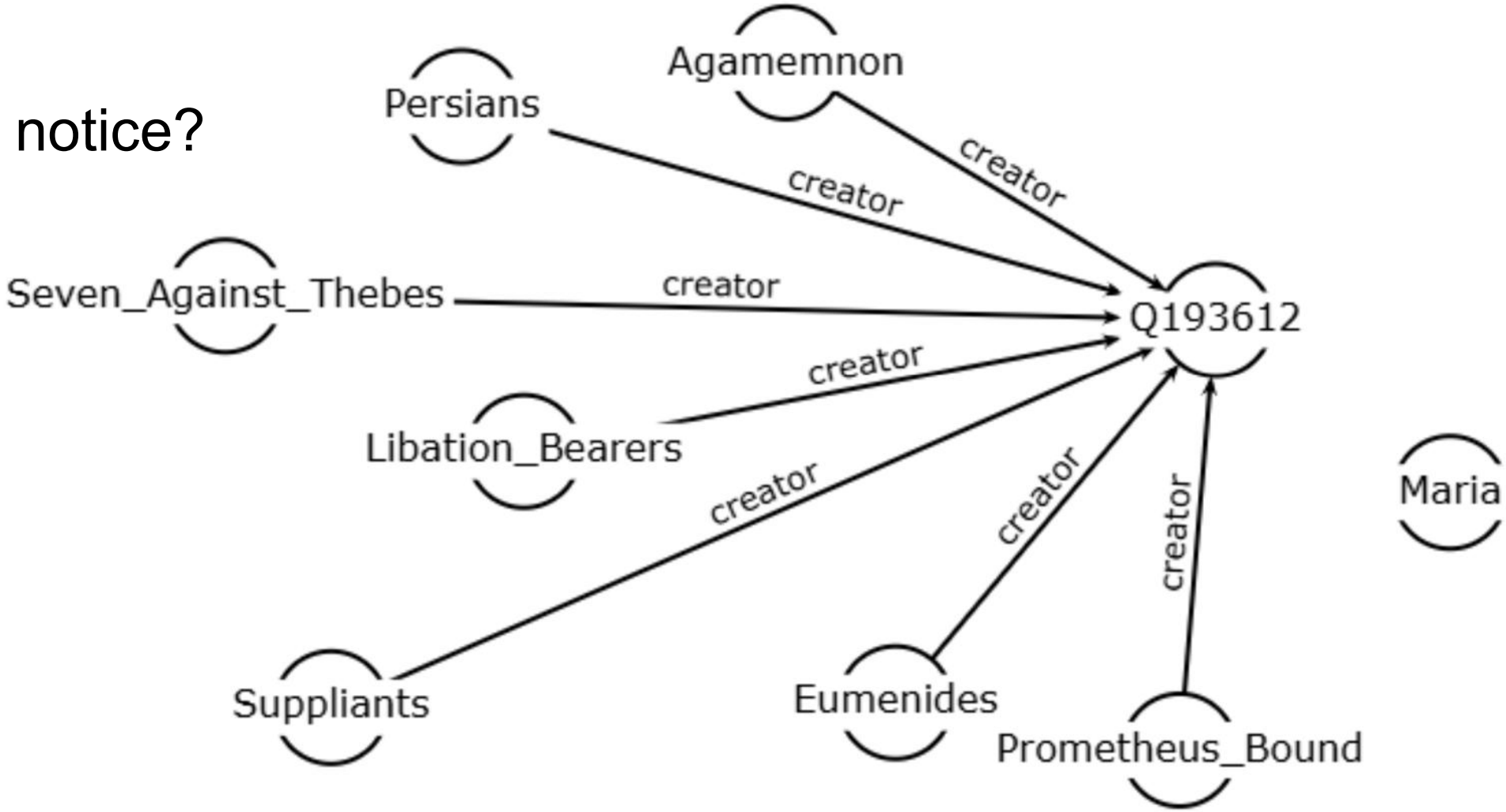
Αισχ
French
Escl
Dutch
Aeschylus
Seven_Against_Thebes
Prometheus_Bound
Persians
Libation_Bearers
Agamemnon
Suppliants
Eumenides
Q40939
creator
Node Info
Selected Node: Q40939
Type: class
Attributes:
title: Aeschylus (string)
Relations:
Persians (creator)
Seven_Against_Thebes (creator)
Suppliants (creator)
Selected Relation
Selected Relation: None
Graph Stats
Nodes: 8
Relations: 7
All Nodes
Filter nodes...
Q40939
Freeze
Toggle Panels
toneelschrijver uit Oude Athene (525v Chr-
Aischylos

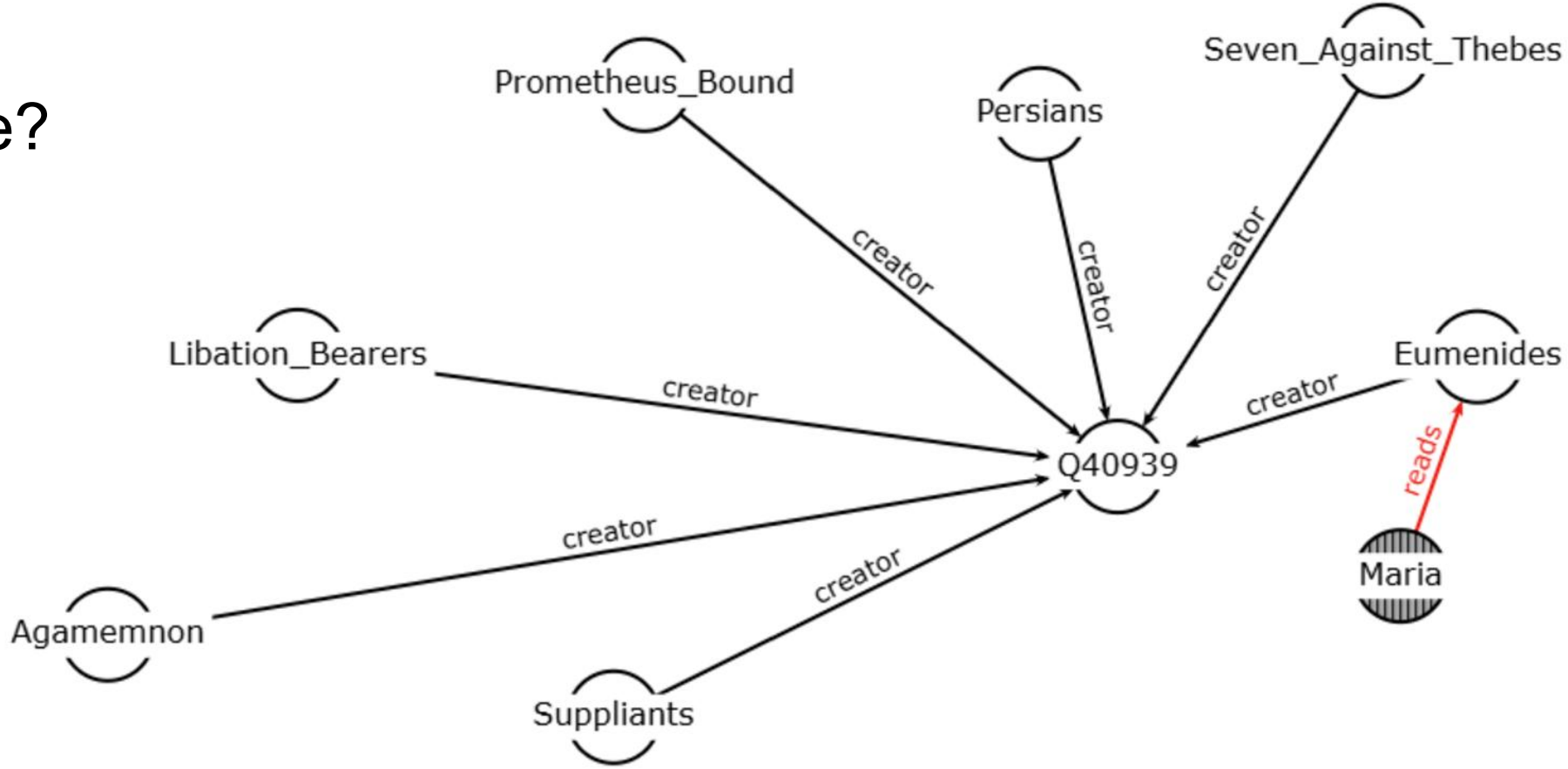
http://talos-ai4ssh.eu/kge/v12/

What do you notice?



http://talos-ai4ssh.eu/kge/v12/

What do you notice?



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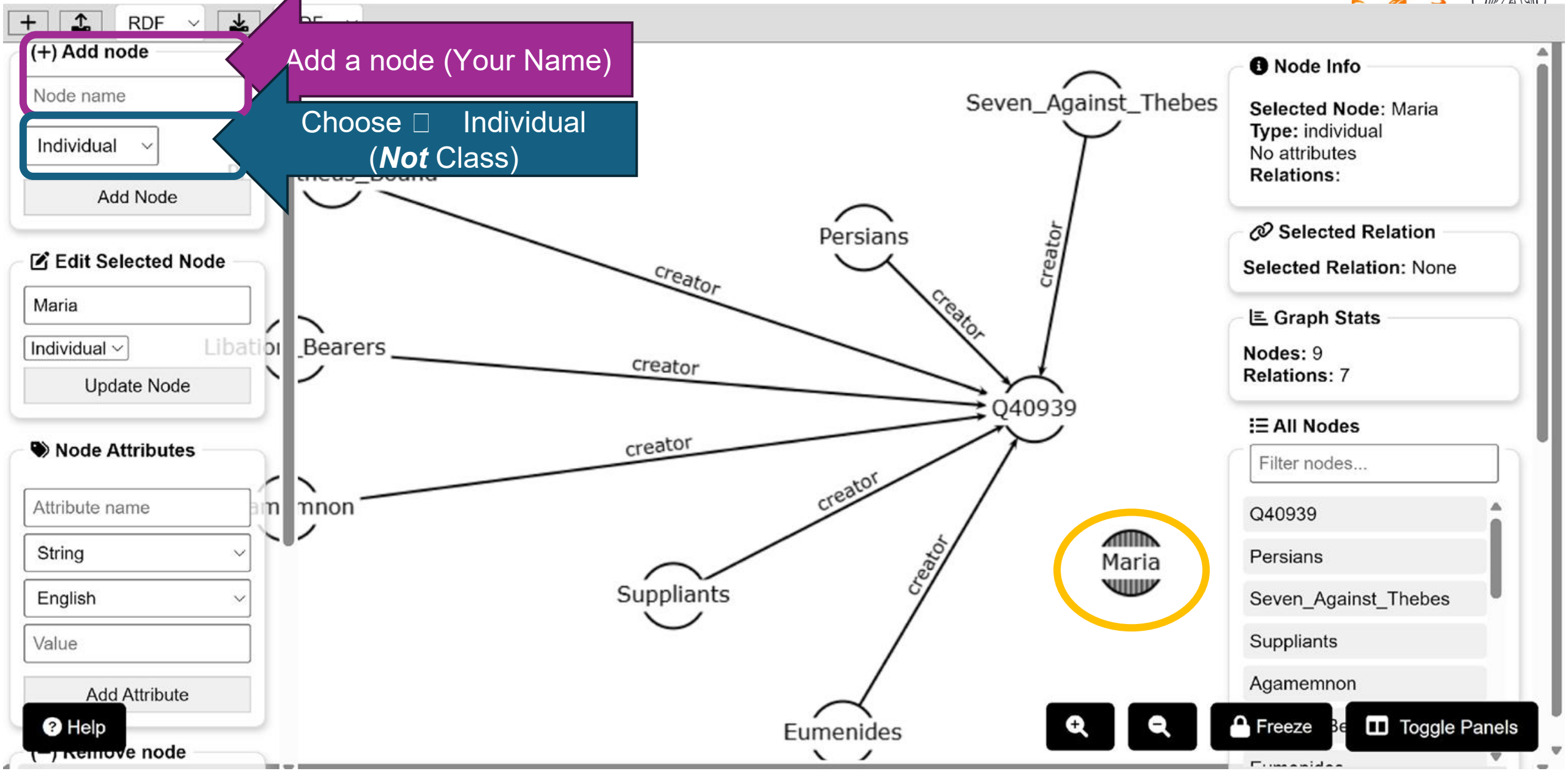

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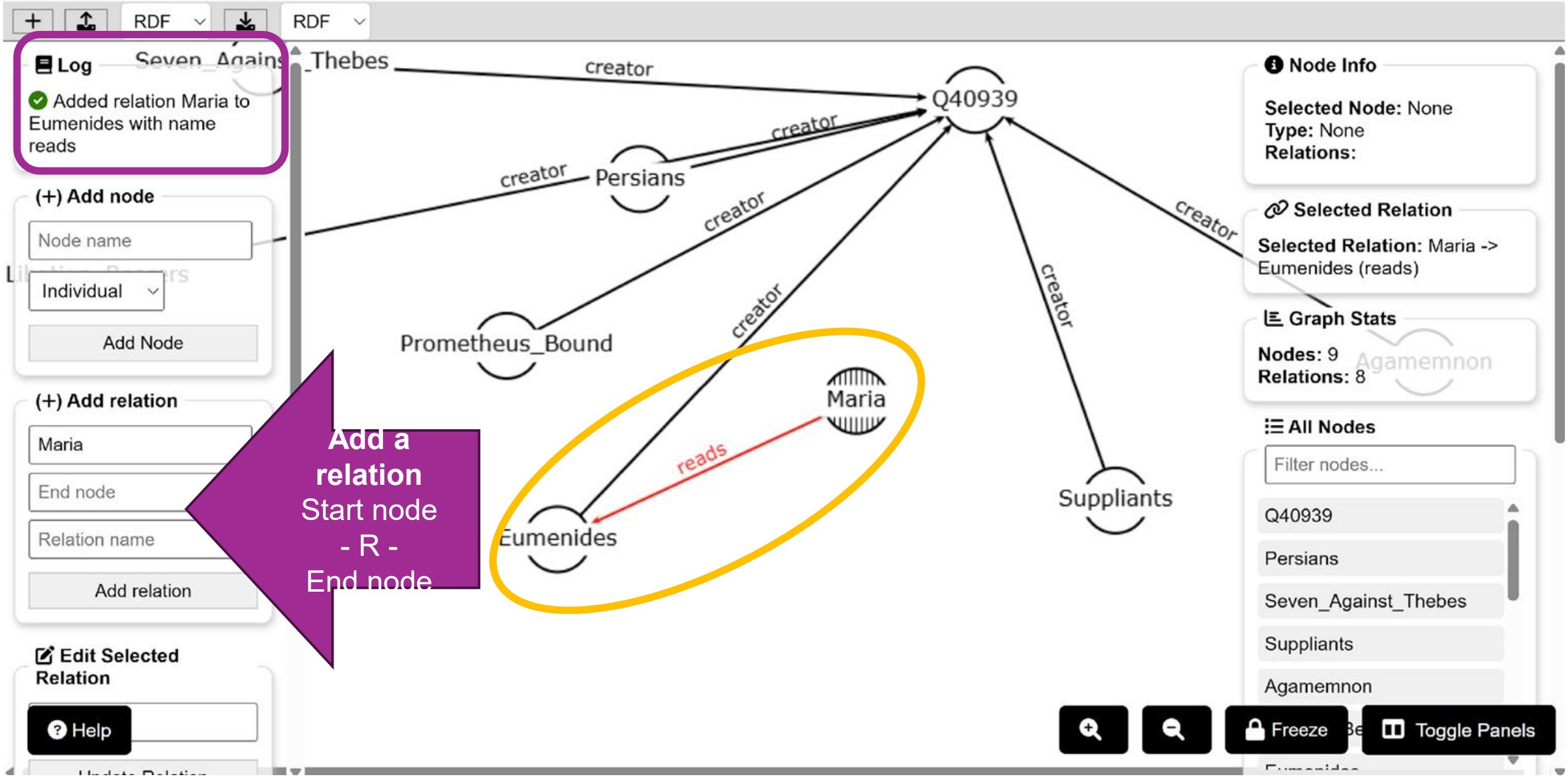


Your turn!

Scan this QR code!

1 Visit this address - KGE http://talos-ai4ssh.eu/kge/v12/

2 Upload the file aeschylus_plays.rdf RDF

3 What is Q40939 (Wikidata)?

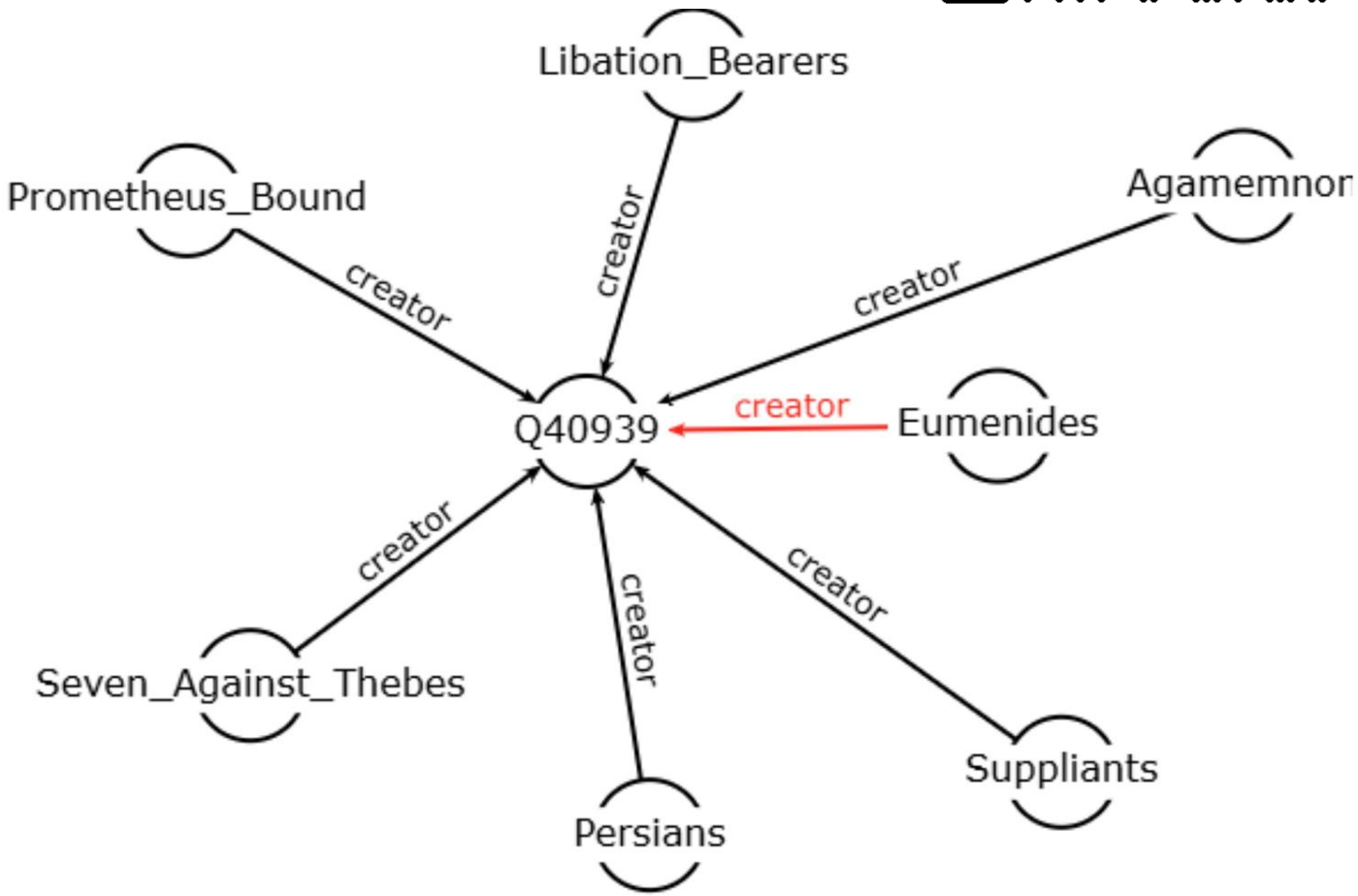
4 Find 2 more nodes.

5 Find 2 more relations.

6 Add 1 more node.

7 Add 1 more relation.

8 Download the new **RDF** file.



What if I want to create a more abstract level?

http://talos-ai4ssh.eu/kge/v12/

How can I modify the Knowledge Graph to:

Declare ***Eumenides*** as a **Play**?

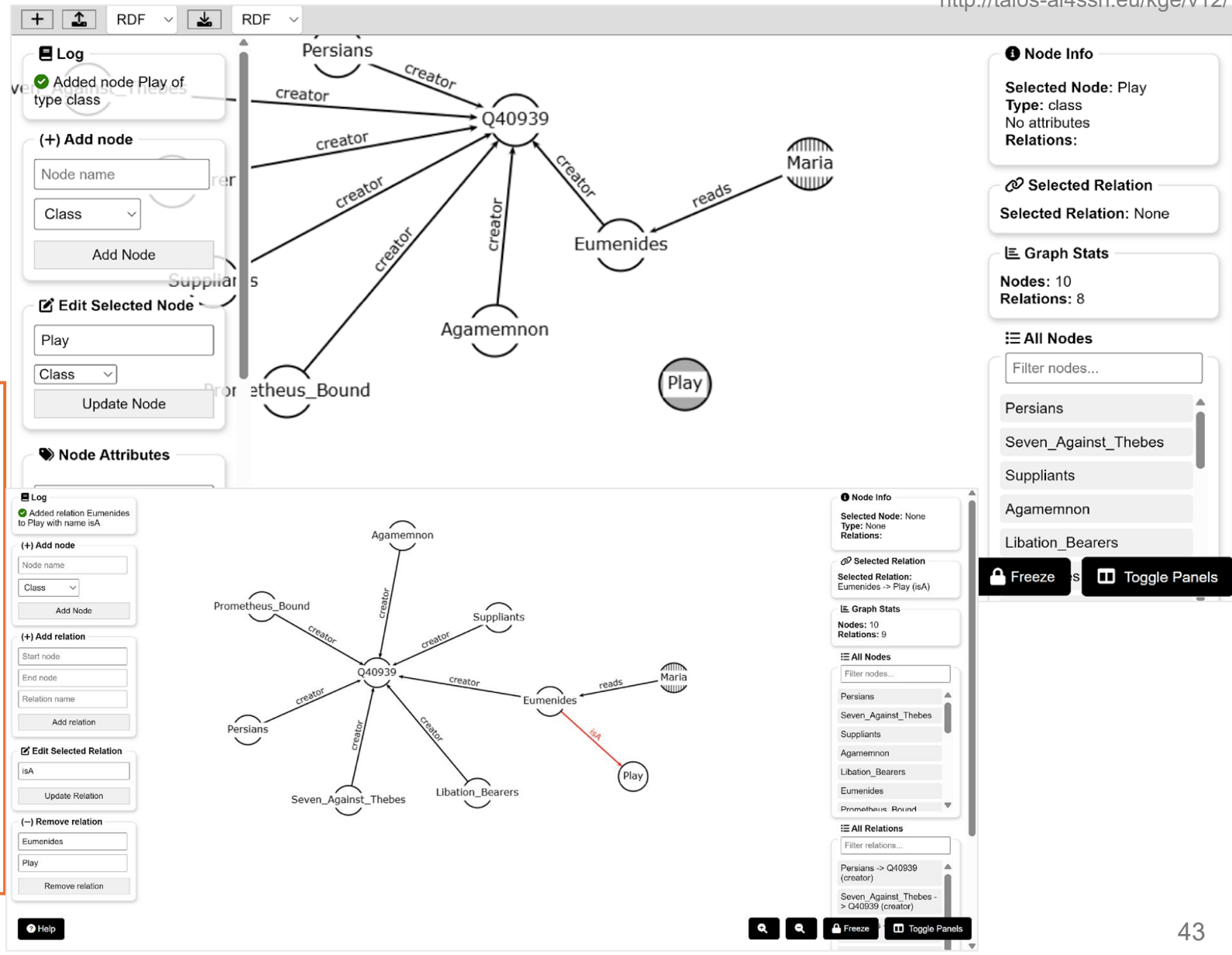
Add **Play** as a **Class node**
&
Link **Eumenides** to **Play** using the **isA relation.**

The following code snippets show how

- the Class Play
- the individual Eumenides
  - and relevant information are tagged.

```
<owl:Class rdf:about="http://kge.org/resources#Play">
  <rdfs:label>Play</rdfs:label>
</owl:Class>
```

```
<owl:Class rdf:about="http://kge.org/resources#Eumenides">
  <rdfs:label>Eumenides</rdfs:label>
  <kge:title>Eumenides</kge:title>
  <kge:creator></kge:creator>
  <kge:datePublished>-458-01-01</kge:datePublished>
</owl:Class>
```



What if I want to create a more abstract level?

Now try it on your own!

How can I modify the Knowledge Graph to:

Declare ***Aeschylus*** as a **Tragic Poet**?

Add **Tragic Poet** as a **Class node &**
Link **Aeschylus** to **Tragic Poet** using the **isA relation.**

http://talos-ai4ssh.eu/kge/v12/

Congratulations!

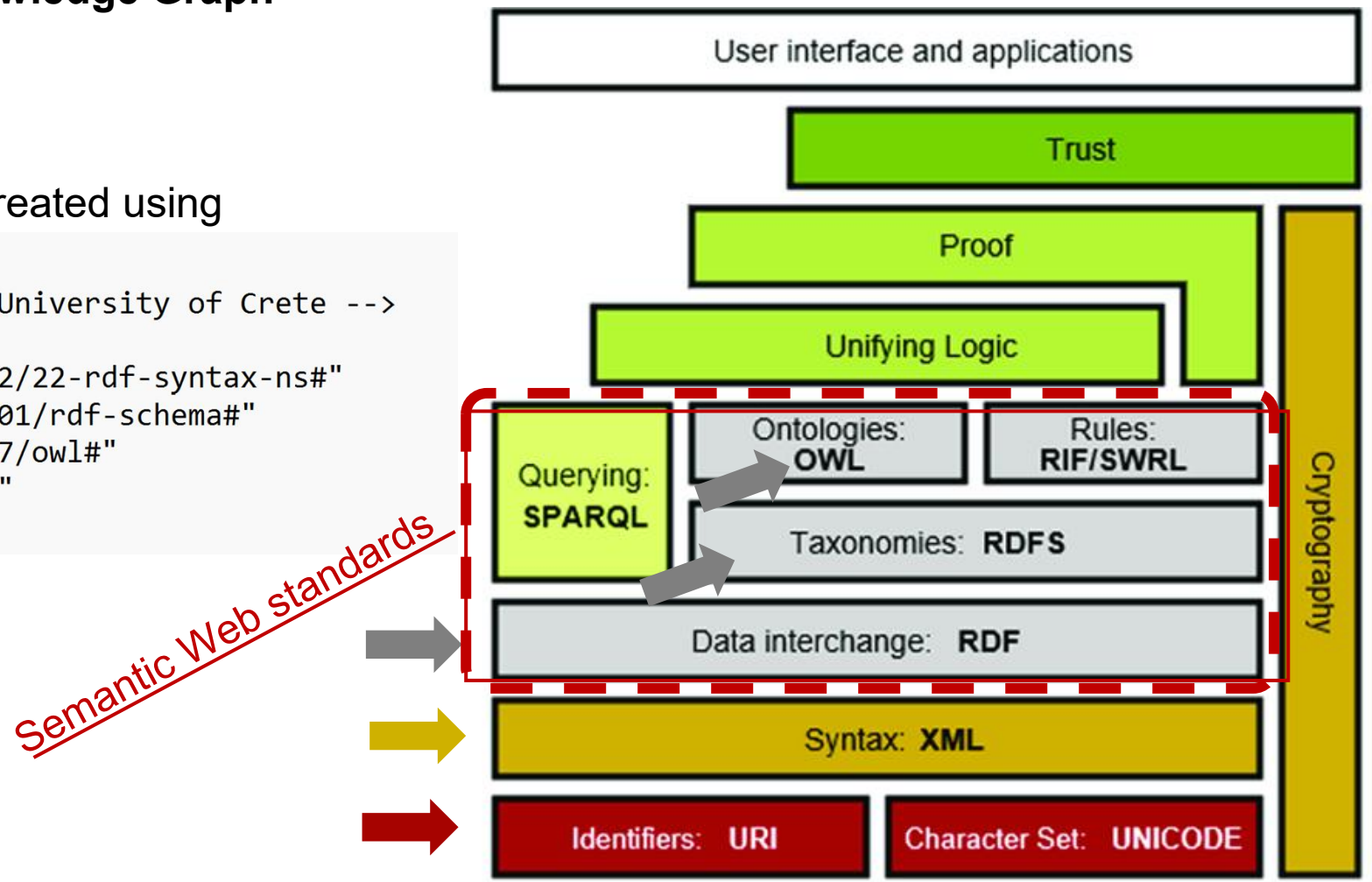
You have just created **your first Knowledge Graph / RDF / Semantic Web** Dataset!

Congratulations!

You have just created **your first Knowledge Graph / RDF / Semantic Web** Dataset!

Here's a snippet of the code you've created using KGE:

```
<?xml version="1.0" encoding="UTF-8"?>
<!-- Generated by KGE - TALOS AI4SSH - University of Crete -->
<rdf:RDF
    xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
    xmlns:rdfs="http://www.w3.org/2000/01/rdf-schema#"
    xmlns:owl="http://www.w3.org/2002/07/owl#"
    xmlns:kge="http://kge.org/ontology#"
    xmlns="http://kge.org/resources#">
```



End of Part I 🙂