



Putting the Extraction of Canonical References into a Global Philology Perspective

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Outline

1. Extraction of canonical references
2. Applications:
 - 2.1 Study of scholarly reception
 - 2.2 Search through secondary literature
3. Global Philology Scenarios



Extraction of canonical references



References in Classics

- **canonical texts** (e.g. Vergil, *Aen.* 12, 101-109, *Hom.* Il. 7.180)
- **inscriptions** (e.g. CIL 3, 6174; AE 1991, 1405)
- **papyri** (e.g. PCair. inv. 10750)
- **manuscripts** (e.g. Vendôme, Bibl. mun. 31)
- **fragmentary texts, coins, etc.**



Interoperability of canonical references

34 VIII. 3—IX. 5. 1451 a 27—1451 b 12

τῷ ἀγερμῷ, ὃν οὐδὲν θατέρου γενομένου ἀναγκαῖον ἦν
ἢ εἰκὸς θάτερον γενέσθαι, ἀλλὰ περὶ μίαν πρᾶξιν οἴαν
λέγομεν τὴν Ὀδύσσειαν συνέστησεν, ὁμοίως δὲ καὶ τὴν
30 Ἰλιάδα. Χρὴ οὖν καθάπερ καὶ ἐν ταῖς ἄλλαις μιμητικαῖς ἡ μία 4
μίμησις ἐνός ἐστιν οὕτω καὶ τὸν μῦθον, ἐπεὶ πράξεως μίμησίς
ἐστι, μᾶς τε εἶναι καὶ ταύτης ὅλης καὶ τὰ μέρη συνεστά-
ναι τῶν πραγμάτων οὕτως ὥστε μετατιθεμένου τινὸς μέρους
ἢ ἀφαιρουμένου διαφέρεσθαι καὶ κινεῖσθαι τὸ ὅλον. ὁ γὰρ
35 προσὸν ἡ μὴ προσὸν μηδὲν ποιεῖ ἐπίδηλον, οὐδὲν μόριον τοῦ
ὅλου ἐστίν.

IX Φανερὸν δὲ ἐκ τῶν εἰρημένων καὶ ὅτι οὐ τὸ τὰ
γενόμενα λέγειν, τοῦτο ποιητοῦ ἔργον ἐστίν, ἀλλ’ οὐλα ἀν
γένοιτο καὶ τὰ δυνατὰ κατὰ τὸ εἰκὸς ἢ τὸ ἀναγκαῖον. ὁ γὰρ 2
1451 b ἴστορικὸς καὶ ὁ ποιητὴς οὐ τῷ ἡ ἔμμετρα λέγειν ἢ ἄμετρα
διαφέρουσιν (εἴη γὰρ ἀν τὰ Ἡροδότου εἰς μέτρα τεθῆναι,
καὶ οὐδὲν ἥπτον ἀν εἴη ἴστορία τις μετὰ μέτρου ἢ ἄνευ μέτρων).
ἀλλὰ τούτῳ διαφέρει, τῷ τὸν μὲν τὰ γενόμενα λέγειν,
5 τὸν δὲ οὐλα ἀν γένοιτο. διὸ καὶ φιλοσοφώτερον καὶ 3
σπουδαιότερον ποίησις ἴστορίας ἐστίν. ἡ μὲν γὰρ ποίησις
μᾶλλον τὰ καθόλου, ἡ δὲ ἴστορία τὰ καθ' ἔκαστον λέγει.
ἔστιν δὲ καθόλου μέν, τῷ ποίῳ τὰ ποῖα ἄττα συμβαίνει 4
λέγειν ἡ πράττειν κατὰ τὸ εἰκὸς ἢ τὸ ἀναγκαῖον, οὐ στο-
10 χάζεται ἡ ποίησις ὄνόματα ἐπιτιθεμένη· τὸ δὲ καθ' ἔκα-
στον, τί Ἀλκιβιάδης ἐπράξειν ἢ τί ἐπαθειν. ἐπὶ μὲν οὖν τῇ 5
κωμῳδίας ἥδη τοῦτο δῆλον γέγονεν· συστήσαντες γὰρ τὸν

رسطو، عن فن الشعر، ١٤٤٧ - ١٣١ و مابعده

=

Aristotle, *Poetics* 1447 a13-14 ff.



Consecutive references

(vgl. Hdt. 2, 170 f. u. 6. Apul. met. 11,23,9. Auson. Mos. 186 f. Ov. fast. 3, 325 f. 4,552. Verg. Aen. 6, 264ff. (E. Norden z. St.). Stat. Theb. 4, 516. Apoll. Rhod. 4, 249).

Discursive references

“The picture of Achilles and of the **Iliad** that emerges from the twenty explicit references in the first half of the **Aeneid** is almost totally negative. Achilles is the unyielding (inmitis, 1 .30, 3.87), ferocious (saevus, 1.458, 2.29) warrior of **Iliad 20** and **21** ; he is the preeminent killer of Trojans (1.30, 458, 468, 475, 484 ; 1.458-493, 2.196-198, 3.87, 5.803-811) and of Hector in particular (1.99, 483-484 ; 2.270-279 ; 6.168).”

Reference + quotation

The most impressive of these openings within the line accompany the arrival of the chthonic powers: **aduentante dea.** "procul, o procul este, profani! (6. 258) and the miraculous appearance of Aeneas from the cloud: **cum sic reginam adloquitur cunctisque repente improvisus ait:** "coram, quem quaeritis, adsum." (I. 594-595)



Canonical Text Services URNs

urn:cts:greekLit:tlg0012.tlg001.perseus-grc1:1.1-1.10
_____ _____ _____ _____ _____
prefix namespace textgroup work exemplar passage

work

Pliny

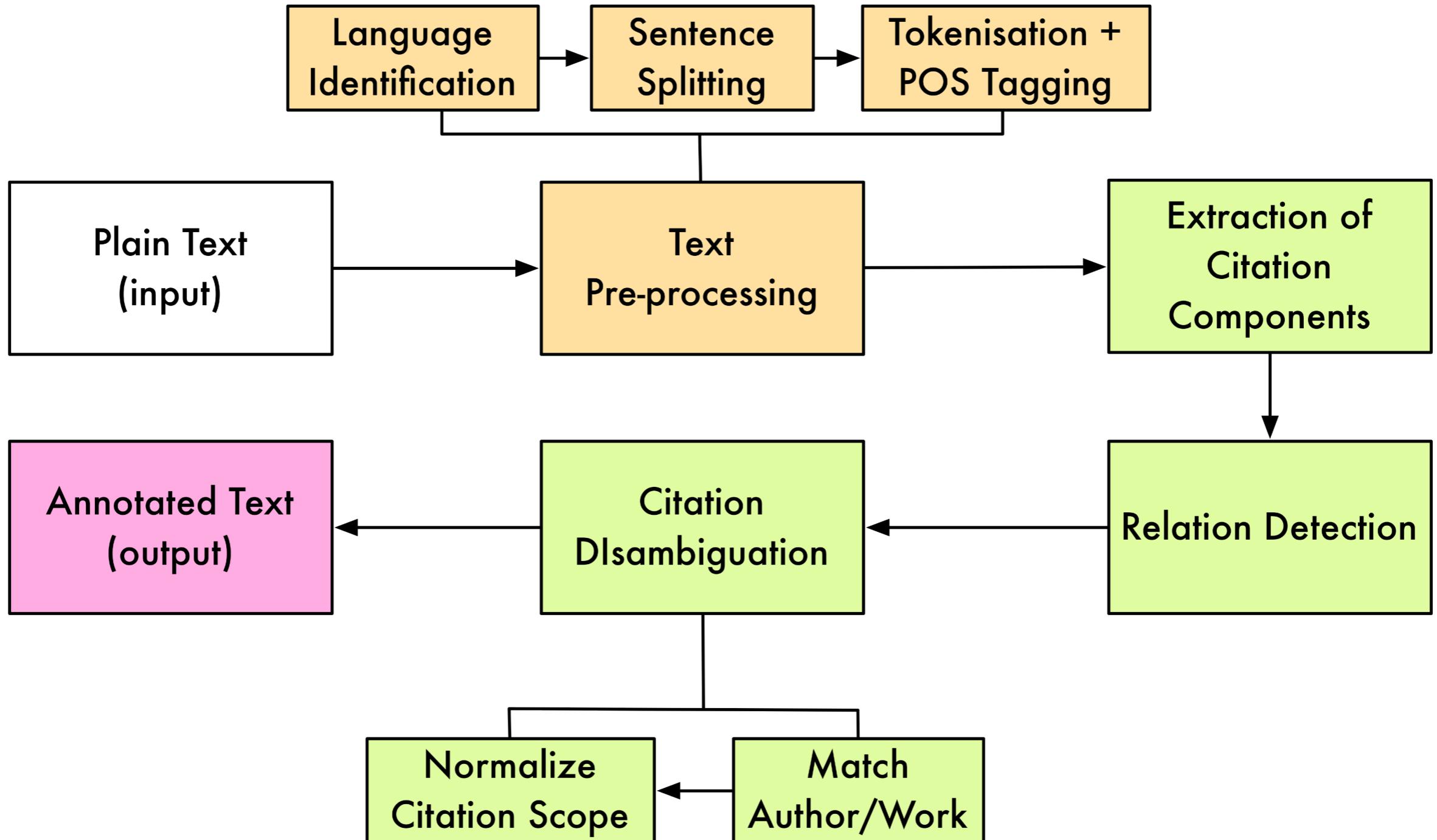
urn:cts:latinLit:phi0978

Pliny's NH

urn:cts:latinLit:phi0978.phi001

Pliny, *Nat.* 11,4,11

urn:cts:latinLit:phi0978.phi001:11.4.11





Named Entity Recognition & Classification

monks to bees occurs in Aldhelm of Malmesbury 's « De virginitate ».

is in their voluntary solidarity and obedience to leadership.

seen from other Christian and pagan literature.

y influenced by Pliny, nat. 11, 4, 11 and 11, 16, 46 and Vergil, georg. 4, 149-218.

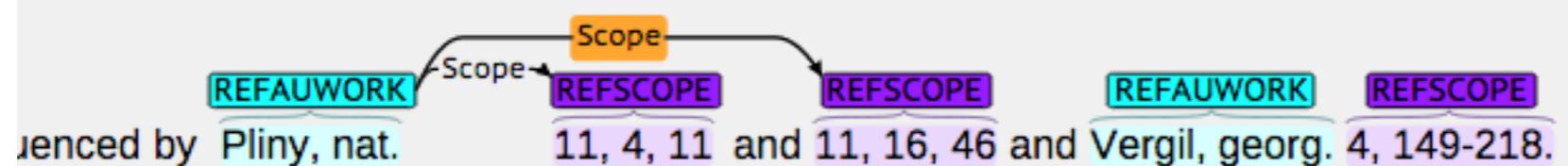
Entities:

- **aauthor** => Omero
- **awork** => Georgics
- **refauwork** => Pliny Nat., Thuc.
- **scope** => 11,4,11 ; IX 49 ;



Relation Detection

; to bees occurs in Aldhelm of Malmesbury 's « De uirginitate ».
heir voluntary solidarity and obedience to leadership.
om other Christian and pagan literature.

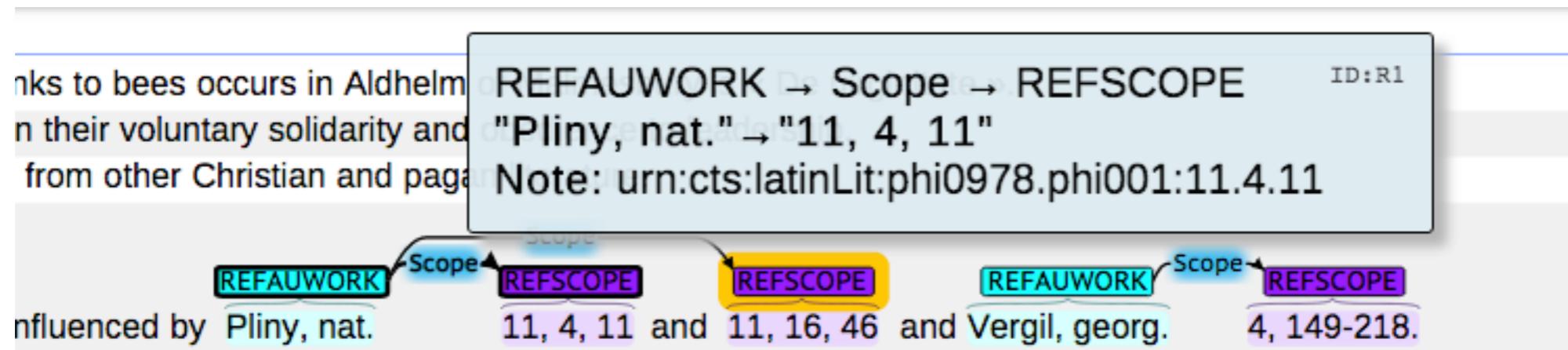


Combinations:

- **refauwork + scope** => Pliny, nat. 11, 4, 11
- **aauthor + scope** => Ammianus (15, 8, 7)
- **awork + scope** => Trabajos 159–173



Entity/Relation Disambiguation



Pliny, nat. 11, 4, 11 => urn:cts:latinLit:phi0978.phi001:11.4.1

Vergil, Georg, 4,149-218 => urn:cts:latinLit:phi0690.phi002:4.149-4.218



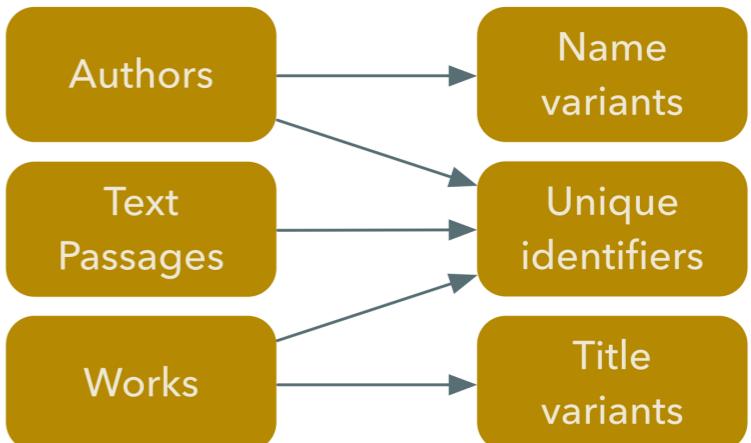
1 Citation Extractor

Lorem ipsum Verg. Aen. 12.10 f. sit
amet, consectetur adipiscing elit. Duis
facilisis lacinia ipsum id pharetra.

Verg. Aen. 12.10 f.

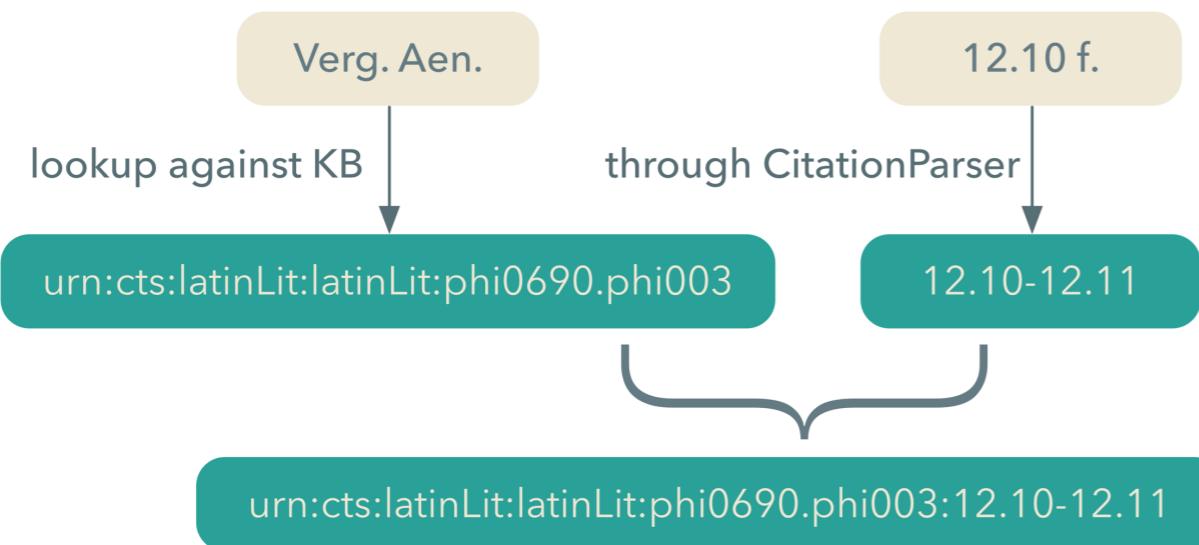
Verg. Aen. + 12.10 f.

3 Knowledge Base

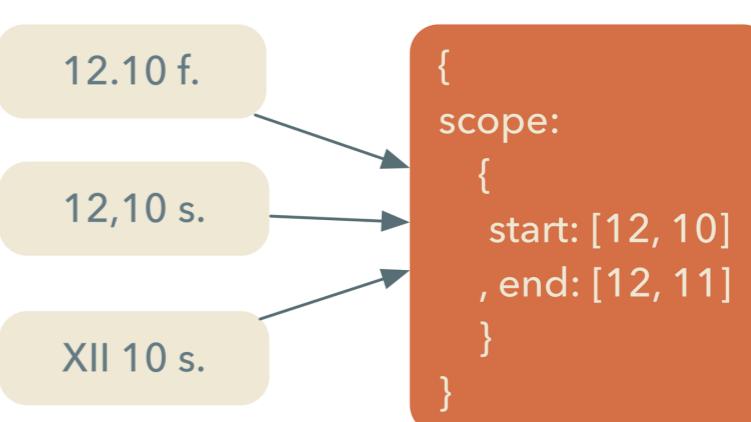


(1,500 authors; 5,500 works)

2 Citation Matcher



4 Citation Parser



(Context-Free Grammar)



Classics articles in JSTOR

	Number
Total articles	138,821
Successfully processed articles	119,723
Sentences	34,853,399
Tokens	865,075,857
Extracted canonical references	1,649,868
Extracted author mentions	1,448,163
Extracted work mentions	4,665

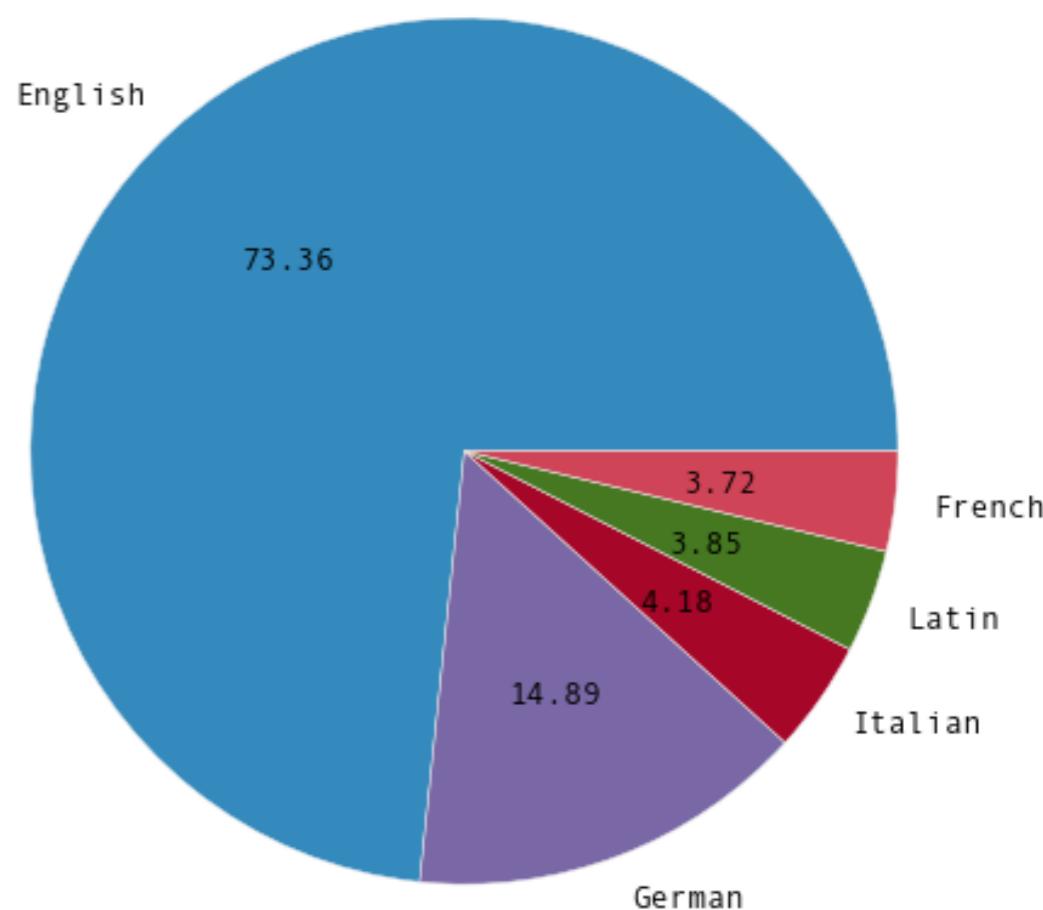


Table 2: Basic statistics about the JSTOR data.



Study of scholarly reception



Citations as Traces of Scholarship



<https://www.flickr.com/photos/napafloma-pictures/27317099101/>



Quantitative Approaches to Scholarly Reception

W. Scheidel (1997). “Continuity and Change in Classical Scholarship”, *Ancient Society* 28.

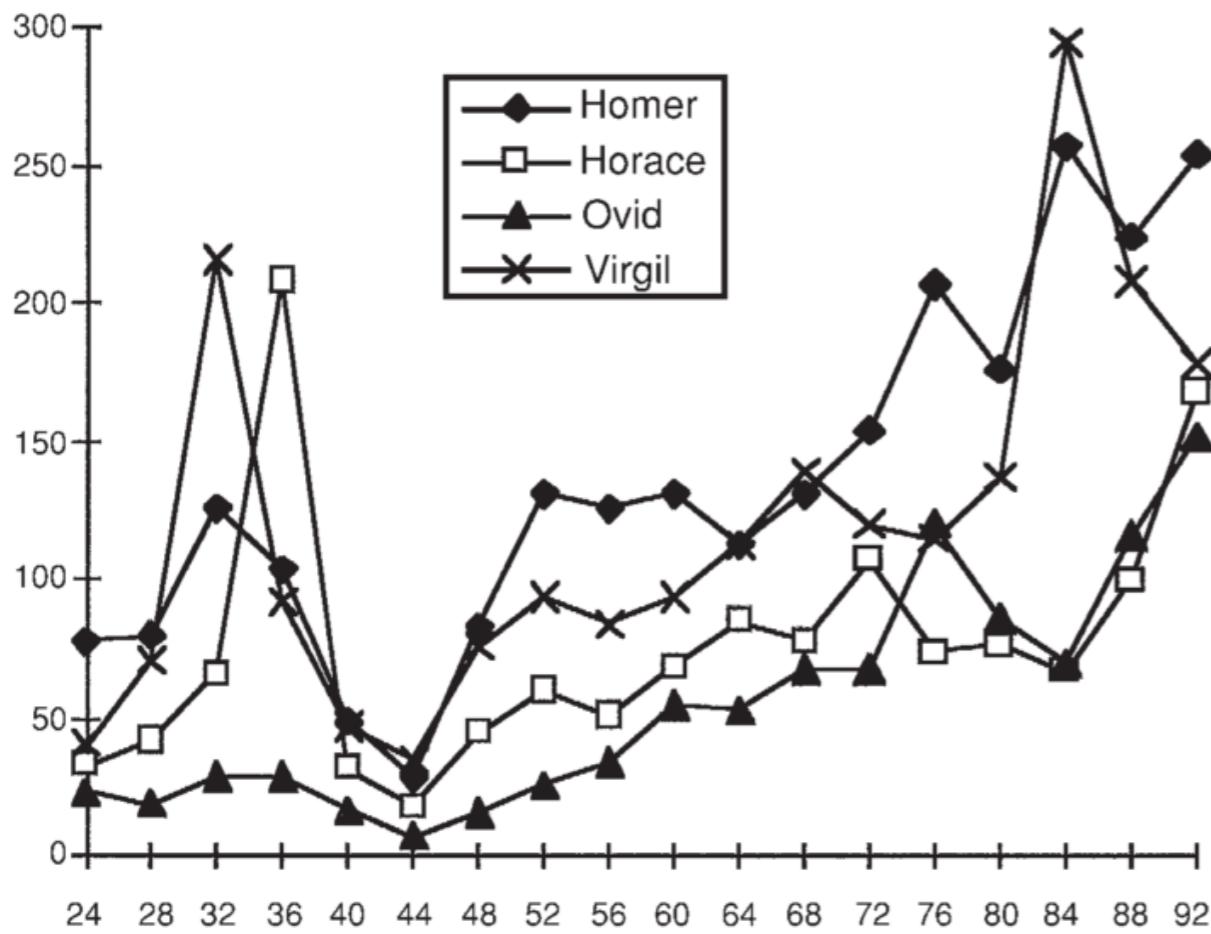


Fig. 7 Number of entries: poets

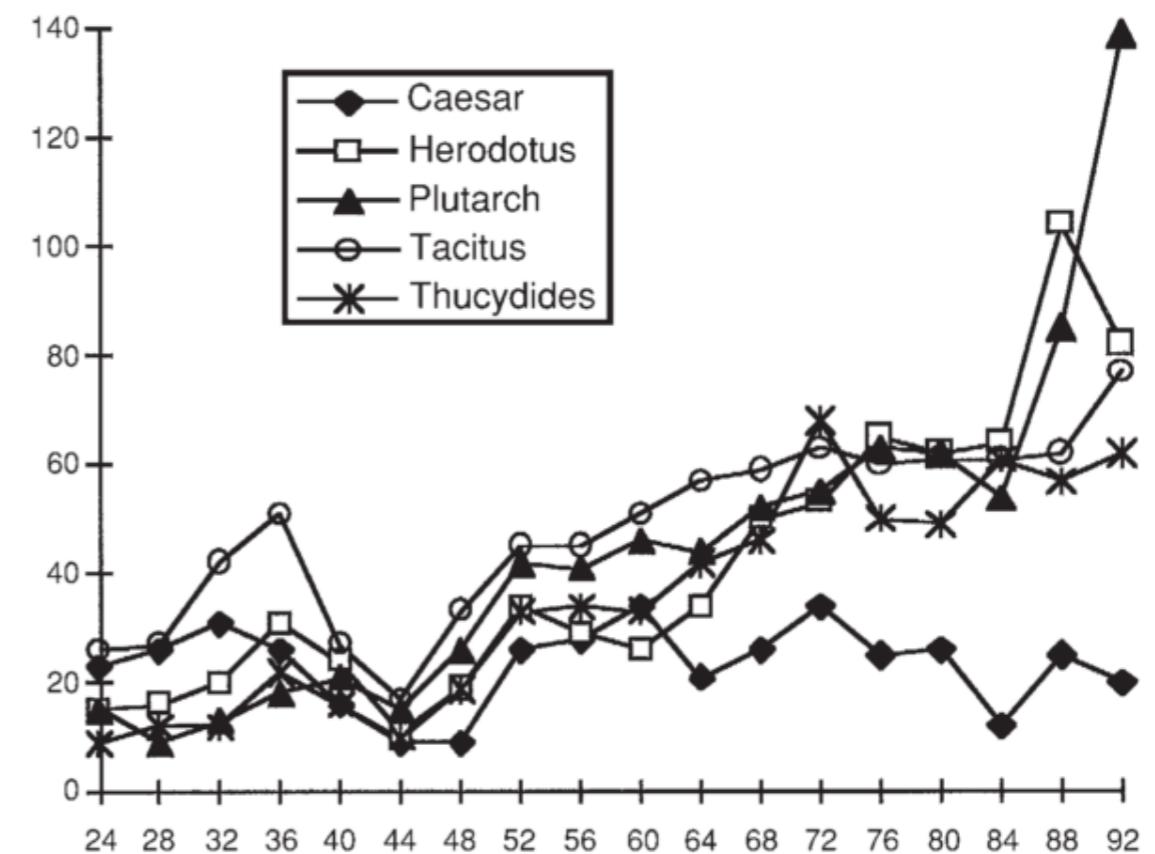
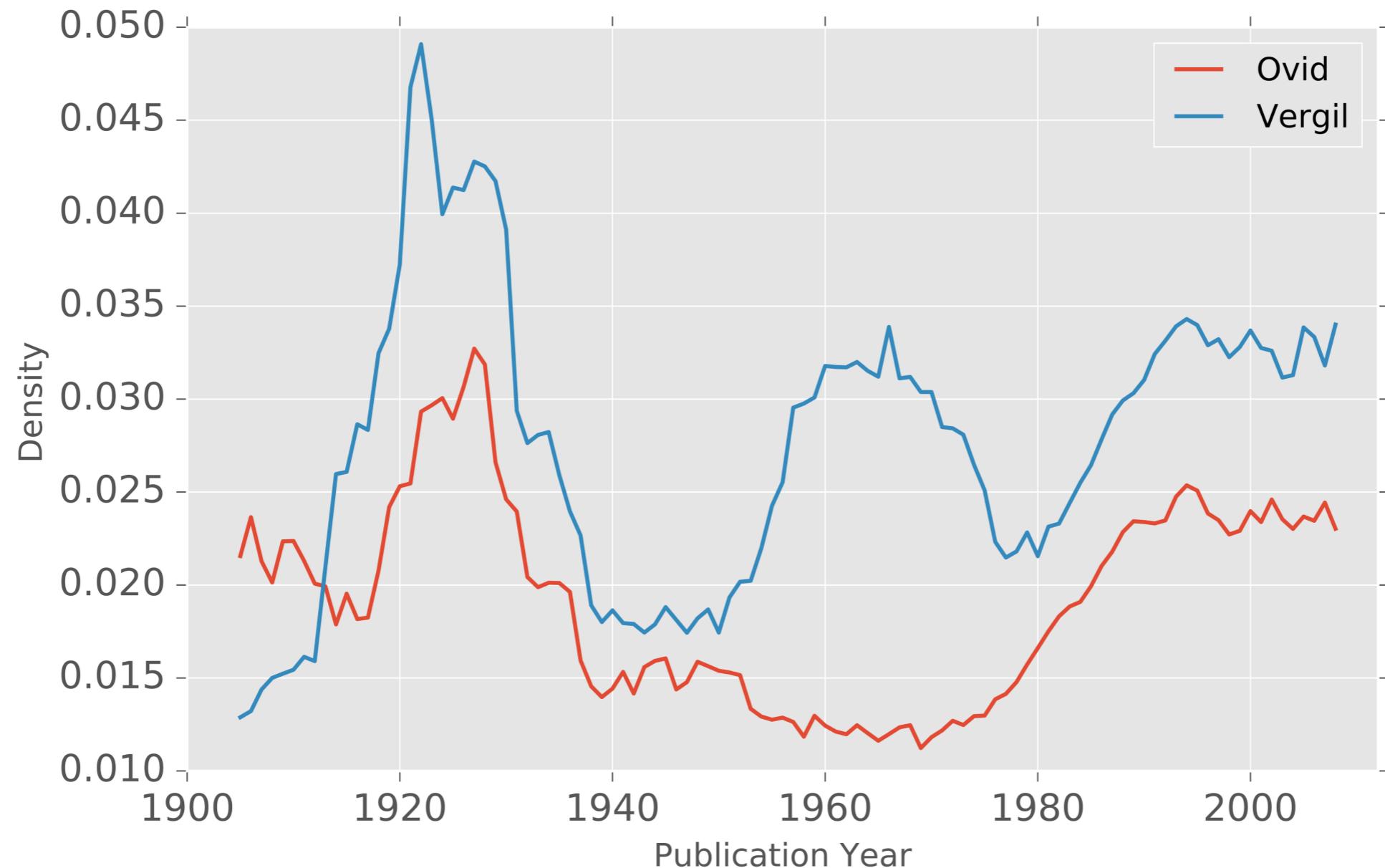


Fig. 8 Number of entries: historians and biographers

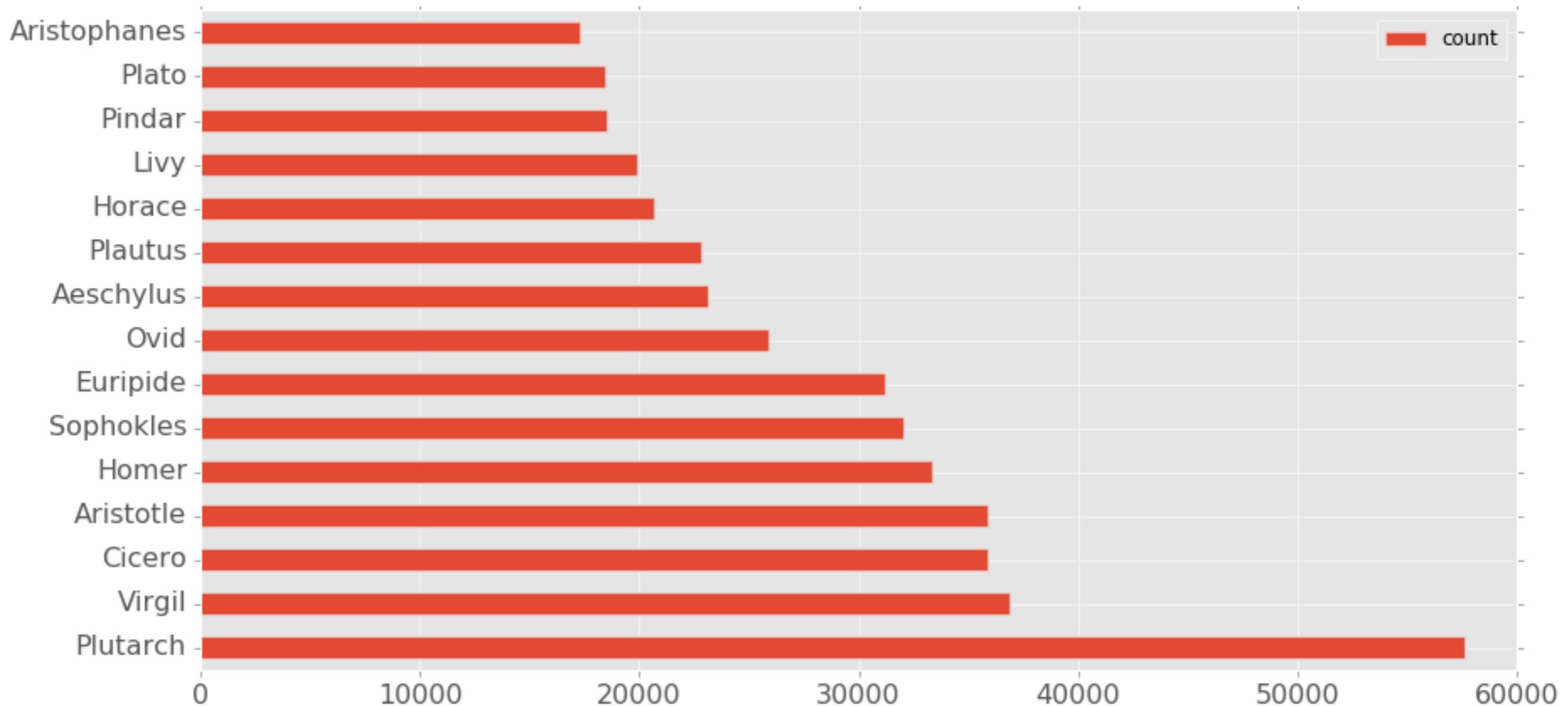


Waves of Reception





Towards to a Quantified Canon



1% of Greek/Latin authors accounts for 30% of references in JSTOR



Search through secondary literature



Aeneid in JSTOR Home Explore About

Display: all

I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII								
1-50	51-100	101-150	151-200	201-250	251-300	301-350	351-400	401-450	451-500	501-550	551-600	601-650	651-700	701-750	751-800	801-850	851-900	901-950	951-1000
References: 291 Quotations: 314																			

In Focus: Book 1, lines 1-50

Arma virumque cano, Troiae qui primus ab oris
 Italiam, fato profugus, Laviniaque venit
 litora, multum ille et terris iactatus et alto
 vi superum saevae memorem Iunonis ob iram;
 5 multa quoque et bello passus, dum conderet urbem,
 inferretque deos Latio, genus unde Latinum,
 Albanique patres, atque altae moenia Romae.
 Musa, mihi causas memora, quo numine laeso,
 quidve dolens, regina deum tot volvere casus
 10 insignem pietate virum, tot adire labores
 impulerit. Tantaene animis caelestibus irae?
 Urbs antiqua fuit, Tyrii tenuere coloni,
 Karthago, Italiam contra Tiberinaque longe
 ostia, dives opum studiisque asperrima belli;
 15 quam Iuno fertur terris magis omnibus unam
 posthabita coluisse Samo; hic illius arma,
 hic currus fuit; hoc regnum dea gentibus esse,
 si qua fata sinant, iam tum tenditque fovetque.

Results: quotations references

Aen. 1.1 112 52 3

Menin Virumque: Translating Homer with Virgil in "Epigrammata Bobiensia" 46_47 and 64

SCOTT MCGILL
The Classical Journal 2006
 DOI: [10.2307/30038019](https://doi.org/10.2307/30038019)

By rendering Iliad 1.1 with Aeneid 1.1 rather than translating Homer with an eye to word-for-word correspondence, the EB poets offer a striking perspective on that aspect of ancient education.

— (reference: 571a5798b634c1c68fef6343)

Silius Punica 6. 1-53

EDWARD L. BASSETT
Classical Philology 1959
 DOI: [10.2307/266203](https://doi.org/10.2307/266203)



Search for parallels in secondary literature?

- **Parallel**
 - co-occurrence of two (or more) references within a given context (e.g. sentence)
- **Query example**
 - Which articles discuss parallels between Vergilian and Homeric poems?
- **Use cases**
 - was a given parallel already known in the literature?
 - preparation of a commentary
 - ...



Graph Search for Parallels

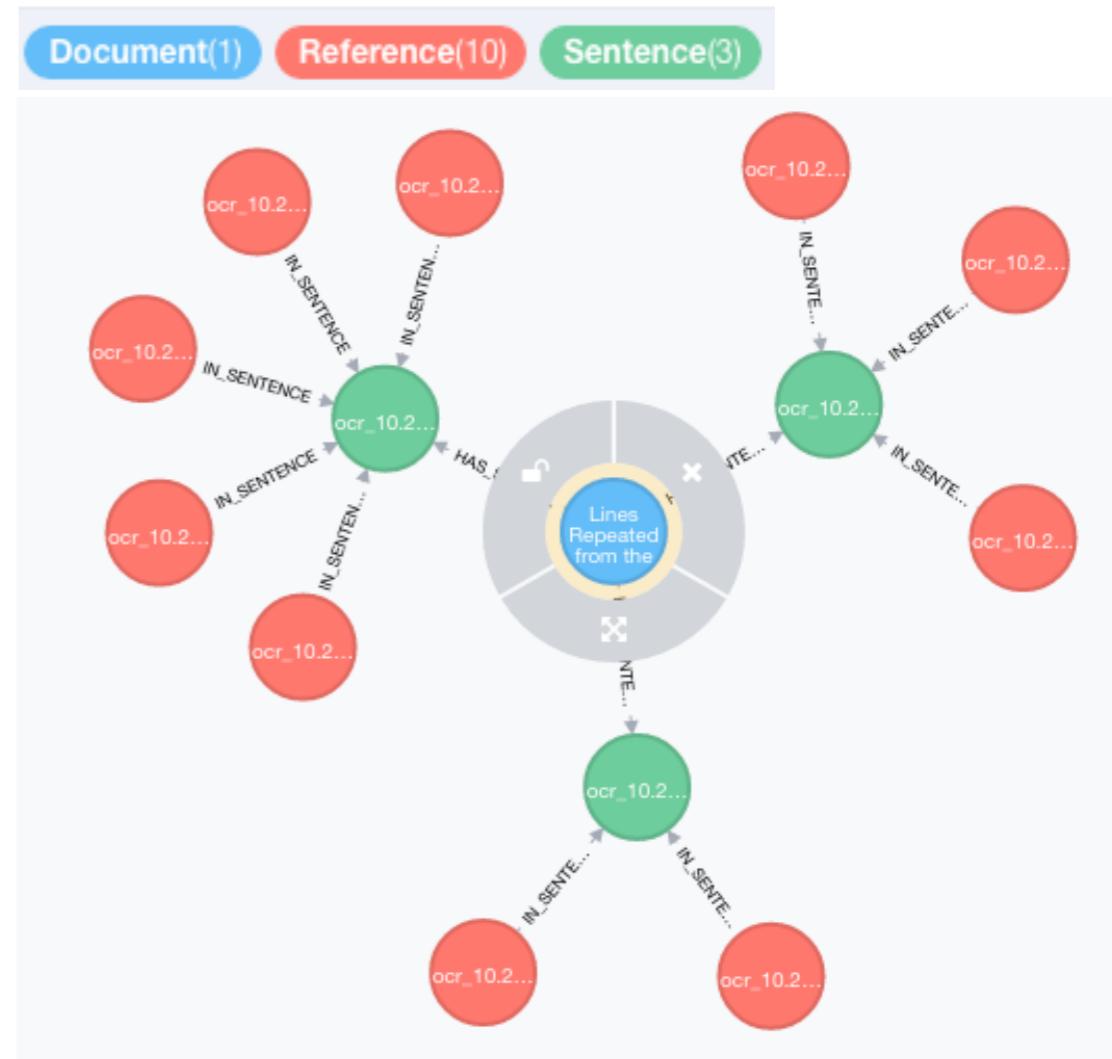
GET

```
http://nlp.dainst.org/citedloci/api/
references?
urn=urn:cts:latinLit:phi0690&level=scope
&urn=urn:cts:greekLit:tlg0012&level=scope
```



```

1 MATCH (d:Document)-[:HAS_SENTENCE]-(s:Sentence)
2 MATCH (r1:Reference)-[:IN_SENTENCE]-(s)
3 MATCH (r2:Reference)-[:IN_SENTENCE]-(s)
4 WHERE r1.author_urn = "urn:cts:greekLit:tlg0012" and r1.annotation_type = "scope" and
      r2.author_urn = "urn:cts:latinLit:phi0690" and r2.annotation_type = "scope"
5 RETURN d.doi as doi, s.sequence as sentence_number, r1 as ref1, r2 as ref2
  
```





Result Example 1

It was already apparent to Servius (ad Aen. 6.468) that the encounter of Dido and Aeneas in the underworld (**Verg. Aen. 6.450-76**) is modelled upon Homer 's scene of Ajax ' shade shunning Odysseus in silence because he had been the provocation for his suicide (**Od. 11.541-64** ; Knauer 108-12).

R. Drew Griffith, “Catullus' Coma Berenices and Aeneas' Farewell to Dido”, in *TAPhA* 1995(125), pp. 47-59. DOI: 10.2307/284345



```
{  
  "document": {  
    "publisher": "American Philological Association",  
    "doi": "10.2307/284345",  
    "pubdate": 1995,  
    "author": "R. Drew Griffith",  
    "journaltitle": "Transactions of the American Philological Association (1974-)",  
    "reviewed-work": "",  
    "title": "Catullus' Coma Berenices and Aeneas' Farewell to Dido",  
    "filename": "ocr_10.2307_284345.txt",  
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    "pagerange": "pp. 47-59",  
    "type": "fla",  
    "id": "10.2307/284345"  
  },  
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    {  
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      "type": "scope",  
      "surface": "(Od. 11.541-64 ;"  
    },  
    {  
      "urn": "urn:cts:latinLit:phi0690.phi003:6.450-6.76",  
      "_id": "571a40dab634c1c6a2ee9942",  
      "type": "scope",  
      "surface": "(Verg. Aen. 6.450-76)"  
    }  
  ],  
  "sentence": {  
    "text": "It was already apparent to Servius (ad Aen. 6.468) that the encounter of Dido and Aeneas in the underworld (Verg. Aen. 6.45  
0-76) is modelled upon Homer's scene of Ajax's shade shunning Odysseus in silence because he had been the provocation for his suicide (Od.  
. 11.541-64 ; Knauer 108-12).",  
    "sequence": 124  
  }  
},
```



Result Example 2

“The picture of Achilles and of the **Iliad** that emerges from the twenty explicit references in the first half of the **Aeneid** is almost totally negative.

Achilles is the unyielding (inmitis, **1.30, 3.87**), ferocious (saevus, **1.458, 2.29**) warrior of **Iliad 20 and 21** ; he is the preeminent killer of Trojans (**1.30, 458, 468, 475, 484** ; **1.458-493, 2.196-198, 3.87, 5.803-811**) and of Hector in particular (**1.99, 483-484** ; **2.270-279** ; **6.168**).”

Katherine Callen King, "Foil and Fusion: Homer's Achilles in Vergil's Aeneid", in *Materiali e discussioni per l'analisi dei testi classici*, 1982(9), pp. 31-57.
DOI: [10.2307/40235789](https://doi.org/10.2307/40235789)



Result Example 3

The role of Boreas as the lover of Oreithyia and Pharmakeia is also interesting in view of the horse symbolism involved in the maenad's rituals : Boreas was thought to be able to fertilize horses (**Hom., Il. 20.221** ; cf. **Verg., Georg. 3.274-5**).

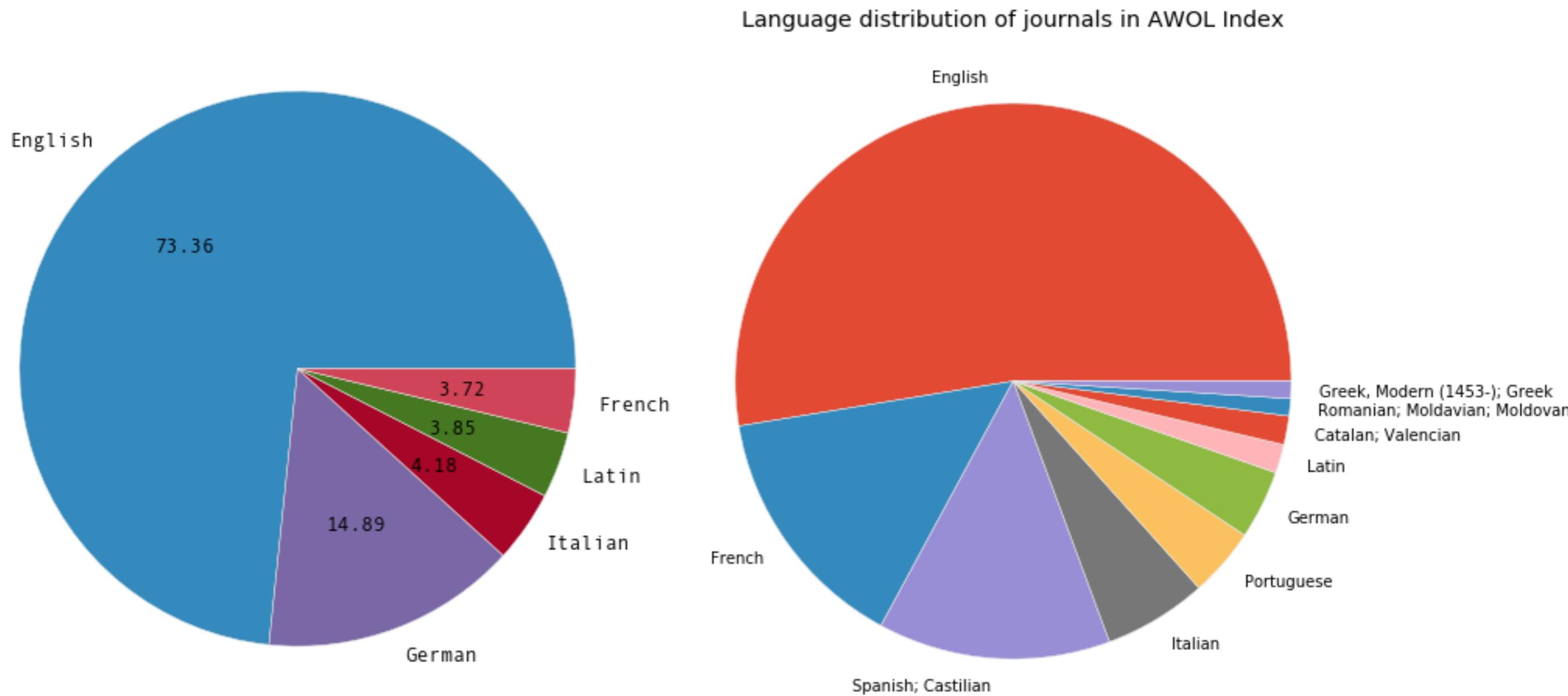
Carl A. P. Ruck, “On the Sacred Names of Iamos and Ion: Ethnobotanical Referents in the Hero's Parentage”, in *CJ* 1976 71(3), pp. 235-252. DOI: [10.2307/3296184](https://doi.org/10.2307/3296184)



Global Philology Scenarios for the Extraction of Canonical References



1 Fostering Language Diversity



JSTOR

Ancient World OnLine (AWOL)



2. Increasing Access



Matteo Romanello @mr56k · 9 Dec 2016

Just published a tiny tool to find [@JSTOR](#) articles quoting or referring to the Aeneid. Feedback wanted! [aeneidinjstor.eu](#) #DigiClass

The screenshot shows a web browser window with the URL [www.aeneidinjstor.eu/options](#). The page title is "Aeneid in JSTOR". Below the title are links for "Home", "Explore", and "About". A sidebar on the left titled "Display" has a dropdown menu set to "all". To its right is a large grid visualization of the Latin text. The grid consists of a grid of colored squares (blue, green, yellow) representing the text structure. The numbers 1-29, 30-109, 110-189, 190-269, 270-349, 350-429, 430-509, 510-589, 590-669, 670-749, 750-829, 830-909, 910-989, 990-1069, 1070-1149, 1150-1229, 1230-1309, 1310-1389, 1390-1469, 1470-1549, 1550-1629, 1630-1709, 1710-1789, 1790-1869, 1870-1949, 1950-2029, 2030-2109, 2110-2189, 2190-2269, 2270-2349, 2350-2429, 2430-2509, 2510-2589, 2590-2669, 2670-2749, 2750-2829, 2830-2909, 2910-2989, 2990-3069, 3070-3149, 3150-3229, 3230-3309, 3310-3389, 3390-3469, 3470-3549, 3550-3629, 3630-3709, 3710-3789, 3790-3869, 3870-3949, 3950-4029, 4030-4109, 4110-4189, 4190-4269, 4270-4349, 4350-4429, 4430-4509, 4510-4589, 4590-4669, 4670-4749, 4750-4829, 4830-4909, 4910-4989, 4990-5069, 5070-5149, 5150-5229, 5230-5309, 5310-5389, 5390-5469, 5470-5549, 5550-5629, 5630-5709, 5710-5789, 5790-5869, 5870-5949, 5950-6029, 6030-6109, 6110-6189, 6190-6269, 6270-6349, 6350-6429, 6430-6509, 6510-6589, 6590-6669, 6670-6749, 6750-6829, 6830-6909, 6910-6989, 6990-7069, 7070-7149, 7150-7229, 7230-7309, 7310-7389, 7390-7469, 7470-7549, 7550-7629, 7630-7709, 7710-7789, 7790-7869, 7870-7949, 7950-8029, 8030-8109, 8110-8189, 8190-8269, 8270-8349, 8350-8429, 8430-8509, 8510-8589, 8590-8669, 8670-8749, 8750-8829, 8830-8909, 8910-8989, 8990-9069, 9070-9149, 9150-9229, 9230-9309, 9310-9389, 9390-9469, 9470-9549, 9550-9629, 9630-9709, 9710-9789, 9790-9869, 9870-9949, 9950-10029, 10030-10109, 10110-10189, 10190-10269, 10270-10349, 10350-10429, 10430-10509, 10510-10589, 10590-10669, 10670-10749, 10750-10829, 10830-10909, 10910-10989, 10990-11069, 11070-11149, 11150-11229, 11230-11309, 11310-11389, 11390-11469, 11470-11549, 11550-11629, 11630-11709, 11710-11789, 11790-11869, 11870-11949, 11950-12029, 12030-12109, 12110-12189, 12190-12269, 12270-12349, 12350-12429, 12430-12509, 12510-12589, 12590-12669, 12670-12749, 12750-12829, 12830-12909, 12910-12989, 12990-13069, 13070-13149, 13150-13229, 13230-13309, 13310-13389, 13390-13469, 13470-13549, 13550-13629, 13630-13709, 13710-13789, 13790-13869, 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2. (Incr)easing Access

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Extracted from text

Jürgen Malitz 1982, ABHANDLUNGEN THUKYDIDES' WEG ZUR GESCHICHTSSCHREIBUNG
 (p. 265) 47 1,89-118; vgl. dazu Wikmowitz (wie Anm. 19), S. 26f und F. Jacoby, Klio 9,1909,100
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[Link to PDF](#)

Peter Funke 2006, Western Greece (*Magna Graecia*)
 (p. 160) And in his historical survey of the period between the Persian wars and
 the Peloponnesian War, Thucydides (Thuc. 1,89-118) completely omits any reference
 to southern Italy and Sicily.

[Link to PDF](#)

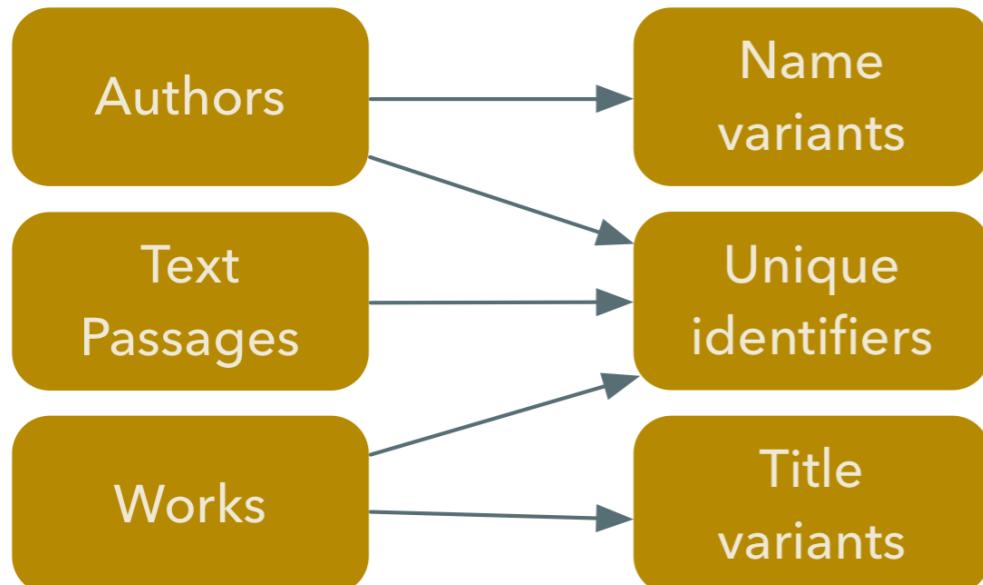
The results of search for
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2. HuCit Knowledge Base

Knowledge Base

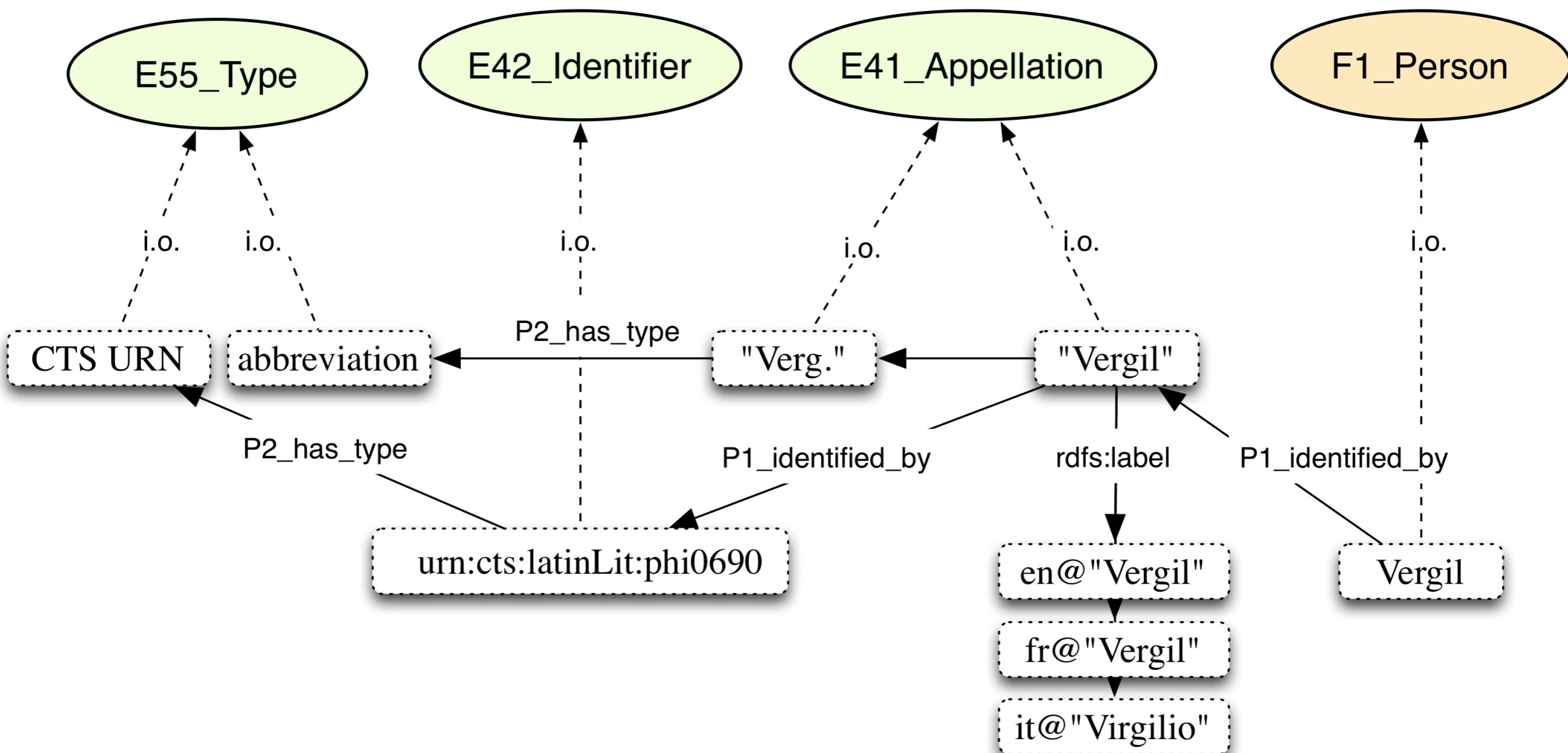


(1,500 authors; 5,500 works)

- **HuCit = CIDOC-CRM + FRBRoo**
- **Linked Open Data:**
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 - **Perseus Catalog**
 - **VIAF / Wikidata**

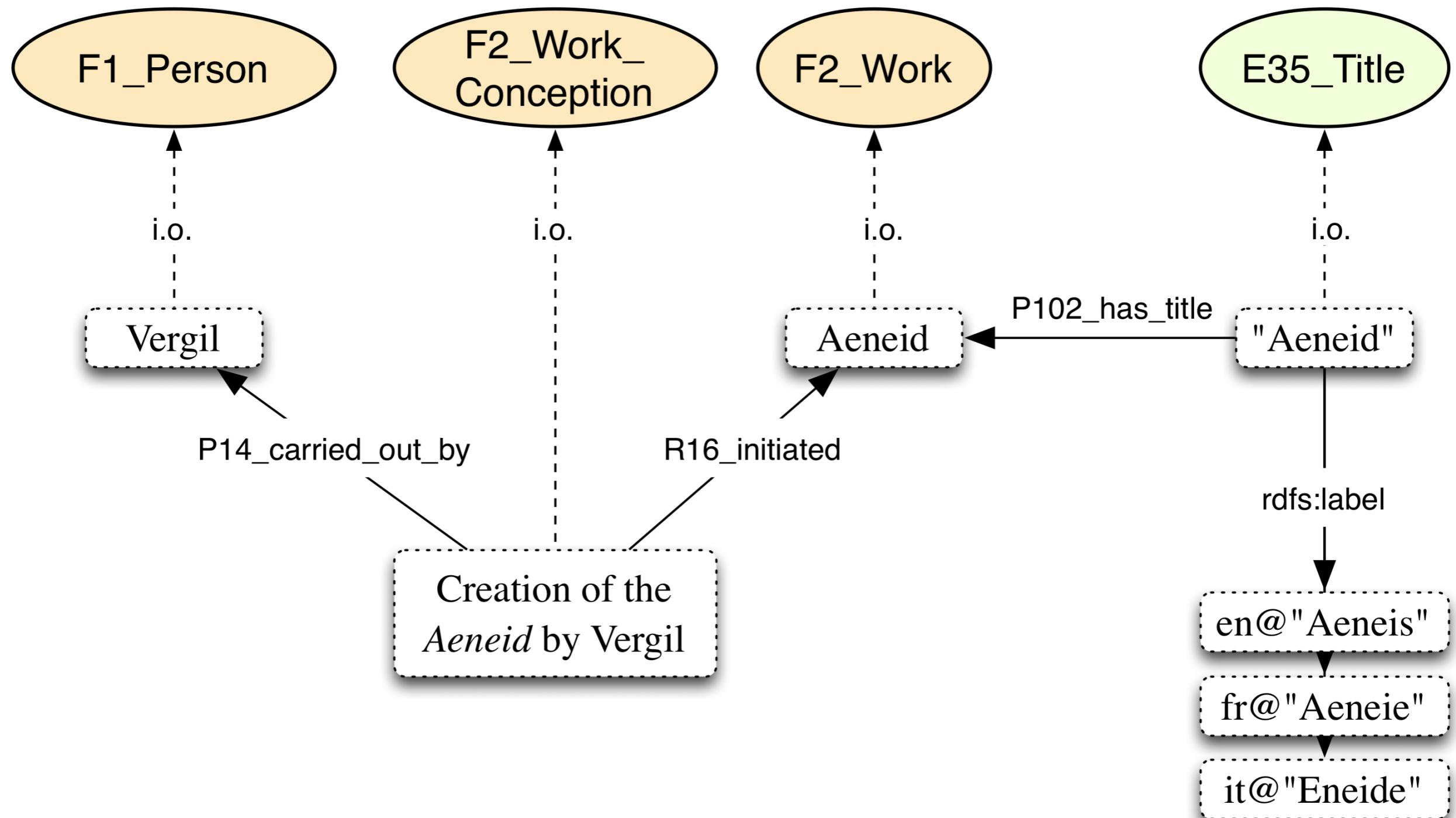


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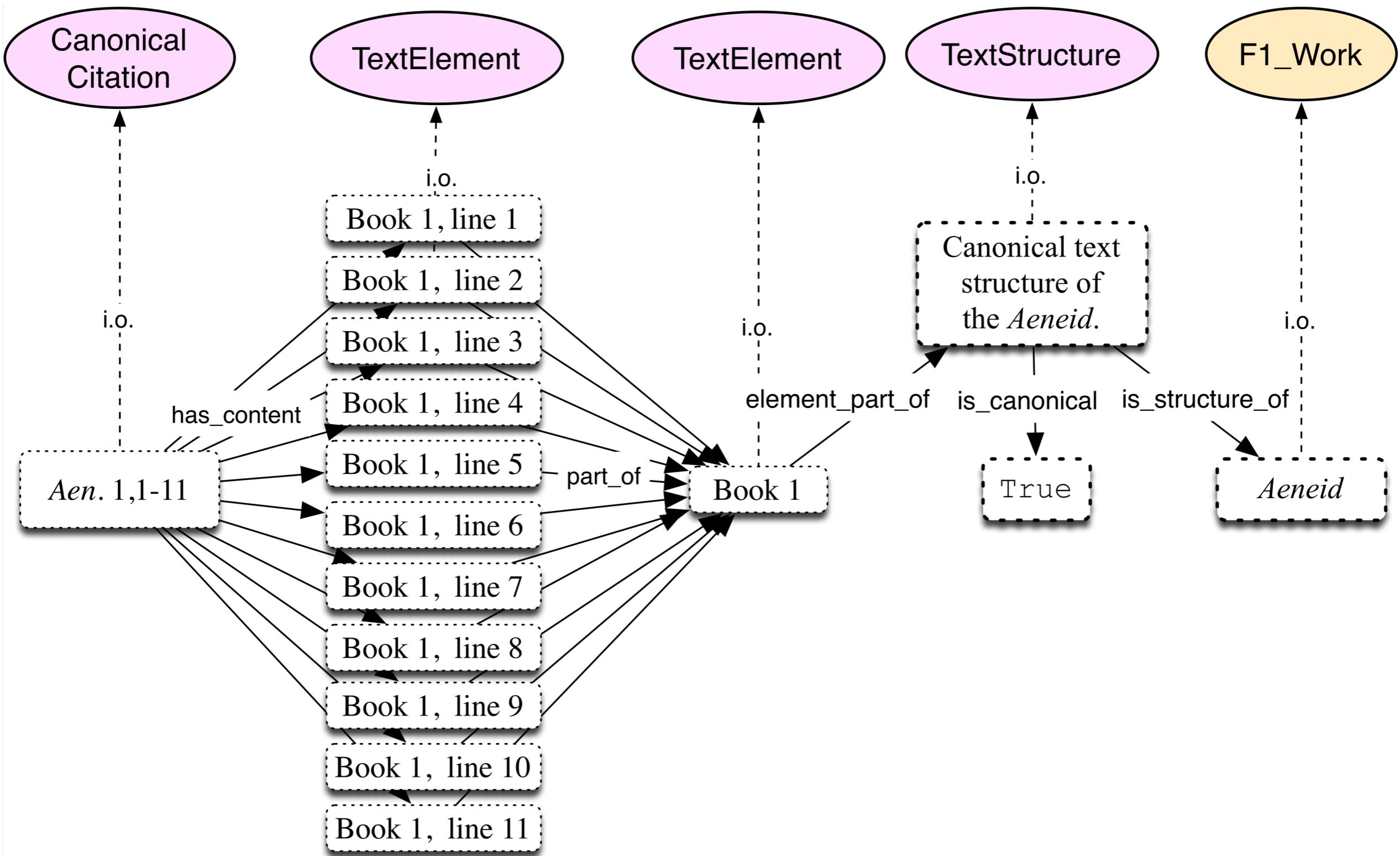


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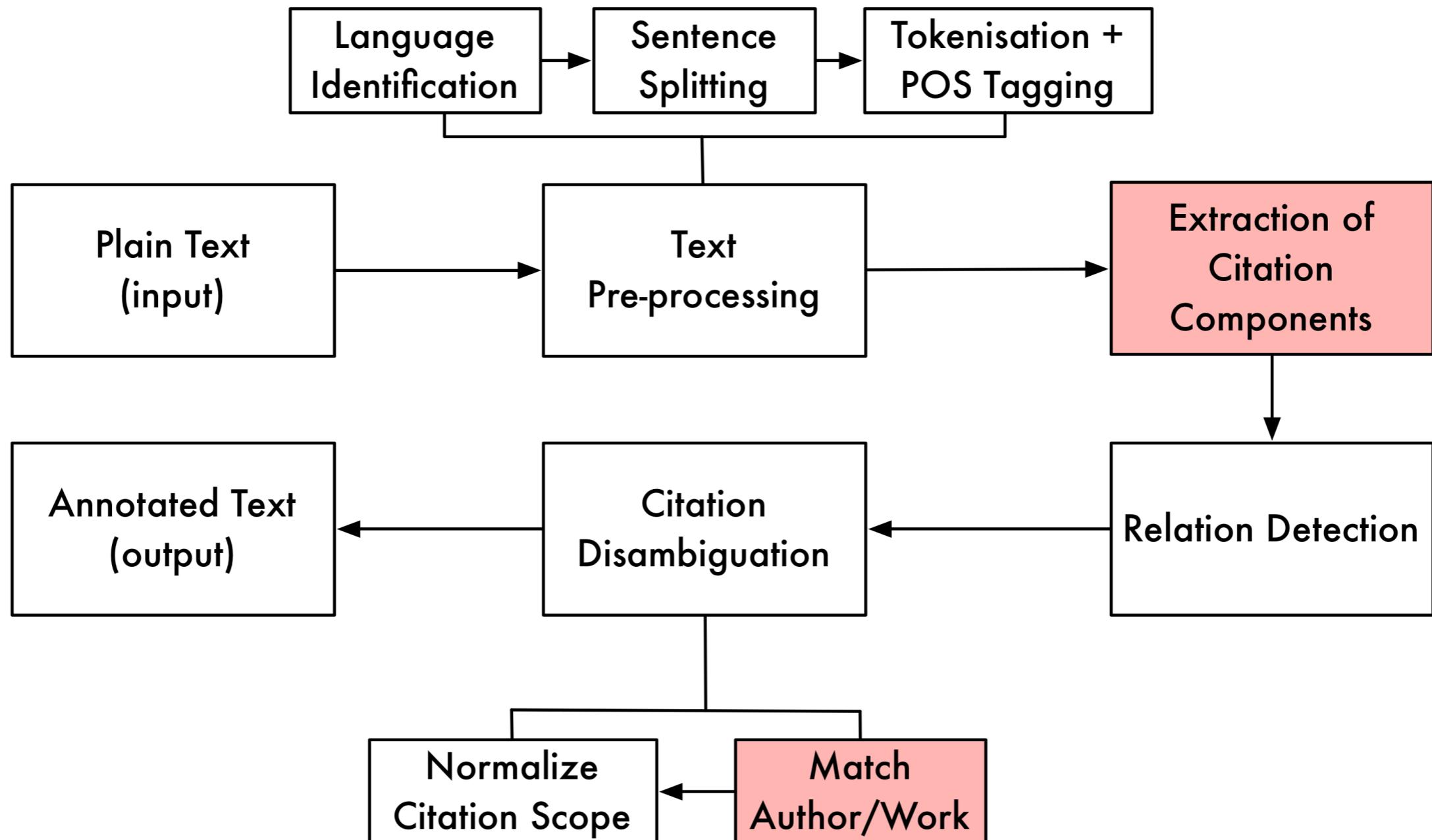


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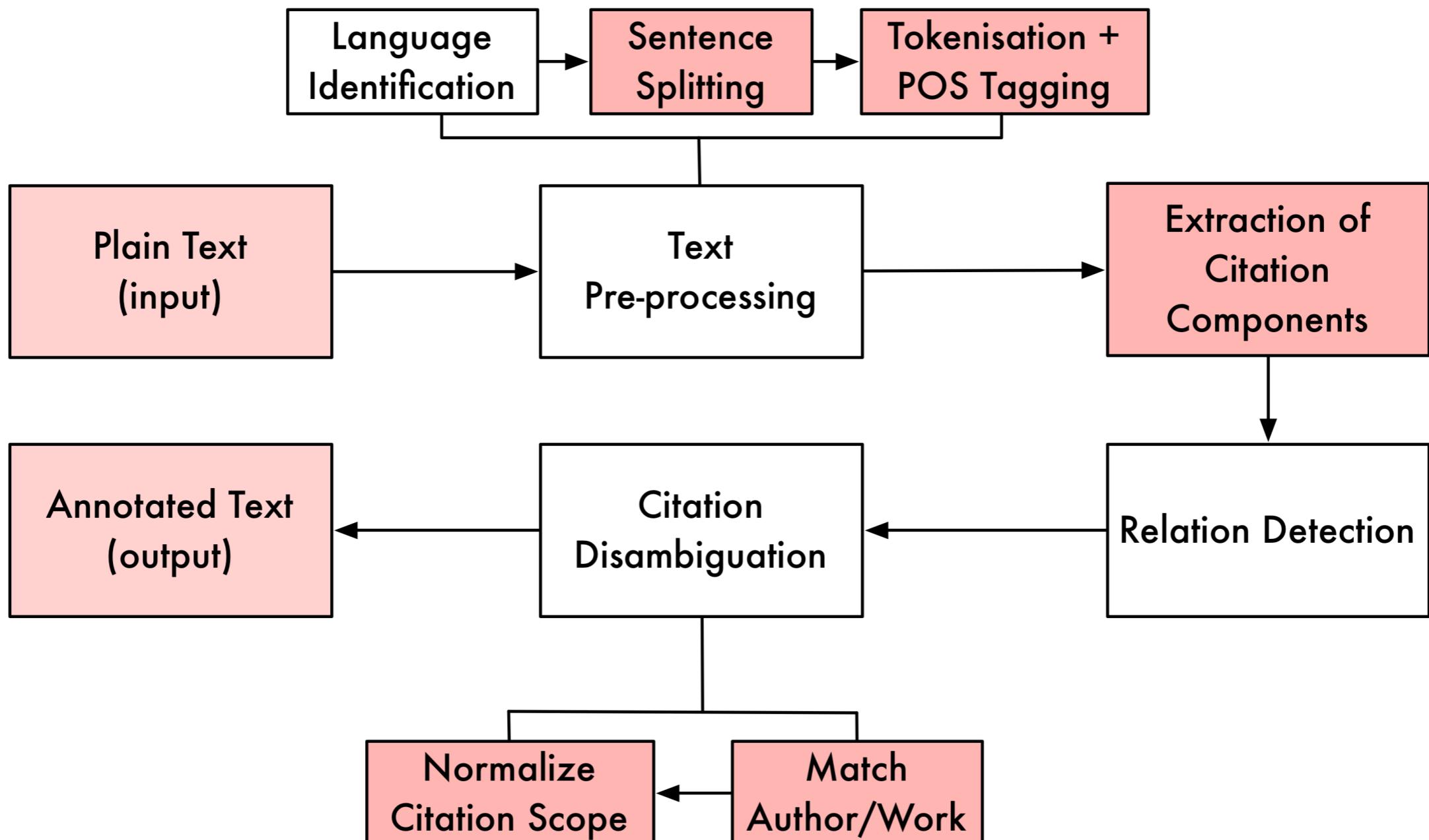


3 Adding European Languages





3 Adding Non-European Languages





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