

Fragmentary Texts and Digital Collections of Fragmentary Authors

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What is a fragment?

(*Oxford English Dictionary*, s.v. fragment)

- a part broken off or otherwise detached from a whole
- a part remaining or still preserved when the whole is lost or destroyed
- an extant portion of a writing or composition which as a whole is lost
- a portion of a work left uncompleted by its author

Different kinds of fragments

- material fragments
- textual fragments

material fragments

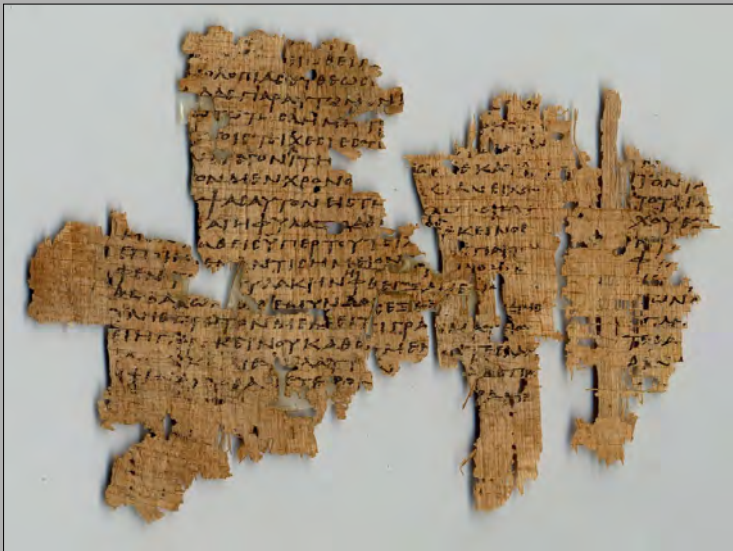


material fragments
= physical remains of ancient evidence



reconstruction of the monument

textual fragments (1)



textual fragments
= material fragments bearing
textual evidence

→ surviving broken off pieces of
ancient writings

textual fragments (2)

Athenaeus, *Deipnosophistai* 10.67 (447c)

Ἑλλάνικος δ' ἐν Κτίσεσι καὶ ἐκ ῥιζῶν, φησι κατασκευάζεται τὸ βρῦτον γράφων ὧδε·
'πίνουνσι δὲ βρῦτον ἔκ τινων ῥιζῶν, καθάπερ οἱ Θραῖκες ἔκ τῶν κριθῶν'. Ἐκαταῖος δ'
ἐν δευτέρῳ Περιηγήσεως εἰπὼν περὶ Αἰγυπτίων ὡς ἄρτοφάγοι εἰσὶν ἐπιφέρει· 'τάς
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Hellanicus in *The Foundings* says that beer is made also of rye; he writes as follows:
'They drink beer made of rye, as the Thracians drink it made of barley'. Hecataeus, in
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bread-eaters, continues: 'They grind up the barley to make the drink'. And in *The
Description of Europe* he says that the Paeonians drink a beer made from barley, also
parabias, made from millet, and even fleabane. 'They also anoint themselves', he
says, 'with an oil made from milk'. So much for that. (trans. Gulick)



textual fragments

= quotations of lost works embedded into other texts

print collections of fragmentary texts

- textual excerpts drawn from many different sources
- excerpts arranged according to various criteria
- length of the excerpts different from one edition to another
- when printed the excerpt gives a false illusion of materiality
- duplication of the same text in multiple editions

F 13

103

F 13 [F13 *FGrHist*; 28 *FHG*] – HARPOCRATION s.v. 'Ανθεστηριών· ὄγδοος μὴν οὗτος παρ' Ἀθηναίοις, ἱερὸς Διονύσου. Ἴστρος δὲ ἐν τοῖς τῆς Συναγωγῆς κεκλησθαὶ φησιν αὐτὸν διὰ τὸ πλεῖστα τῶν ἐκ γῆς ἀνθεῖν τότε.

Cfr. Phot. [A 1955] et Suda [A 2500] s.v. 'Ανθεστηριών

2 ὄγδοος μὴν : ὁ τῇ μὴν Ν, μὴν ὄγδοος Phot. οὗτος : ἐστὶ *Epit.*, Phot., *Suda* Διονύσου : Διονύσι Jacoby 2-3 Ἴστρος ~ Συναγωγῆς om. *Epit.*, Phot., *Suda* 3 ἐν τοῖς : ἐν τῷ 5^ο Dobree κεκλησθαὶ ~ διὰ : κεκλησθαὶ δὲ αὐτὸν οὕτω διὰ *Epit.*, Phot. (οὕτως), *Suda* (οὕτως) 3-4 διὰ ~ τότε : οὕτω διὰ τὸ τὴν ἄνθρωπον τοῦ βότρυος τοῦτω μάλιστα τῷ μηνὶ γίνεσθαι καὶ διὰ τὸ πλεῖστα τῶν ἐκ γῆς ἀνθεῖν τότε Jacoby ex *Glossae rhet.* s.v. 'Ανθεστηριών (Bekker, *Anecdota*, I, p. 403) 4 γῆς : τῆς γῆς BCF

Antheisterion: questo ad Atene è l'ottavo mese, sacro a Dioniso. Istro nei libri della *Raccolta* dice che si chiamava in questo modo perché in quel periodo fiorisce la maggior parte dei frutti della terra.

L'espressione ἐν τοῖς τῆς Συναγωγῆς potrebbe suggerire che in origine il testo di Arpocrasione conteneva l'indicazione del numero del libro da cui era stato tratto il frammento di Istro, e si può congetturare che fosse il sesto (ἐν τοῖς = ἐν τῷ 5^ο), pur restando il fatto che non se ne conosce il contenuto¹. Il mese attico di 'Ανθεστηριών, ben attestato anche in altre zone del mondo greco², corrispondeva approssimativamente ai mesi di

¹ Cfr. JACOBY, *FGrHist* IIIb (Suppl.) 323a-334 (Text), p. 638.

² Vd. W. KUBITSCHKE s.v. *Antheisterion*, in *RE* I, 2 (1894), col. 2375; A.E. SAMUEL, *Greek and Roman Chronology. Calendars and Years in Classical Antiquity*, München 1972, pp. 57 (Atene), 87-89 (Apollonia in Calcidica, Perinto), 98 (Eretria), 102 (Teno), 104 (Paro, Oliaro), 106 (Amorgo),

representing textual fragments

- construct truly hypertextual editions, including not only excerpts but links to the scholarly sources from which those excerpts are drawn
- create meta-information through an accurate and elaborate semantic markup
- produce meta-editions consisting not only of isolated quotations, but also of pointers to the original contexts from which the fragments have been extracted
- provide scholars with an interconnected corpus of primary and secondary sources of fragments that also includes critical apparatuses, commentaries, translations, and modern bibliography on ancient texts

- textual fragment as **hypertext**
 - a text derived from another text and interconnected to many other different typologies of texts
- textual fragment as **multitext**
 - the result of a work of stratification of manuscripts and scholarly conjectures

demo.fragmentarytexts.org

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About

demo.fragmentarytexts.org is a site complementary to [Fragmentary Texts](#), which is a blog on "collecting and representing fragments of lost authors and works".

The aim of this site is to experiment tools and devise methods for representing fragments of lost works, i.e. ancient texts that have survived only through quotations preserved by other authors.

Print collections of fragmentary texts are collections of textual excerpts drawn from many different sources and arranged according to various criteria, such as chronological order or thematic disposition. The length of these excerpts can be significantly different from one edition to another and depends on the editor's choice. The aim of a digital collection of fragmentary texts is to go beyond the limits of print collections and express fragmentary sources in a more dynamic and interconnected way.

We begin by presenting some examples from the *Lives of Plutarch* and the *Deipnosophists of Athenaeus*, whose texts are full of quotations of ancient authors. The aim is to visualize fragments inside their context of transmission, which is the first requirement to understand the origin of a quotation and its meaning.

We have adopted [Ajax](#) technology to represent fragments, and this experimental web site has been created using an Open Source CMS enriched with plugins created ad-hoc in order to add visual functionalities.

[CREDITS](#) [DISCLAIMER](#) [XHTML VALID](#) [SITE MAP](#)

<http://demo.fragmentarytexts.org>

Berti – Büchler, Fragmentary Texts and Digital Collections of Fragmentary Authors

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What is text mining?

„Process of deriving high-quality information from text“
(Feldman & Sanger 2006)

What is text mining?

„Text Mining is 'big reading'.“
(Craig Bellamy on Twitter, Jul. 5th 2010)

Classes of text minings tools

Unsupervised

Supervised

Bootstrapping

Pattern

Manual

Tasks of extracting and collecting fragmentary authors

- **Task 1:** Associations between person and work names
- **Task 2:** Extraction of fragments of an author
- **Task 3:** Finding new quotations and parallel texts
- **Task 4:** Expansion of the fragments' set

Task 1: Workflow person name extraction

- **Step 1:** Extraction of candidates by pattern such as
 - VN VN
 - VN ETH
 - VN LOC
- **Step 2:** Resolving morphological dependencies using Morpheus
- **Step 3:** Statistical evidence criterion
- **Step 4:** Generating a similarity graph of those candidates and building valid concept classes
- **Step 5:** Applying validated patterns on text in order to extract less frequent occurrences
- **Step 6:** Iterating step 2 - 5

Pattern

Pattern

Unsupervised

Unsupervised

Supervised

Botstrapping

Task 1: Some results of the PN extractor

- **Step 1:** Extraction of candidates by pattern such as
 - Ἑλλάνικος Λέσβιος (VN ETH)
- **Step 2:** Resolving morphological dependencies
 - Removing candidates like Ἑλλάνικος Ἀκουσιλάω VN VN
- **Step 3:** Statistical evidence criterion like min freq is 4.
- **Step 4:** Generating a similarity graph of those candidates and building valid concept classes e.g.

Ἑλλάνικος Λέσβιος (VN ETH)

Ἑλλάνικος ὁ Λέσβιος (VN ZN ETH)

Step 5: Applying validated patterns on text in order to extract less frequent occurrences

- Ἑλλάνικός τε ὁ Λέσβιος
- Ἑλλάνικος δὲ ὁ Λέσβιός
- Λέσβιος Ἑλλάνικος
- ...
- Overall after 1 iteration 16 different versions of Hellanicus of Lesbos

Task 3: Finding new quotations and parallel texts: pseudo algorithm

1	$V = \text{segment_corpus}(C)$ with $v_1, v_2, \dots, v_n \in V, \cup v_i = C$ and $v_i \neq v_j$	
2	for each $v \in V$	
3	$F = \text{train_features}(v);$	Training
4	for each $v \in V$	
5	for each $f \in F$	
6	$e = (v_i, v_j) \in E = \text{select all } v_j \text{ containing feature } f_k$	Linking
7	for each $e \in E$	
8	$s = \text{scoring}(e = (v_i, v_j) \in E; F_i; F_j);$	
9	$\text{if}(s < \text{threshold}) \{E = E \setminus \{e\}\}$	Scoring

Task 3: Finding new quotations and parallel texts: Types of Completeness

Extraction of fragmentary authors

- *String approaches:*
 - *GST*
 - Letter n-grams
- Syntactic approaches (*(literal) quotations*):
 - N-gram expansion
 - Word n-grams
 - Distance based co-occurrences
- Semantic approaches (*parallel texts*):
 - *Semantic clustering*
 - *Semantic graph based approach(es)*
 - Relations of contrastive semantics
 - *Radius retrieval*
- *More complex approaches:*
 - *DCT*
 - *Winnowing*

Task 2: Extraction of fragments: Role of named entities

		Complete graph	w_id>=100 && freq(word)>1	w_id>=300 && freq(word)>1	w_id>=500 && freq(word)>1	Named Entities	Normalised Named Entities	Normalised Text and Named Entities
Graph properties	Number of nodes	538,572	388,929	363,359	353,618	1,149	4,487	2,178
	Number of co-occurrences	57,762,474	34,818,138	25,615,956	21,004,538	15,436	126,188	152,856
	Number of significant co-occurrences	30,382,422	21,739,476	17,687,582	15,462,940	14,876	69,858	84,124
	Percentage	0.53	0.62	0.69	0.74	0.96	0.55	0.55
	Average degree	56.41	55.90	48.68	43.73	12.95	15.57	38.62
Argumentation trail properties	Number of trails	> 10 ⁸	> 10 ⁸	> 10 ⁸	> 10 ⁸	361,094	7,958,240	3,087,581
	Average degree	15.34	9.93	7.70	6.79	7.03	7.77	9.93
	Average degree of internal node (trail length 2)	31.34	21.08	14.33	11.45	7.02	10.15	12.31
	Average degree of internal node (trail length 3)	301.38	362.56	285.86	231.39	55.66	76.06	81.86

Task 2: Extraction of fragments: Possible ways?

- **Option 1:** Statistical based
- **Option 2:** Pattern based
- **Option 3:** Completely different?

Supervised

Pattern

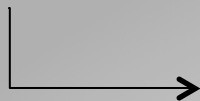
Unsupervised

Again: textual fragments

Athenaeus, *Deipnosophistai* 10.67 (447c)

Ἑλλάνικος δ' ἐν Κτίσεσι καὶ ἐκ ῥιζῶν, φησι κατασκευάζεται τὸ βρῦτον γράφων ὧδε·
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textual fragments
= quotations of lost works embedded into other texts

Why was it reused?

'They drink beer made of rye, as the Thracians drink it made of barley'.

the Paeonians drink a beer made from barley, also *parabias*, made from millet, and even fleabane.

'They also anoint themselves', he says, 'with an oil made from milk'.

Some „significance“ related properties:

- **tf.idf**: Except „Thracian“ and „Paeonians“ all other words have a term weight of 0 (function words) or are weak content words.
- **Difference analysis**: no discriminating words
- **Log-likelihood ratio**: no discriminating words

Dale Chall Readability Index: [6.59;9.36] AVG: 7.85 (level of 9th – 10th grade of a secondary school)

Is there any measurable content in this fragments?

Definition/Motivation

- Definition Co-occurrences:
 - Common occurrence of at least two objects/events within a dedicated window
 - » Possible windows in Classical Studies: line, sentence, paragraph, document, author, century
- Motivation:
 - Psycholinguistic experiments: Given a word: What is the first word test persons answer?

Stimulus	Response Prob.	# of Prob.'s	Co-occurrence	Significance
butter	Bread	60	Bread	51
	soft	40	Cheese	49
	Milk	32	Sugar	29
	Margarine	27	Milk	23
	Cheese	20	Margarine	22
	Fat	16	Farina	18
	yellow	14	Eggs	16
	Bread and butter	8	Pound	14
	Box / can	6	Meat	13
	eat	6		

An example of Data Mining: Relation between beer and diapers I

There is a story that a large supermarket chain, usually Wal-Mart, did an analysis of customers' buying habits and found a statistically significant correlation between purchases of **beer** and purchases of nappies (**diapers** in the US). It was theorized that the reason for this was that fathers were stopping off at Wal-Mart to buy nappies for their babies, and since they could no longer go down to the pub as often, would buy beer as well. As a result of this finding, the supermarket chain is alleged to have the nappies next to the beer, resulting in increased sales of both.

Contrastive relation: (beer, diapers)

Source: <http://web.onetel.net.uk/~hibou/Beer%20and%20Nappies.html>

An example of Data Mining: Relation between beer and diapers II

There is a story that a large supermarket chain, usually Wal-Mart, did an analysis of customers' buying habits and found a statistically significant correlation between purchases of **beer** and purchases of **nappies** (diapers in the US). It was theorized that the reason for this was that **fathers** were **stopping off** at **Wal-Mart** to buy nappies for their babies, and since they **could no longer go down to the pub as often**, would buy beer as well. As a result of this finding, the supermarket chain is alleged to have the **nappies next to the beer**, resulting in increased sales of both.

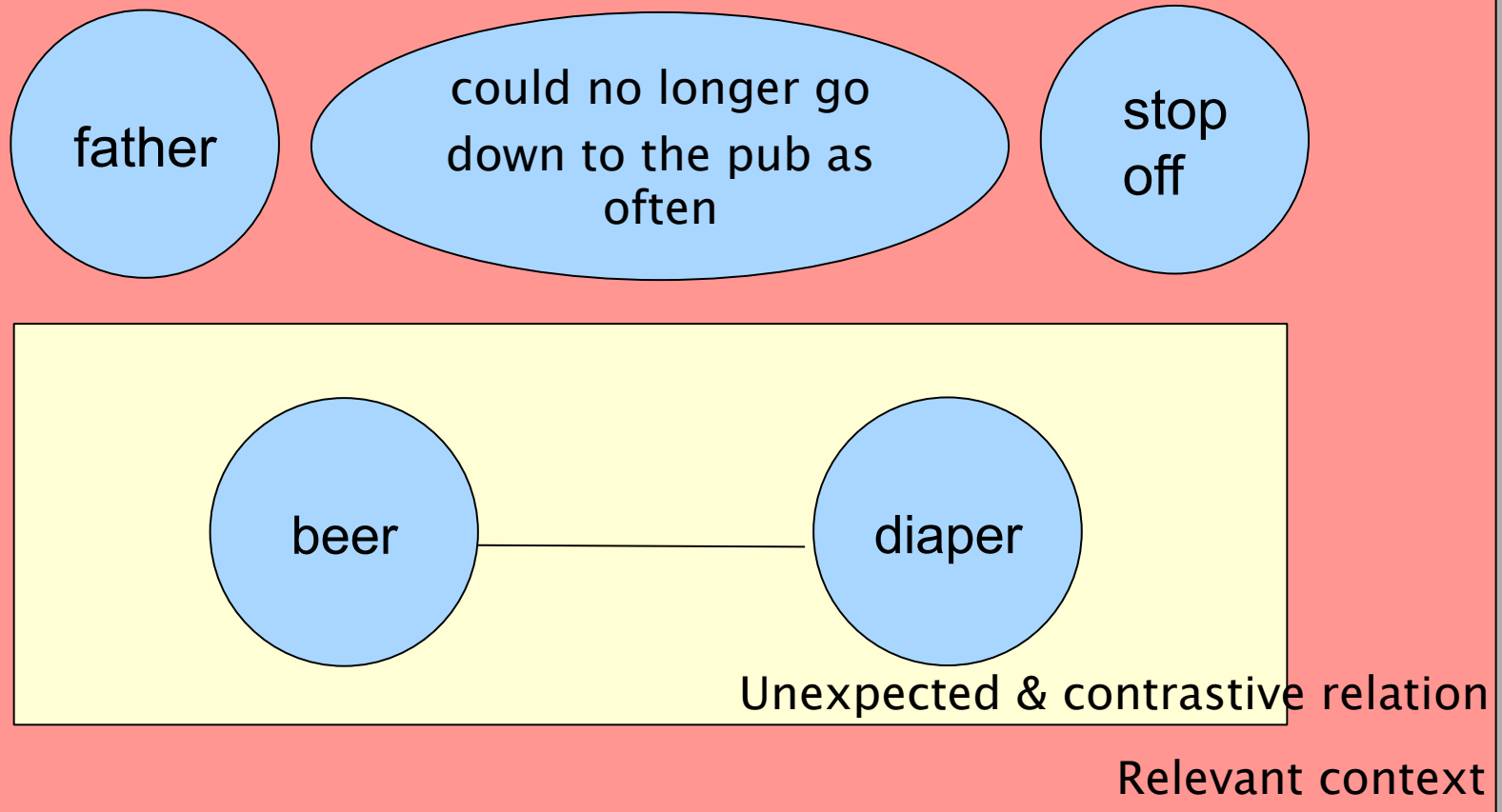
Latent relation: (beer, diapers)

Context: fathers, stopping off, Wal-Mart, could no longer go down to the pub as often

Result of this relation: nappies next to the beer

Source: <http://web.onetel.net.uk/~hibou/Beer%20and%20Nappies.html>

What should be the result?



Some examples (if the original text is still existent)

- Relation of (Ὀδόμαντοι, πέος)
 - engl.: (*Odomastai (a folk in Thrace), penis*)
 - Context: Found in an Ancient comedy (Aristophanes, 5th c. BC)
- Relation of (κοπρολόγος, ψάλτρια) – engl.: (shit collector, *dancing girl*)
 - Context: ἄστυνόμοι – engl.: (*protecting the city, public festivals*)
 - Found in Aristotle (4th c. BC)

Results

- Lots of *contrastive semantic relations* can be found (manual evaluation is still in progress)
- But depending on text sort:
 - Other clusters can be found additionally
 - As shown in examples **comedy**
 - **Sarcasm**
 - **Cynicism**
 - **Artificial ambiguity** like „*Michael Schumacher* the red *king*“ (translated from a German corpus)
 - **Scope to gnomology & philosophical texts**

Contrastive semantic relations from a bird's eye view

- What did I do with the example of *beer* and *diaper*?
 - If I would write it down: A **semantically textual reference**.
- Is there a relation between **contrastive relations** and **textual reuse**?
 - Clearly, yes.
 - First evaluation results: More than 90% of the latent relations (Settings: minimum frequency: 2, Except the contrastive relation itself not more than 2 additional associations)

Focus:

_____ Here: Why is knowledge reused?

Nobody would reuse something like: „Milk is white and good for you“.

Why: It's well-known.

Why was it reused?

'They drink *beer* made of *rye*, as the *Thracians* drink it made of *barley*'.

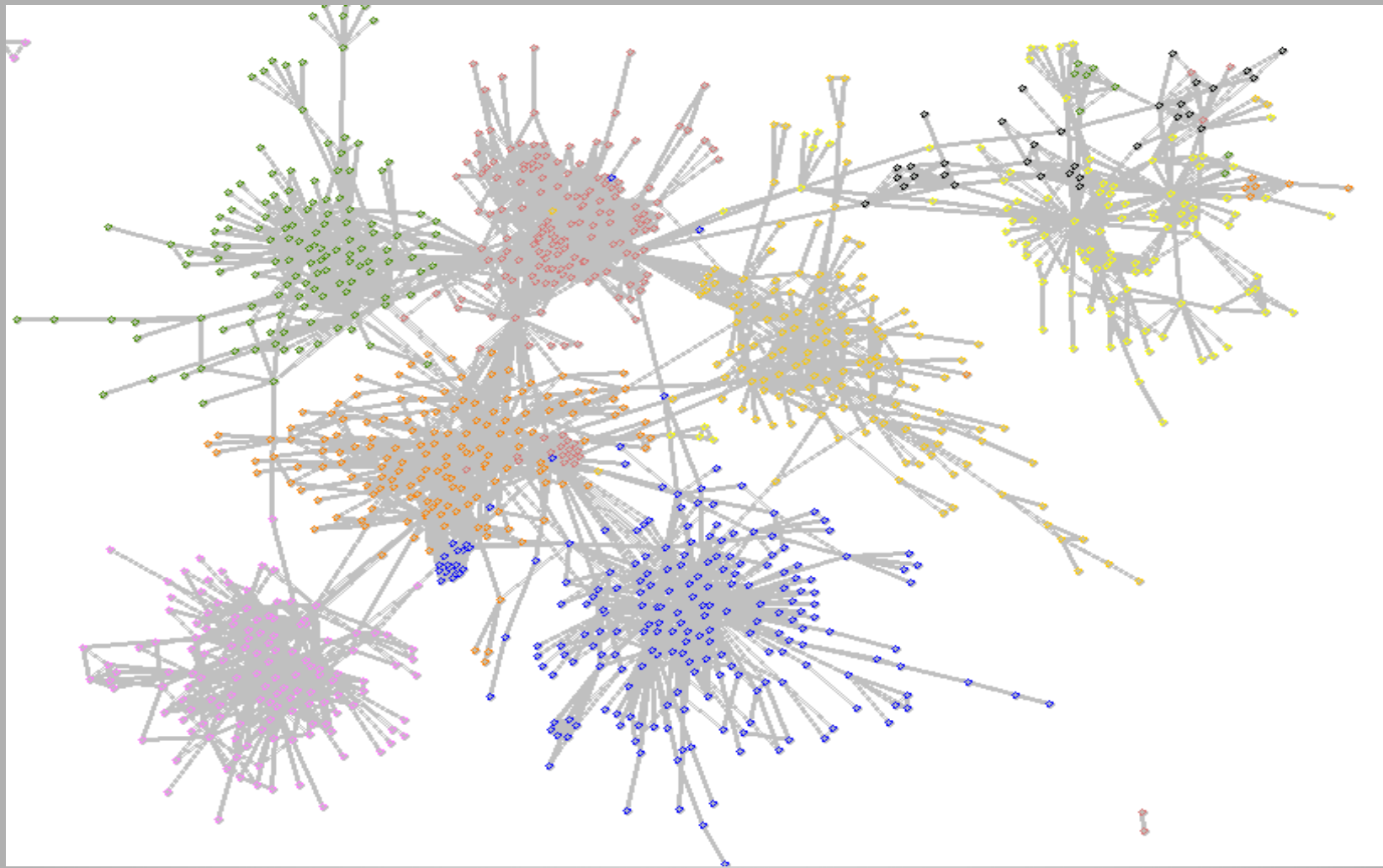
the Paeonians drink a beer made from barley, also *parabias*, made from millet, and even fleabane.

'They also anoint themselves', he says, 'with an oil made from milk'.

Dissimilarities in the contextual usage (TLG):

- (milk,oil): 72%
- (fleabane, millet): 92%, (parabias, millet): 97%, (fleabane, parabias): 94%, (barley, fleabane): 94%, ...
- (rye, barley): 80%

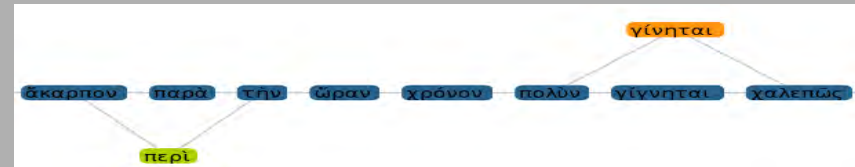
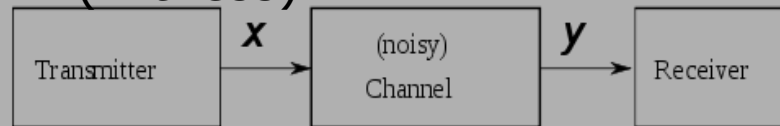
Further work: Semantic spaces



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How can Marco benefit from work with Monica?

- **NEW QUESTION:** Shannon's Noisy Channel Theorem (witness):



- **NEW QUESTION:** Not HOW but why is something quoted?
 - Contrastive semantics
- **EVALUATION:** How to evaluate text reuse & knowledge transfer?
 - Collection of fragmentary authors as highly reviewed *Gold Standard*

Summary

To be, or not to be, that is the question
Hamlet, Shakespeare