A corpus-based analysis of the verb *pleróo* in Ancient Greek

The diachronic relevance of the container image-schema in its evolution

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This is a corpus-based study of the development of the verb *pleróo* in Ancient Greek, originally meaning FILL, from the 6th c. BCE in Classical Greek, up to the end of the 3rd c. BCE in Hellenistic Koiné. It implements a hierarchical cluster analysis and a multiple correspondence analysis of the sum of the attested instances of *pleróo* of that period, divided by century. It explores the gains following a syncretism between two methodological strands: earlier introspective analyses postulating variant construals over intuitively grasped schematic configurations such as image schemas, and strictly inductive methods based on statistical analyses of correlations between co-occurring formal and semantic features. Thus, it examines the relevance of the CONTAINER image-schema to the architecture of the schematic construction corresponding to the prototypical and historically preceding sense of *pleróo*, FILL. Consequently, it observes how shifts in the featural configurations detected through statistical analysis, leading to the emergence of new senses, correspond to successive shifts on the perspectival salience of elements in the schematic construction of the verb.

Keywords: corpus-based diachronic semantic analysis, image-schemas, prototypicality, agglomerative hierarchical clustering, multiple correspondence analysis

1. Introduction

Since the advent of Cognitive Linguistics in 1970's, a common denominator of the various works within what back then was broadly understood to be a semantically motivated grammatical description, was unification. Either this concerned studies on Case (Fillmore, 1968; Chaffe, 1970), semantic gestalts (Lakoff, 1977) or

constructional frames (Fillmore, 1977), the aim was to understand language as an integrated phenomenon whose core lied beyond an autonomous syntactic component, which had been the first domain to be denied modularity.

This holistic view (Lakoff, 1982, 1987, Chapter 2) had the effect of extending the range of linguistic phenomena towards two directions: one concerns the conceptual underpinning of all linguistic manifestations and the other the usage-based emergence of what are broadly understood as linguistic properties (Langacker, 1987, pp. 65–75, 281). The latter were conceived as distinct to the notion of rule, which was traditionally analysed as a phenomenon applied in a top-down fashion. Instead, linguistically relevant patterns are motivated in a bottom-up fashion. Their nature is non-reductive (Langacker, 1988, p. 150) and for that reason "immanent", in Langacker´s terms, to the instantiated utterances that give rise to them (Langacker, 2008, Chapter 7).

The links drawn between language as a usage-based phenomenon and holistically relevant to cognition indicated an empirically-based methodology beyond the analysis of idealised standard examples, many times not attested in real texts. Nevertheless, although to a great extent empirically based, earlier works such as these of Fillmore (1985), Talmy (1985), Lakoff (1987), and Langacker (1987) had mostly been either intuitive or narrow in their empirical scope. Widening the empirical window over linguistic phenomena seemed to be a necessity. Otherwise, linguistic analysis would miss a methodologically consequential point: the chaotic nature of the socially structured phenomenon, through which a conceptually motivated linguistic patterning emerges. How can semantic motivation be linked to the exponentially increased complexity of an object, when the latter encompasses as relevant *all world knowledge* (Glynn, 2010a, pp. 1–3) and *all linguistic usage events*?

At the same time, the realisation that the flexibility of lexical meaning shows that this is of "processual" and not "reified" nature (Geeraerts, 1993, p. 260), eventually brought Cognitive Linguistic theorising in contrast with the radial models of meaning structuring, implemented in earlier analyses (e.g. Lakoff, 1987), where the notion of discrete sense was assumed. What was introspection to the study of grammaticality had become an erroneous guide to the definition of meaning as coming in discrete linguistic and conceptual chunks (e.g. Sandra & Rice, 1995; Glynn, 2014a, pp. 118–121).

In this context, corpus-based research in semantics, initiated by works like these of Dirven, Goossens, Putseys, and Vorlat (1982), Lehrer (1982), Schmid (1993), Geeraerts, Grondelaers, and Bakema (1994) or Geeraerts, Grondelaers, and Speelman (1999) paved the way for a more confident confrontation with this widening of the scope of inquiry. If similarity is the basis for the operationalisation of the notion of category, then massive corpora of semantically fluctuating linguistic forms can feasibly constitute the basis for an appropriate inductive analysis. The

latter can lead to an objective – and freed from the often erroneous intuitive evaluations – picture of what is semantically and, for that matter, conceptually possible. Thus, inductive methodology through corpus-based analysis reflects the theoretical assumption of usage-based emergence of linguistic patterning. In a relevant sense, bottom-up linguistic categorisation *is* conceptual categorisation, and can be traced through an appropriate inductive methodology. In this light, a word's role as an individual unit is reduced not to the demarcation of its conceptual boundaries but to its ability to function as an access point to a region within the entire field of conceptual possibilities.

What are these regions determined by? Corpus-driven research holds that they are determined by co-occurrence of various linguistic phenomena that, although many times seemingly unrelated, they represent linguistic dimensions that yield language's emergent complexity (Glynn, 2010a, pp. 5–9). Methodologically, this approach points at a multivariate analysis of various co-occurring factors, what especially in lexical semantic analysis has been termed the *behavioural profile* of linguistic items. The behavioural profile approach, initiated in linguistics by works like Glynn (2009, 2010a), Divjak (2006), Gries (2006), Janda and Solovyev (2009), Speelman and Geeraerts (2010), is based on the following idea: systematic population of conceptual regions by similar features – albeit directly understood as semantic or grammatical – signal semantic entrenchment. High frequency of feature coalescence implies the regularisation of a semantic pattern of limited scope, namely a lexical item (Langacker, 2008, p. 219). The features coded as comprising a term´s behavioural profile can span over a variety of semantic, constructional/syntactic or morphological features (Gries, 2006, pp. 73–75).

In the light of this methodological turn, an important question arises: how incompatible are the two modes of method? Having as an intended methodological end the operationalisation of the various factors that impact upon the use of lexemes, corpus-based multifactorial lexical-semantic analysis envisages an age where learning different analytical methods would take priority over studying hypothetical constructs (Glynn, 2010a, p. 9).

Nonetheless, there is a serious methodological challenge following this perspective, which stems essentially from a frequency-based examination of prototypicality (Glynn, 2014a, p. 122). This concerns the feasibility of a pervasively inductive analysis as the only legitimate method for obtaining insights into linguistic phenomena reducible to statistic measurement. The issue is related to a dual possibility of conceiving prototypicality. Glynn (2014a, p. 121) distinguishes between what he calls "conceptual prominence" and "relative frequency commonness". The two types roughly correspond to Geeraerts´ distinction between "introspective" and "analytic" operationalisation of prototypicality (Geeraerts, 1987, p. 288). The issue of the relation between the two types remains as yet unresolved (see Arppe,

Gilquin, Glynn, Hilpert, & Zeschel, 2010, pp. 9–11; Gilquin, 2010, pp. 145–166; Glynn, 2014a, p. 122).

Retaking then the premise argued for above that our methodology, in a certain sense, reveals the organisation of language itself, the possibility of a methodological refinement arises: in parallel to an appropriate inductive methodology that reflects the bottom-up linguistic categorisation as conceptual categorisation, top-down intuitive evaluation of data that leads to the validity of assuming the existence of schematic constructs should not be relegated as statistically non-testable. Instead, it is and it should remain a legitimate means of discovery procedure that reflects one of the two strands of language function: the one that goes from schema to the instantiation of linguistic categories into utterances, *in parallel* to the induction of usage events into categories.

This paper can be precisely seen as an attempt to pave the ground for such a unification. To do this, it implements a corpus-based diachronic analysis of the evolution of the verb *pleróo* in Ancient Greek, from its first attestation in the 6th c. BCE until the 3rd c. BCE, all the way through the classical period into the Hellenistic era. The choice of working with diachronic data is not random. In the light of seeing schematic structures as susceptible to alternative construals, it inquiries into how perspectivisation over image-schematic gestalts can be traced through corpus-based analysis at a featural level. The paper is organised as follows: Section 2 presents a theoretical argument for the necessity as well as the possibility of a methodological integration between intuitive research and corpus-based analysis. It goes on to address the relevance of image schemas in language change and recasts Lakoff's image-schema transformations into the newer paradigm of corpus-based cognitive linguistic research, trying to draw a careful distinction between the – as yet – hesitantly defined types of prototypicality. Section 3 introduces the schematic constitution of the construction of *pleróo*, in its original, most typical and frequently instantiated sense, that of FILL. It defines the positioning of the image-schema of container as embedded within the semantic scope of the verb and looks at its correspondence with elements within *pleróo*'s construction. In turn, what follows is a description of the operationalisation of the variables used to define the behavioural profiles of the various senses of *pleróo*, and the explication of the methodological tools of agglomerative hierarchical clustering and multiple correspondence analysis used to define the grouping of senses and the feature configurations that define their behavioural profiles. Section 4 carries on with the analysis of the corpus, divided by centuries from about 650 BCE to about 200 BCE. It looks at how the clustering of senses evolves, at the new senses emerging and the interaction that takes place between demarked feature configurations and the senses newly emerged. It then sees how these interactions map onto the way the image schema of container involved

is variably construed along with the changes in featural configurations concomitant to the semantic shifts. The paper ends with the conclusions.

2. Bottom-up induction and top-down elaboration: Perspectives on their union

2.1 Top-down gestalts sanctioning semantic change

The discussion above on the necessity for a bi-directional model is especially relevant to the matter of semantic change. One of the basic concerns in the relevant literature has been the gradual nature of it. The notion of gradual change, in turn, displays two interconnected facets. The first concerns the fact that semantic change takes a considerable amount of time until it is stabilised into a certain pattern. The second, from which the first one possibly stems, is the assumption that gradualness of semantic change is due to the existence of parallel construals that co-exist for long period until the one gives up on its activation in favour of the other. These parallel construals are hypothesised to comprise a motivated single gestalt-like phenomenon, where two cognitive effects co-occur in a single construal operation (Verhagen, 2007, pp. 57–58).

But what is the exact nature of this gestalt-like link in the case of two lexical senses where the one is the extension of the other? Following work on diachronic prototype semantics (Geeraerts, 1997, 2006), we can conceive this link as a schematic categorisation of the two related senses that comprises the prototypical characteristics of both. Every time the instantiation of a category extends its meaning towards a new direction, the schematisation that sanctions the original instantiation must be adjusted so that it accommodates both the first and the second instantiation. The schema in Figure 1 below depicts this process, where extension of sense [A] to an – as yet- non-entrenched sense (B) forces the schematisation (C) to re-adjust its prototypicality, so that it accommodates both the original sense as well as the latter's extension, in order to ensure both [A] and [B]'s category membership (Langacker, 2008, pp. 225–226). In a relevant manner, [A] does not extend its sense solely towards (B) but towards [C] too, extension being depicted with dashed line and categorisation with a solid one:
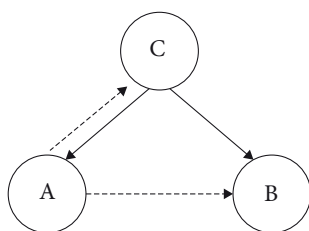
Figure 1. Categorial extension (Langacker, 2008, p. 226)

Nevertheless, a question arises as to the synchronic aspect of the process that leads to semantic change, understood as polysemy. What licences in first place the semantic change as well as the direction that this will follow? The theoretical *a posteriori* accommodation of the schematic categorisation that sanctions both instantiations may represent a valid process. Nonetheless, in accord with Verhagen's assumption, a synchronically present gestalt must exist *a priori*, as a common space between [A] and (B). This gestalt may be understood as a blueprint and driver to semantic change.

2.2   Image schemas as prototypes and language change

The relevance of image-schemas to conceptual structuring has long been highlighted in literature (Johnson, 1987). Lakoff (1987, Chapter 4), in the context of showing that human knowledge about the world is organised in the form of *Idealised Cognitive Models*, refers to four ways of structuring them. These are the following: propositional structure, metaphoric and metonymical mappings and, finally, image-schemas (Lakoff, 1987, p. 68).

   Image-schemas refer to the pre-conceptual structures with prime experiential content that abstractly pattern a great part of humans' conceptual coherence. They have long been analysed as patterns that provide the structural base for metaphor to operate (Lakoff, 1990, pp. 54, 64–73). Crucially, complex metaphors may also be structured by image schemas that through elaboration and inheritance relations give rise to conceptual metaphoric mappings like ARGUMENT IS WAR or LOVE IS A JOURNEY. The latter, for instance, is possibly based on the image schema of PATH, where the individual concepts of EVENT, OBJECT, ACTION, PEOPLE, OBSTACLE, VEHICLE, etc. are gradually built up into the complex structure of understanding love relations as events that are structured around the evolution along a path.

   An important aspect of the interaction between image schemas and metaphor is related to the preservation of the structure projected by the image schema structuring the source, in the target domain (Lakoff, 1990, p. 54). In this light, image

schemas provide the "blueprint" for the interpretation of a domain in terms of the other (Díez Velasco, 2001, p. 49). Thus, in a metaphor like MORE IS UP and LESS IS DOWN, there is a consistent mapping between the image schema of a path and that of a linear scale, preserving at the same time the transfer of inferences such as that of quantitative inclusion (Lakoff, 1993, pp. 214–215).

What about historical semantic change? As mentioned above, semantic change is gradual. This gradualness may stem from the possibility of the co-existence of parallel construals that are part of the same gestalt. A typical example of this possibility is the well-known case of the semantic change of "over". Among its various senses, in (1) and (2) below it can respectively mean ALONG THE BRIDGE and AT THE END OF THE BRIDGE. This shift, according to Lakoff (1990, pp. 418–440), is due to the inherent possibility of the human mind to foreground different parts of a single gestalt, in this case the image schematic gestalt of a PATH. Thus, the difference between (1) and (2) lies in the foregrounding of the PATH and the END OF THE PATH, respectively, as trajector of the relation that *over* profiles (op. cit., pp. 423–4):

(1)   The man walked over the bridge
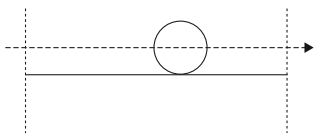

Figure 2. *over* profiling PATH
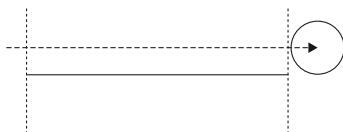
(2)   The man lives over the bridge

Figure 3. *over* profiling END OF PATH

A question arises here as to the possibility of unifying the notion of prototype with that of image schema for some cases of semantic change. Can an image schema represent the prototypical re-adjustment from which both related senses stem, as depicted in Figure 1? Above, it was said that a basic analytical problem that any treatment of semantic change must address is the theoretical *a posteriori* accommodation of the schematic categorisation that sanctions both instantiations of two related senses. Although extension takes place in time, the blueprint of the extended sense must be already present within a generic space, which is nothing else but a prototype as a synchronically present gestalt. The idea is feasible and has been

explored in works such as Kövecses (2010, p. 280), where he identifies in principle any concept as a generic space (see also Fauconnier & Turner, 2002, p. 41–2).

Accordingly, in the light of the discussion above on the distinction between the two facets of prototypicality, this of frequency-based commonness between usages and that of intuitively grasped schematic salience, may give us a hint as to how image-schematic gestalts fit in the context of prototypicality. Image-schemas correspond to the "conceptual prominence" and the multitude of elaborated instances to the "relative frequency commonness". Analytically, the former can be intuitively grasped, possibly along with a statistically observed patterning, whereas the second is exclusively observed through a multivariate analysis correlating the behavioural profiles of the various instances of an identical term.

I assume then the feasible working hypothesis that in diachronic lexical semantic change, meaning extension is mediated by image schemas that are immanent in both related senses and act as the generic space between them. In this light, the present work takes the Ancient Greek verb *pleróo*, originally meaning FILL, and implements a corpus-based analysis of its diachronic evolution from classical Greek in 6th c. BCE to the end of the 3rd c. BCE. The choice of the specific verb is not random, as its semantic scope prototypically sanctions the container image schema. The latter is of great interest in cognitive linguistic literature (Johnson, 1987, p. 331), for its central role in conceptual construal (Tyler & Evans, 2003, pp. 25–27, 178–199) as well as the earliness of its acquisition by infants (e.g. Hespos & Baillargeon, 2001).

Theorising on image schemas has been mostly linked to the semantic analysis of spatial adpositions (Brugman, 1988; Brugman & Lakoff, 1988; Evans & Tyler, 2004; Lakoff, 1987; Tyler & Evans, 2003). The reason is obvious: Prepositions directly encode spatial scenes and their use gives rise to metaphorical interpretation of spatial experience (Boers, 1996). Thus, for instance, preposition *in* can be used to metaphorically designate the situation of experiencing an emotional state:

(3)   He is in a bad mood.

Here, the emotional state is directly interpreted as if it were a container, whereas the experiencer is interpreted as if he were contained within that state. In contrast, a verb such as *pleróo*, meaning FILL, only indirectly incorporates the container schema as part of its constructional scope:

(4)   *Diónusos …*   *oínou*   *kratéra*   *plerósas*
       Dionysus.SG.NOM   wine.GEN.SG   glass.ACC.SG   fill.PST.PRT.3PRS.SG
       'After, Dionysus filled up the glass'   (Dyris, Hist.Frag.1339)

As can be seen, the container image schema is sanctioned by the accusative object, whereas genitive case sanctions what could be called the role of FILLER. Hence, it is

interesting to look at the behaviour of the schema in relation to the semantic change that took place from Classical to Hellenistic Greek and generated a polysemic term that meant FULFILL as well as FILL. Especially in the light of the difference between the two senses in terms of the number of participants in the verb's constructional schema, the examination of the process of the change under discussion gains special interest.

The questions then that the remainder of this paper intends to address are the following: Given that the verb *pleróo* does not directly encode the container schema, how does the latter behave as a structured gestalt in relation to the verb's semantic evolution? Do we observe what Lakoff calls "image-schema transformations" that are concomitant to the semantic shifts of *pleróo*? How does the verb's constructional schema – otherwise semantic frame (see Goldberg, 1995; Fillmore, 1977, 1985) – interact with these transformations and the changes occurring in the verb's senses? In this light, we can understand the image-schema of container as a mediator between the two senses, as depicted below in Figure 4:
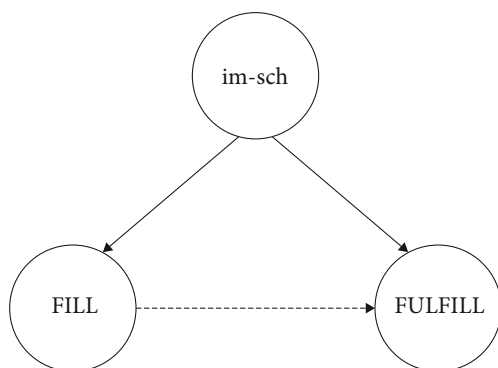

Figure 4. Image schema as a prototype

As can be seen, Figure 4 depicts a process distinct to that described in Lakoff (1987) for the case of *over*, in a certain important aspect: The image schema is the generic space over which FILL and FULFILL are superimposed.

Finally, as a more general concern of theoretical and methodological importance, the integration of a top-down intuitive type of analysis with a bottom-up inductive methodology is addressed. Although Glynn (2014a, p. 123) argues that corpus-driven usage-feature analysis attains the goals that initially had been set out by analyses based on radial networks, the theoretical analysis presented so far indicates that radial network representations may help disentangling the two versions of prototypicality. While it is true that diachronic semantic change from one sense to the other cannot be grasped through demarcation of semantic units but only

through frequency-based analysis of features, at the same time radial stemming from a schematic prototype of what are subjectively perceived to be two different senses may be methodologically useful as well as psychologically real.

3.   The verb *pleróo*: Schematic and featural constitution

3.1   The container image schema within FILL's linguistic construction

As was shown above, the container schema, depicted as in Figure 5 (Evans & Green, 2005, p. 181), is not immanent to the totality of the scope of the verb *pleróo*, in contrast to what happens in the case of adpositions.
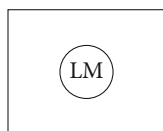
Figure 5.   Container image schema

In the case of *pleróo*, a more complex configuration holds. Concretely, the trajector profiled by the relation evoked by *pleróo* is not the trajector conceptually understood to be profiled against a container. Additionally, and more importantly, what is understood as a conceptual trajector profiled against a container landmark in the case of *pleróo* is a peripheral argument X expressed in genitive case. X stands in a conceptual relation with the accusative landmark LM, expressed precisely by the presence of genitive. The latter substitutes for what in other languages such as English is expressed through the preposition "with", as in (5):

(5)   John filled the glass with water.

The relations for *pleróo* are depicted below in Figure 6.

Nevertheless, the otherwise static relation between LM and TR, under the scope of the relation FILL activated by the verb *pleróo*, becomes dynamic. Looking closer at the relation between X as a trajector and the container as a LM, we observe that, due to the verb, a construal of directional relation between the X-volume and the container as a potential end-point value is imposed. This is depicted in Figure 7.
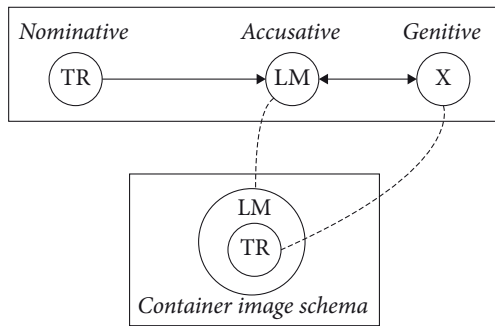
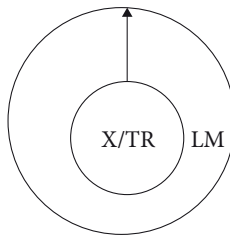**Figure 6.** Inclusion of container image schema in *pleróo*

Figure 7. Dynamic interpretation of container image schema

Putting it all together, we obtain the following figure for the conceptual organisation of the construction of *pleróo*:
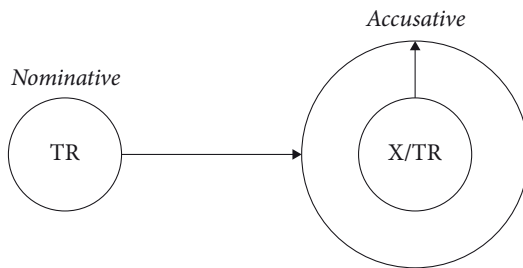
Figure 8. Conceptual configuration of the construction of *pleróo*

As we will see later, the dynamic character of the relation between X and LM as well as the nature of the former as a trajector partially independent of the semantic scope of the verb play a crucial role in the semantic evolution of the verb. For the moment, let us turn to some methodological concerns.

3.2   Operationalisation of variables in the analysis of *pleróo*

Insofar as diachronic semantic research is concerned, where sense differentiation in the course of time is gradual and for long periods partial – that means, non-discrete – and where introspection is not a valid criterion because of the natural lack of intuition, the operationalisation of a word's co-occurrences as semantically relevant becomes methodologically indispensable, on a par with recent research on synchronic aspects of polysemy (see Glynn, 2015, 2016; Heylen, Wielfaert, Speelman, & Geeraerts, 2015). This permits the detection of any pattern of behavioural profile, with the occurrence of any set of "feature configuration" (Geeraerts et al., 1994, pp. 89–104) – in principle – being possible. This treatment of meaning nullifies methodologically the necessity of postulating word-senses (Kilgarriff, 1997).

Speaking then about polysemy means detecting "feature configurations" that define a non-discrete operationalisation of word-senses. These can span over a variety of semantic, constructional/syntactic or morphological features. Two aspects of their choice that deserve mention are the type of the features to be included in the coding of a term's behavioural profile as well as the number of them.

Insofar as the former is concerned, the seminal work of Gries (2006) on the senses of the verb "run" in English tags for the following features: TENSE, TRANSITIVITY, COMPLEMENT SYNTAX and AGENT TYPE. Are these variables either enough or adequate for all works on profile identification? The answer is clearly not. What is still debatable though are the criteria to be used in order to reach the choice of the appropriate features. To some extent, it is the intuition of the researcher as to what are reliable tests of sense identification that comes into play (see Glynn, 2010c, for some discussion). In the present work, the choice of the features to be coded has been also the result of a "trial and error" process. Accordingly, the features that were attested to give a coherently variable picture between different uses of terms as well as between different diachronic stages were included. In contrast, features that did not offer anything in the overall picture or were found to skew towards an incoherent overall picture were left aside. In any case, many techniques such as multiple correspondence analysis or hierarchical cluster analysis that are implemented here are not so much about hypothesis testing as about data exploration and hypothesis forming (Glynn, 2010c; Glynn, 2014a, p. 444).

Thus, for the identification of the distinct feature-based profiles of the various senses of the verb *pleróo*, the following features were coded: CONJUGATION (e.g. INDICATIVE, INFINITIVE, PARTICIPLE, etc.),[1] TENSE (PRESENT, PAST, PRESENT PERFECT, etc.), VOICE (ACTIVE, PASSIVE, MIDDLE, REFLEXIVE), and the semantic

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1.   On the decision to include PARTICIPLE under CONJUGATION TYPE, see note 6.

type of AGENT, PATIENT as well as the argument expressed in GENITIVE. The first three belong to the "formal features", so to speak, and the other to the semantic ones (Gries, 2006, pp. 75–86).[2] Additionally, a coding of the syntactic realisation of the semantic arguments in a compact form as a series of symbols was also introduced, with the aim of including collostructional concerns in the analysis, without increasing excessively the number of variables considered. A sample of coding is given below in Table 1:

Table 1. Coding sample of semantic and formal features for *pleróo*

CONJUGATION	TENSE	VOICE	AGENT	PATIENT	GEN_SEM	CODE
INFINITIVE	PAST	A	ANIMAL	BODY_ORGAN	NA	so0g
INDICATIVE	PRESENT	A	PERSON	CONCRETE_OBJECT	SUBSTANCE	SOG
PARTICIPLE	PAST	P	NA	PERSON	FOOD	SG
PARTICIPLE	PAST	P	NA	PERSON	QUANTITY	SG
INDICATIVE	PRESENTPERFECT	P	NA	PERCEPT	NA	SG
INDICATIVE	FUTURE	A	PERSON	DUE	NA	SO

Another problem to be dealt with is the actual semantic coding of AGENT, PATIENT and GENITIVE ARGUMENT. More concretely, what level of abstraction should someone go for when coding? As is possible to see in the table above, an AGENT can be potentially coded – among others – as an ANIMAL or as a HUMAN, and both at the same time as ANIMATE ENTITY in contrast to NON-ANIMATE ENTITY such as "river" or "air". How fine grained should coding be in its denotational description? Similarly, here, the preliminary observations but also the process of trial and error will indicate the degree of semantic tuning. In the present work, effort was put so that the semantic types that prototypically figured within the corpus be respected. If, for example, a big amount of texts figured "speech" as a PATIENT, and if this was in turn observed to be systematically linked to a VOICE feature of PASSIVE, it was rather coded as such and not e.g. as a NON-ANIMATE ENTITY. It is surprising how limited a range of semantic types is actually attested, even if finer grained, in a corpus of 637

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2. An anonymous reviewer reminds me here that formal features are only indirect indicators of semantic structure, under the assumption that all featural patterns are motivated by semantic structure (Glynn, 2010c, p. 241). The distinction is blur and the issue of meaningfully linking the two avoiding statistical triviality or interpretative circularity is of uttermost methodological and theoretical importance. Although to a greater or lesser extent several studies have been devoted to the theoretical implications of this blurred distinction (Glynn, 2009, Section 4.3; 2010b, 2010c, and especially Glynn, 2015), the distinction is – at least terminologically – maintained (Fabiszak Hebda, Kokorniak, & Krawczak, 2010; Krawczak & Glynn, 2015; Krawczak & Kokorniak, 2012), most of the time without explicit theoretical discussion of the question.

utterances that span over 4 centuries. These do not exceed the 30. A similar picture is observed for the case of PATIENT as well as the GENITIVE ARGUMENT.

The 637 occurrences of the lexeme *pleróo* are extracted from the *Thesaurus Linguae Graecae* corpus,[3] which includes virtually every extant Greek text from 6th c. BCE to15th c. CE. Given the fact that what this work is interested in is language change, a synchronic analysis of all occurrences would not be meaningful. Thus, the 637 instances were divided into 3 groups, each for each century, with the exception of 6th and 5th c. BCE that were grouped together due to the limited number of occurrences in 6th century. This grouping gave about 210 occurrences on average for each group.

Subsequently, these occurrences – that comprise the sum of the attested instances of *pleróo* for that period- were intuitively categorised into different senses by centuries: 10, 11 and 18, for 6th/5th c. BCE to 3rd c. BCE, respectively. The coding into senses was based on the Liddell & Scott dictionary of Ancient Greek Language. Nonetheless, there have been senses such as EQUIP appearing in the coding, which, although not present in the dictionary, where used as better approximations of senses present in the dictionary. Methodologically, this was deemed to be necessary, as it better reflected distributional facts. Thus, for instance, there has been observed a systematic (to a percent that exceeds the 90% of occurrences) omission of a genitive-case argument, otherwise FILLER, when the direct object in accusative case is BOAT:

(6) *Oi*   *Athenaioi*   *eplérosan*   *tas*   *naus*
  DET   Athenian.NOM.PL   fill.PST.3PRS.PL   DET   boat.ACC.PL
  'The Athenians *equipped* the boats'

Systematically, in examples such as (6), the constructional pattern employed for purposes of coding was soøg, corresponding to a zero realisation of the genitive case FILLER. Zero realisation of what normally would be a genitive argument coded as G in SOG shows an entrenchment of a constructional pattern limited to the concept of BOAT. Based on the assumption that there is harmonisation between conceptual and grammatical structure without any grammatical characteristic being vacuous or purely formal (Goldberg, 2003, p. 219), we understand that zero realisation of genitive has possibly become part of the behavioural profile of a lexicalised sense. This view is reinforced by instances where the verb *pleróo* takes as its complement words such as "navy", clearly a sense of EQUIP:

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3. http://stephanus.tlg.uci.edu

(7) *Syrakósioi   ploroúsi   nautikón*
     Syracusan.NOM.PL fill.3PRS.PL navy.ACC.SG
     'The Syracusans are equiping the navy'

The use of the methods of hierarchical clustering analysis (HCA) as well as multiple correspondence analysis (MCA) employed here is admittedly at a preliminary stage within linguistics and in terms of descriptive adequacy far from ideal (Glynn, 2014a, p. 126). The preliminary character of all studies is reflected in the fact that dictionary senses are employed as the starting point of the analysis. Analysis cannot be exclusively based on ID-tagging, thus implementing a multivariate statistical analysis proper, due to the size of the samples that are usually used in this type of research (Gries, 2006, p. 81). Also, the fact that what is accommodated in these studies is the prototypical structure, taking the row of each observation under the rubric of a specific sense facilitates the analysis. Additionally, the present study does not display a drawback mentioned by Glynn (Glyyn, 2014a, p. 126) about Gries' analysis, which is the fact that his study is not restricted to *run* but it also includes all the phrasal verbs that include *run* plus a particle, such as *run off* or *run away*. The caveat then of converting the analysis from polysemy to one of near-synonymy does not hold for the present study as it only employs instances of the single verb *pleróo*.

Following Gries (2006, pp. 81–82) and Glynn (2014a, pp. 128–131), I submit the senses identified through dictionary-based coding to HCA (for a detailed explanation of the technique see Divjak, 2010; Divjak & Fieller, 2014; also Levshina, 2015, pp. 301–21), by group.[4] Clustering takes as an input the whole range of features identified as relevant, nonetheless a choice that is not readily obvious.

MCA is an exploratory method as well, for complex categorical data. It visualises the overall attraction between factors on a two-dimensional plane that reduces a space of multi-dimensional correspondences into a single plot. In a sense parallel to what holds of HCA diagrams, proximity of data-points on the map represents frequency-based associations. The principle behind the implementation is simple: the frequency of co-occurring features is converted into distances between these features. In turn, these distances are plotted so that proximity between points reflects similarity. Understanding distance as similarity is based on the conversion of the overall co-occurrence of features (variables and observations) into a correlational distance matrix. In our case, this has the following effect: the senses that appear closer are "more similar" as they display similarities in the distribution of the features across their contexts (for an analysis of the technique see Glynn, 2014b; Levshina, 2015, pp. 375–385). Additionally, individual features tend to get clouded

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4. The statistical platform used to implement the analysis is R (see Baayen, 2008; Gries, 2013; Levshina, 2015).

together if they co-occur. The map that results can be understood as a compensation between multidimensional correspondences and two-dimensional representation.

4. Data analysis

4.1 6th and 5th c. BCE

As was said above, HCA yields a hierarchical grouping of the intuitively coded senses, based on their contextual features. The picture looks like an upside-down tree, otherwise called *dendrogram*, where the most closely related senses appear most embedded within the tree, forming a cluster. In turn, these clusters agglomerate into others forming bigger clusters, always based on the similarities they display to their neighbouring members within the tree. The process repeats until the dendrogram reaches its top, or rather its root. Dendrograms can be read either bottom-up or top-down. Vertical distance between the nodes of the tree betrays semantic distance between senses.

Looking at the cluster dendrogram in Figure 9 for the 6th and 5th centuries BCE, we see that clearly two big clusters are formed. The first includes the senses FILL and FILL/EQUIP, a result that may be taken as a comment in disfavour of the step taken above to lexicalise FILL/EQUIP as a separate sense (but see below). This mutual feedback between methodological and analytical choices is of the most interesting themes in corpus-based research using exploratory techniques such as clustering analysis. Coding and feature-grouping results in a representation, whose coherence constitutes an indicator for re-evaluating coding, grouping as well as the relevance of the features included.

In turn, the rest of the senses form two distinguishable clusters that include the following senses: CONSTITUTE, AUGMENT, COMPLETE and SATISFY on one side, and LOAD, OCCUPY, FEED and SATE on the other.

Does this clustering constitute a coherent picture? In other words, is this grouping what would be expected by intuitive extrapolation of the schematic prototypicality of the attested senses? The answer is to some extent yes and to some extent no. As we can see, already the grouping of FILL together with FILL/EQUIP presents us with a challenge. Is the clear-cut differentiation between FILL and EQUIP in their grammatical patterning enough to demark the two uses of *pleróo* as clearly distinct senses? On the other hand, grouping AUGMENT and COMPLETE together would be intuitively understood as motivated, as would FEED and SATE too, possibly on grounds of a metonymic shift that involves the upper endpoint of a scale in relation to a lower point along it (Radden & Kövecses, 1999, p. 32). On the other hand, on what grounds would we intuitively motivate the grouping of AUGMENT with
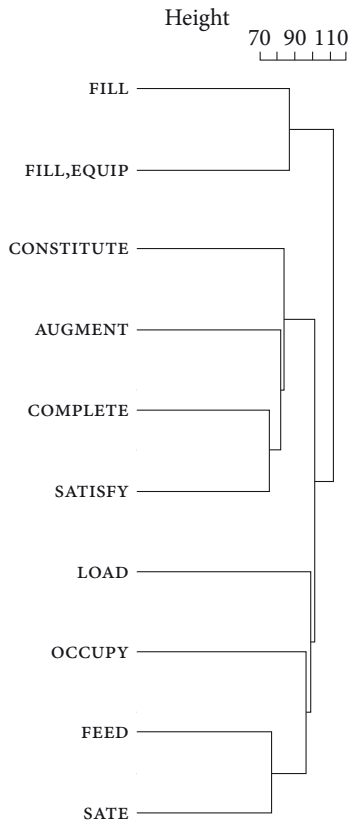
Height

70 90 110

FILL

FILL,EQUIP

CONSTITUTE

AUGMENT

COMPLETE

SATISFY

LOAD

OCCUPY

FEED

SATE

Figure 9. Cluster dendrogram of *pleróo* for 6th–5th c. BCE

SATISFY and its separation from SATE? The latter link anyway would look more intuitive, again in metonymic grounds that involve cause and result (Kövecses & Radden, 1998, p. 56). The inability to give an intuitive motivation for this grouping may imply three things: first, some inherent drawback in the method for semantic analysis that takes senses to be the labels of observation rows; second, the inability to draw significant correlations because of sparseness of data for some cells in the observations, a related matter; third, the limitations that the diachronic nature of the analysis poses on the method. I want to argue for the third possibility, that somehow subsumes the first and amends the drawbacks of the second. As mentioned above, diachronic change's gradient character nullifies in principle the relevance of an analysis based on demarked senses. That means that polysemy that leads to a new sense will never be relevant to senses themselves but to some subset of the features that constitute its behavioural profile. This relevance in a dendrogram may

appear as the attraction between senses, although it may be in fact correlational attraction between features.

This correlation is better visualised through MCA, whose importance for synchronic analysis has been pointed out earlier in literature (e.g. McGuillivray, Johanson, & Apollon, 2008, p. 59) and implemented for semasiological clustering across social dimensions (Glynn, 2014a, p. 131–139; Glynn, 2015, Section 3). Nevertheless, using MCA as a tool for understanding language change has been implemented only scarcely, if at all (Hilpert, 2011, Section 2). Partly, the scarceness of application may be related to what the data of any diachronic research is supposed to be ordered by, namely the dimension of time. In contrast, MCA treats the data exclusively as categorical. The theoretical conviction of the present study behind the use of MCA has been the possibility of interpreting change as a synchronic polysemic relation between entrenched featural configurations, which reduces to prototypicality. In this light, understanding diachrony through synchronic comparisons intends to detect the "cuts" in the entire space of configurational possibilities of a term. Nevertheless, what someone actually obtains is – using an analogy – a series of discontinuous frozen photographic frames rather than a continuous motion. In Hilpert (2011), motion charts have been used for that purpose, applying a method first introduced in Gesmann and de Castillo (2011), through a series of diachronically ordered scatterplots. Nevertheless, longitudinal analysis of that sort through the implementation of MCA for the current study is not a promising methodological move for the following reasons: First, the big number of categories handled through MCA. Second, the occasionally small number of instances in each cell as a result of the presence of an extensive range of features that each category such as CONJUGATION may instantiate. Third, the relatively limited number of data for a given period, which necessitates grouping of long periods of time within a single MCA. I leave the methodological challenge of the incorporation of time as a meaningful ordering dimension for a later stage, when more data has been collected and coded. Implementing then MCA for the data of 6th and 5th centuries BCE and visualising them on a plot (Baayen, 2008, p. 125), we get the map in Figure 10.

The picture we obtain from MCA is in certain aspects similar to that of hierarchical clustering and, to some extent, different to it. The similarities concern the relative grouping of the senses AUGMENT, COMPLETE and SATISFY as well as the senses of OCCUPY and SATE. The curious phenomenon of SATISFY being grouped with AUGMENT and COMPLETE and not with SATE, as would be intuitively expected on the grounds of a metonymic shift that involves the upper endpoint of a scale in relation to a lower point along it (Radden & Kovecses, 1999, p. 32), can receive a better explanation by looking at the plot, where the features that attract it can be located. The difference between SATE and SATISFY is given in terms of both semantic as well as formal features. Thus, what attracts SATISFY are the features PAST
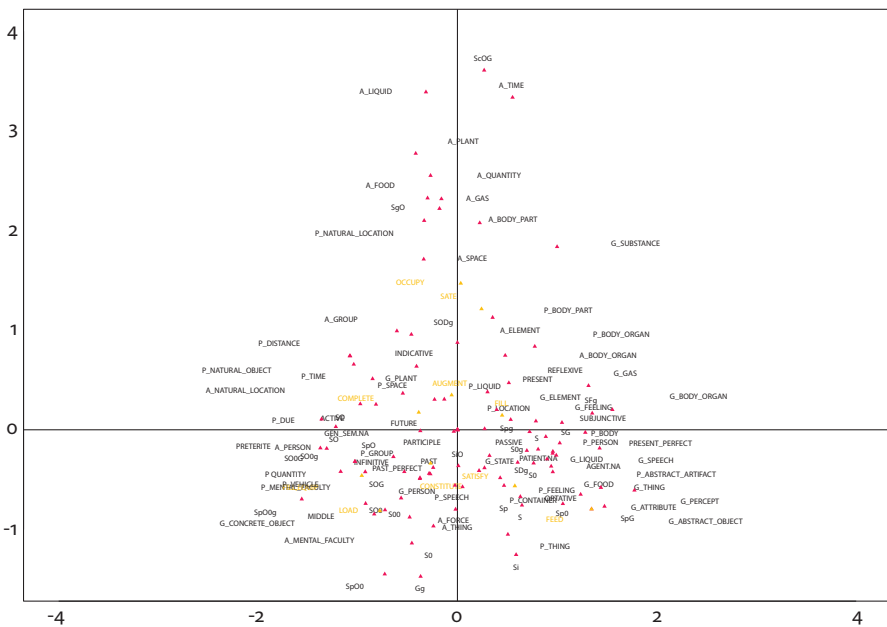
Figure 10. MCA for 6th–5th c. BCE

for TENSE, INFINITIVE for CONJUGATION and ACTIVE for VOICE. In contrast, SATE is attracted by PRESENT for TENSE, INDICATIVE for CONJUGATION and PASSIVE for VOICE.[5] A parallel distinction holds between SATE and FEED. SATE is clearly attracted by BODY_PART as a FILLED argument and FEED by ABSTRACT_OBJECT as a FILLER. The contrast then here is rather between literal and metaphoric use. SATE is literally used, whereas FEED metaphorically. Interestingly, FEED aligns with SATISFY in terms of TENSE, attracted by PAST, but contrasts in terms of VOICE, as attracted by PASSIVE. The partial overlapping between the senses of SATISFY, SATE and FEED in terms of their formal features is given as follows in Table 2:[6]

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5. Although SATE appears in absolute terms closer to REFLEXIVE than to PASSIVE, someone should not forget that a plot collapses more than two dimensions into a plane surface of two dimensions. A detailed look at the data shows that there is no contextual co-occurrence of SATE and REFLEXIVE, an observation that suggests that REFLEXIVE appears in that position correlated with other senses, such as AUGMENT.

6. Including PARTICIPLE in CONJUNCTION type is not unproblematic. Participles belong to a derivational origin, not an inflectional one, and are inflected for case. Nevertheless, the fact that they have their own argument structure unifies and contrasts them to verbs in a specific relevant aspect: The contrast between PROCESS and THING as a dual possibility of construal, which corresponds to the possibility of either foregrounding a processual relation, or backgrounding it as

Table 2. Overlapping between formal features for SATISFY, SATE, FEED

SENSE	TENSE	VOICE	CONJUGATION
SATISFY	PAST	ACTIVE	INFINITIVE
SATE	PRESENT	PASSIVE	INDICATIVE
FEED	PAST	PASSIVE	PARTICIPLE

Table 2 reveals that SATISFY and FEED tend to be construed as non-processual relations with an ACTOR as their trajector, whereas SATE as a processual relation with a PATIENT as its trajector. If there is any pattern arising here at all, this would potentially have to do with the connection between PAST and NON-PROCESSUAL.

Could this pattern be something more consistent than an accident? In order to test this, we can turn to the distributions of features to which AUGMENT, COMPLETE and CONSTITUTE appear to be mostly attracted, in terms of TENSE, VOICE and CONJUGATION. As was said above, AUGMENT, COMPLETE, SATISFY and CONSTITUTE seem to form a single cluster in the respective dendrogram. Taking the horizontal and vertical axes of the MCA plot to represent roughly a division between PRESENT-PAST on the one hand and ACTIVE-PASSIVE on the other, we can classify the aforementioned senses in terms of the relevant features that they are mostly attracted too. The table we obtain is the following:

Table 3. Overlapping between formal features for AUGMENT, COMPLETE, CONSTITUTE

SENSE	TENSE	VOICE	CONJUGATION
AUGMENT	PRESENT	REFLEXIVE	INDICATIVE
COMPLETE	PRESENT	ACTIVE	INDICATIVE
CONSTITUTE	PAST	PASSIVE	PARTICPLE

What Table 3 represents is quite important in its theoretical implications. PRESENT TENSE displays a systematic tendency for co-occurring with PROCESSUAL relations with real epistemic status (Langacker, 2008, p. 306), whereas PAST TENSE tends to co-occur with NON-PROCESSUAL relations, especially PARTICIPLES. Profiling non-processual relations represents a form of *reification* in the continuum that runs between the archetypical categories of ACTIONS and THINGS (Langacker, 2008, pp. 103–112). The cluster PASSSIVE-PAST PARTICIPLE then constitutes a correlation that profiles *a participant as a trajector at the final state of a process* (Langacker, 2008, p. 121). Although senses like FEED and CONSTITUTE appear distant to each

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a reified one. Accounting for the contrast in coding led my analysis to keep both as variations under the same category, a decision that finds an extensive theoretical argument in favour in Langacker (2008, Chapter 4–5).

other in the dendrogram in Figure 9 above, in terms of their grammatical profiling they both highlight a feature that cannot be denied a semantic status: TELICITY. As we will see later on, the feature of TELICITY gains increasing relevance for the evolution of the verb *pleróo* in the centuries that follow. Additionally, it shows that the conceptual attraction of a sense like SATE towards senses such as SATISFY, AUGMENT and COMPLETE and not towards senses like FEED is not based on encyclopaedically based associations of metonymical sort. In contrast, it is grounded on the presence of a schematic centre of prototypicality immanent in the clustered senses.

A somehow reverse situation to that of FEED and CONSTITUTE holds of the separation between the senses of FILL and EQUIP. Concretely, although being grouped together in HCA, in MCA they appear as belonging to opposite sides of the plot. FILL is attracted towards constructional patterns like SG, SØG and SØ, all featuring PASSIVE, whereas EQUIP is attracted by ACTIVE and MIDDLE VOICE and the corresponding grammatical pattern SOØG, with the FILLER being omitted. Nevertheless, EQUIP and FILL also appear to be related systematically with participants of some specific semantic sort too. Thus, the AGENT is correlated to PERSON (coded as A_PERSON for AGENT_PERSON and equally attracting the sense LOAD), whereas the PATIENT to VEHICLE that typically surfaces in utterances as BOAT. Respectively, AGENT for FILL is absent (as the sense is attracted towards PASSIVE with AGENT missing) and PATIENT is related to FOOD. Consequentially, these observations back up the intuitive move of splitting SOG and SOØG into two different lexicalised senses for the case of FILL and FILL/EQUIP.

4.2   4th c. BCE

Let us now look at the hierarchical clustering of the senses registered in the 4th c. BCE in Figure 11.

As can be seen, two predominant clusters are forming, containing the following senses: on the one hand, CONSTITUTE, FILL and SATURATE are clustered together. These stand at major distance to two other partial clusters comprised by SATE, COMPLETE and COMPLY on the one hand, and FILL/EQUIP, IMPREGNATE, SATISFY, AUGMENT and FILL WITH EGGS on the other. The senses that appear for the first time are SATURATE, COMPLY, IMPREGNATE and FILL WITH EGGS, whereas the ones that are not attested for the 4th c. BCE are LOAD, OCCUPY and FEED. It is interesting that all last three senses in the 5th/6th c. BCE form a cluster on their own right along with SATE, which now has been clustered with COMPLETE and the newly apearing sense COMPLY. The latter cluster separates from EQUIP, IMPREGNATE, SATISFY, AUGMENT and FILL WITH EGGS. This division does make intuitive sense, extrapolating the concrete senses of COMPLETE, SATE and COMPLY to a prototypical schematic
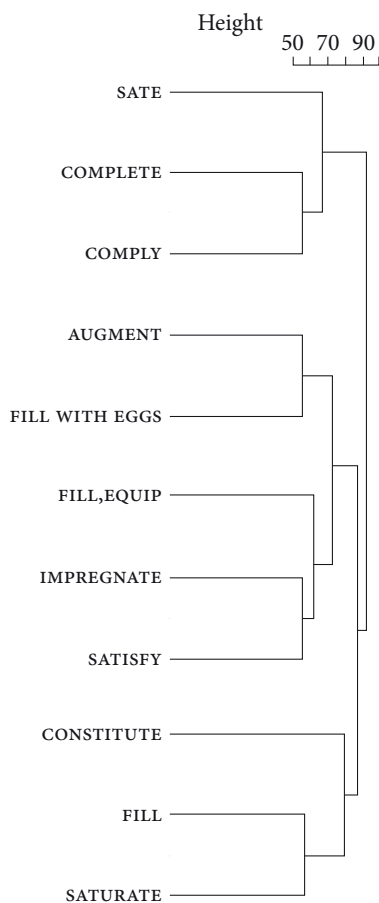
Height
50 70 90

SATE

COMPLETE

COMPLY

AUGMENT

FILL WITH EGGS

FILL,EQUIP

IMPREGNATE

SATISFY

CONSTITUTE

FILL

SATURATE

Figure 11. Agglomerative clustering of *pleróo* for 4th c. BCE

structure of TELICITY, whose relevance was pointed out in the previous section. Another interesting fact is the distancing between the senses FILL and FILL/EQUIP as well as between SATURATE and SATE, which without a MCA mapping remains unexplained (see below). Let us then have a look at the MCA plot in Figure 12, to see what observations can be obtained regarding how the "feature configurations" are formed and influence sense attraction:
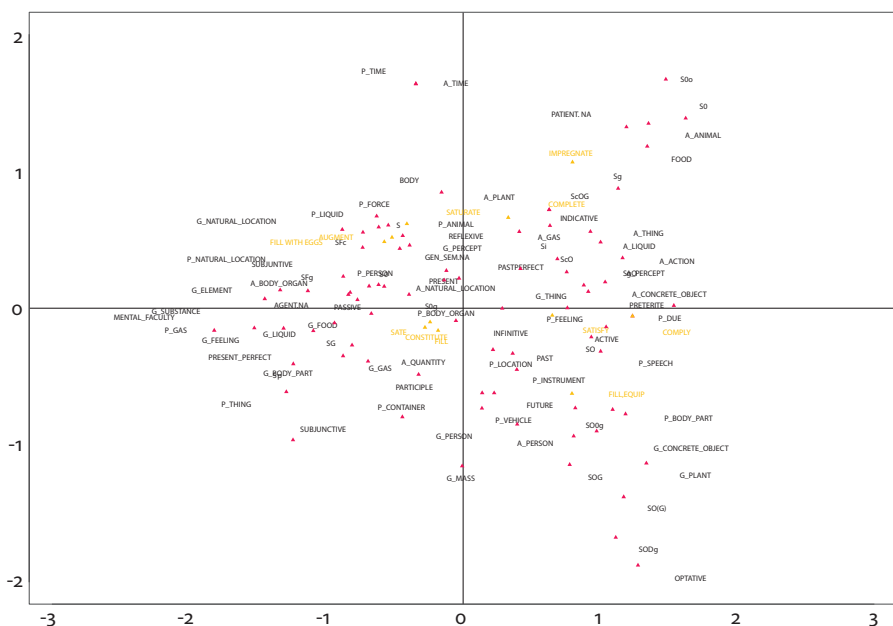
Figure 12. MCA of *pleróo* for 4th c. BCE

A first picture that is readily observable is a rather greater scattering of discernible clusters of senses, as compared to that in Figure 10. How is this observation interpreted? According to Glynn (2014a, p. 122), the phenomenon is not automatically linked to frequency, but rather to an entrenchment of a stable behavioural pattern, in other words of a clearly identifiable context of co-occurrence. On a plot this appears as a well-defined space of attraction of a sense by some features that tend to separate themselves from the undifferentiated and non-variable cloud of the rest of the senses. What are the features in our case that induce this skewing on the plot? Again, there are two features that clearly figure as separate from each other, at a distance greater to that appearing in Figure 10. These are the features of ACTIVE and PASSIVE of the type VOICE. Not only do they figure prominently as separated from each other, but they also occupy polarised locations within the plot divided by the vertical axis. At the same time, ACTIVE and PASSIVE are accompanied by the constructional patterns SO (Subject-Object) and S (Subject), respectively. Someone could say that PASSIVE is predictably associated with S, given that the AGENT is omittable in passive constructions. Accordingly, SO is associated with an object, which appears in active constructions. Nevertheless, it is important to point out that the typical and more frequent pattern for 4th c. BCE is not S nor SO (11.5% and 7.3% overall frequency, respectively) but SG (22.3%), which appears more retracted towards the horizontal axis of the plot. We then have here a good example

of Geeraerts' "feature configuration" (Geeraerts, 1994, p. 89), not at the integral level of sense but at a "sub-sense" level, to use a rather awkward term. Accordingly, towards PASSIVE and s are attracted the senses FILL WITH EGGS, AUGMENT and SATURATE, whereas towards ACTIVE and so the senses SATISFY and COMPLY. In the greater region dominated by PASSIVE, beyond the aforementioned senses we also find CONSTITUTE, SATE and FILL, whereas in the region dominated by ACTIVE we also find FILL/EQUIP and COMPLETE and, somehow more retracted, IMPREGNATE.

Someone understands why IMPREGNATE and FILL_WITH_EGGS occupy different clusters within the dendrogram in Figure 11. IMPREGNATE is related to an AGENT that is profiled acting over a PATIENT, whereas FILL_WITH_EGGS appears in PASSIVE, profiling a PATIENT as a container, a conceptual landmark for EGGS as a trajectory. Interestingly, IMPREGNATE is linked on the map with ANIMAL in the role of the AGENT (A_animal), whereas FILL_WITH_EGGS to an ANIMAL (P_animal), PERSON (P_person) and BODY_ORGAN, distribution that also gives an insight into matters of perspectivisation of the same conceptual theme within different texts.

A parallel explanation is given to the question I addressed above on the difference between SATURATE and SATE. The first is grouped with AUGMENT, attracted by PASSIVE and linked to a profiled PATIENT in the role of the subject (i.e. s), under the meaning of LOCATION, FORCE, LIQUID or BODY_ORGAN. On the other hand, SATE is again attracted by PASSIVE and clearly linked to a PATIENT semantic role in the position of the subject that profiles a PERSON and BODY_ORGAN. Similarly, the anti-diametric positioning of FILL and FILL/EQUIP reveals the same asymmetry between PASSIVE and ACTIVE. Equipping a vehicle such as a boat focuses on the AGENT and omits FILLER, whereas FILL has already started being expressed in PASSIVE, profiling a PATIENT Subject s.

Taking then as base the configuration depicted earlier in Figure 8, we see that in both cases above there is a tendency to demote the genitive argument of FILLER. In the case of PASSIVE and s as a prototypical configuration, AUGMENT, FILL_WITH_EGGS and CONSTITUTE display characteristics that in later centuries will become entrenched as a reflexive pattern. More concretely, we see that the AUGMENT, FILL_WITH_EGGS and CONSTITUTE senses appear in expressions where the FILLER is either silently understood and unnecessary because of the nature of the subject, or totally out of the verb's scope. Thus, in (8) FILL_WITH_EGGS is almost synonymous to GET_PREGNANT, a sense that metonymically evokes also the link between BEING_PREGNANT and UTERUS_INCREASE motivated in turn by the link CAUSE and observable EFFECT. This is a very interesting conceptual association that associates the sense with that of AUGMENT, a sense starting being understood as reflexive (Evans & Green, 2005, p. 182). Here, landmark and trajector are identified and motion takes place from within the landmark, spreading its existence by pushing the boundaries of itself. In (9), for instance, a river increases its size from within,

and the FILLER, which is understood to be WATER, is not expressed in Genitive but through a PP that profiles not WATER as a FILLER but RAIN as a CAUSE, with *pleróo* getting a sense of INCREASE/AUGMENT or FILLUP, thus profiling the boundaries of a container as the upper point of the reflexive motion:

(8) *Nomízousin   pleroústhai ta   thélea*
    Think.PRS.3PRS.PL fill.INF.PS   DET female.ACC.PL
    'They think the female animals get pregnant'   (Arist. Hist.An. 541a.13)

(9) *Upó   ómvron   therinón   pleroúmenon ton Neílon*
    Due-to rain.GEN.PL summery.GEN.PL fill.PS.PRT.ACC.SG Nile.ACC
    'Nile increased because of rain'   (Arist. Frag. 6.34.246)

CONSTITUTE is naturally grouped together with the above senses, meaning FILLED IN ITS FULL POTENTIAL, activating an implicit boundary of completion, such as a quorum:

(10) *Méllei ta   dikastéria   pleroústhai*
    Will   DET court.NOM.PL fill.INF.PASS
    'The courts will be constituted'

We see that there is a demarcation of a specific perspectivisation that starts taking place, which does not solely remain a grammatical possibility over the construal of an utterance but shapes a distinct lexical semantic possibility. Somehow, grammatical feature configurations license the genesis of new senses. In Figure 13 this perspectivisation as a construal that starts becoming lexicalised is shown, compared to the prototypical – here "prototypical" used with the meaning of the most frequent – sense of FILL that was shown in Figure 8 above:
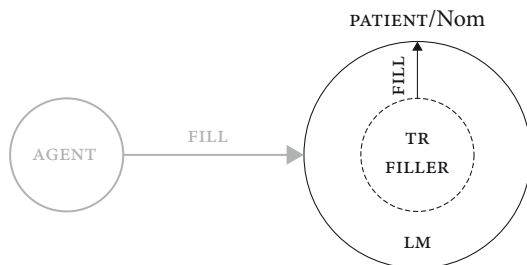

Figure 13. The construction of *pleróo* with demoted AGENT

As we see, the image schema involved as a container within the constructional schema is gaining a construction-like lexicalised sense on its own. This shift is facilitated precisely by four factors:

a. the perspectivisation that passive implements as a means of demoting the AGENT in the typical *pleróo*-construction as FILL
b. the nature of the former as a trajector independent of what the semantic scope of the verb profiles as its own trajector
c. the dynamic/complex character of the relation between FILLER as an independent trajector and PATIENT as landmark, as Langacker (2008, pp. 117–122) views it.
d. The identification of the PATIENT-landmark with that of the FILLER's landmark.

Thus, entrenchment of passivisation as a grammatical feature demotes the AGENCY of *pleróo*'s profiled trajector. Sequentially, the PATIENT landmark assumes simultaneously function of phrasal trajector regarding PASSIVE_FILL as well as conceptual landmark regarding the complex relation that holds between the conceptual trajector of FILLER and its landmark. At a third stage of what Lakoff (1990) would call an "image schema transformation", the complex relation between FILLER and its landmark become processual, thus gaining a conceptual correspondence (Langacker, 2008, p. 163) with FILL itself. Finally, the reflexive nature of the relation holding between trajector and landmark in the "processualised" container image schema enables the landmark to appear alone, now as the newly understood trajector.

The detailed explication of the process above shows how image-schematic structure within a construction interacts with grammatical features, thus carving the schematic path for a lexical semantic change to become in first place possible and, in second, entrenched; but it also shows how frequency-based prototypicality, represented above by Figure 14, interacts with schematic prototypicality, an interaction that gives rise to new lexical senses that are linked to well-demarked feature configurations.

4.3   3rd c. BCE

Let us now pass to 3rd c. BCE and see how HCA and MCA give us an insight into what has been the path the semantic evolution of *pleróo* took. As a first approximation, let us first have a look at the clustering of senses in the dendrogram in Figure 14.

Again, two big clusters prominently figure in the dendrogram. The most embedded group within the first one includes the senses COMPLETE, BRING_ABOUT, FULFILL and SATISFY and next to them the somehow more distant CONSECRATE and FILL/EQUIP. The second cluster contains the more distant sub-group of FILL_UP, AUGMENT, CULMINATE and a second one comprising FILL, REACH, GET_DIZZY, SATE, ASSERT, OFFER, OCCUPY and SPREAD. Within the cluster, FILL and REACH as well as GET_DIZZY and SATE are grouped more distantly.
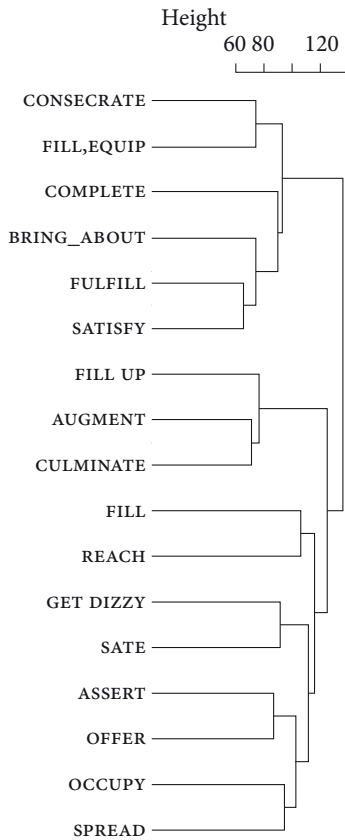
Height

60 80   120

```
CONSECRATE  ────────┐
                    ├──┐
FILL,EQUIP  ────────┘  │
                       ├──────────────┐
COMPLETE  ──────────┐  │              │
                    ├──┘              │
BRING_ABOUT  ───────┤                 │
                    │                 │
FULFILL  ────────┐  │                 │
                 ├──┘                 │
SATISFY  ────────┘                    │
                                      │
FILL UP  ──────────┐                  │
                   ├──┐               │
AUGMENT  ──────────┤  │               │
                   │  ├───────────────┤
CULMINATE  ────────┘  │               │
                      │               │
FILL  ──────────────┐ │               │
                    ├─┤               │
REACH  ─────────────┘ │               │
                      ├───────────────┘
GET DIZZY  ─────────┐ │
                    ├─┤
SATE  ──────────────┘ │
                      │
ASSERT  ───────────┐  │
                   ├─┐│
OFFER  ────────────┘ ├┘
                     │
OCCUPY  ───────────┐ │
                   ├─┘
SPREAD  ───────────┘
```

Figure 14. Agglomerative clustering for 3rd c. BCE

There is a general coherence in the dendrogram, with the possible exception of CONCECRATE and FILL/EQUIP as clustered with the rest of their group. Possibly, they are grouped there not in the name of their similarity with the rest members of their group but their dissimilarity to the rest. The phenomenon of FILL/EQUIP as different to FILL has already been treated in these terms. CONSECRATE, on the other hand, is a newly appearing sense, whose motivation in relation to *pleróo* is metonymical and very distant to any notion of FILL. It actually surfaces as "fill the hand" in Old Testament, with the genitive object of FILL always omitted, originally denoting an entity that belongs to the semantic type of OFFER such as an animal sacrifice or libation. Thus, "fill the hand with an offer" ended up meaning "consecrate". The

persistent then occurrence of HAND as an object that lacks any genitive-case FILLER generates a problem in its positioning within the dendrogram.[7]

In contrast, the rest of the dendrogram appears quite coherent and in certain aspects very interesting. Thus, the cluster COMPLETE, BRING_ABOUT, FULFILL and SATISFY make perfect intuitive sense, in the light of the image-schematic transformation exemplified in the previous section. FILL_UP, AUGMENT and CULMINATE are also naturally grouped together, related on the one hand with the former cluster but in certain aspects different too, possibly in terms of the abstractness of the objects that reach the upper bound of a projected end. Again, the only way of testifying this intuition is looking at a feature-based distribution of the senses. The same comment holds of the last cluster that has a general intuitive effect of a physical object occupying a location.

Let us look then at the corresponding 3rd c. BCE MCA in Figure 17, to obtain a better glimpse of the feature-configurations:
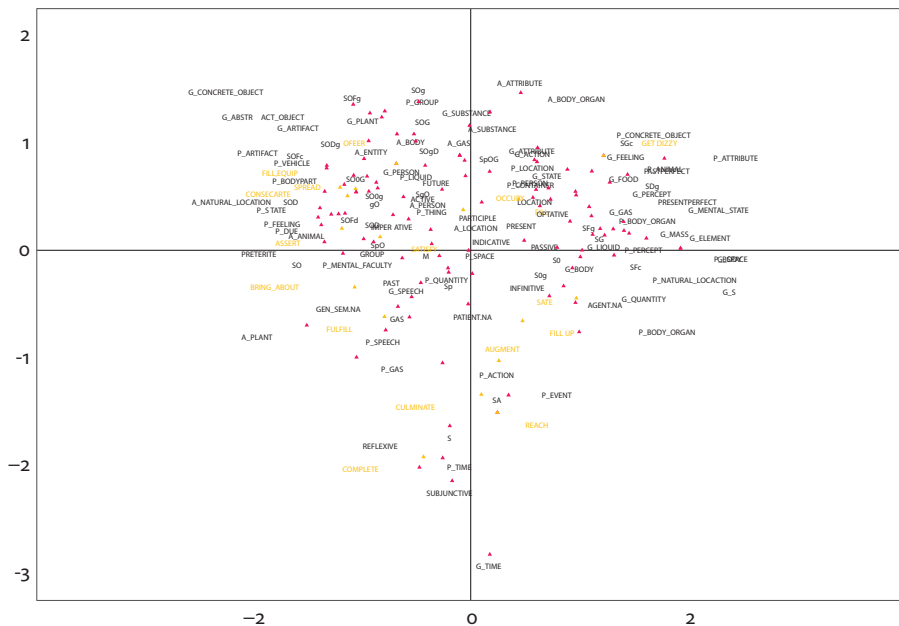

Figure 15. MCA of *pleróo* for 3th c. BCE

The picture is revealing insofar as the distribution of voice-features is concerned. The plane is again polarised regarding these, but now not only between active and passive but also between passive and reflexive as well as reflexive and active. Although all voice-features, namely active, passive, middle and reflexive are present in all plots (with the exception of middle for 4th c. bce), in the present plot, reflexive is what appears to yield demarked senses for culminate, augment, complete and reach, a distribution that makes readily sense in the light of the demotion of the argument within the constructional schema of *pleróo* described above. Another interesting characteristic of the plot for the period is the presence of subjuntive along with reflexive. We saw that for 6th and 5th c. bce, present tended to co-occur with indicative, conjugation used to express the conception of *realis*, and passive/reflexive within a reification pattern like participle or infinitive. The presence of reflexive with a processual relation in subjunctive, conjugation of *projected reality* (Langacker, 2008, p. 306), along with the prominent figuring of s, is important for the following reason: It may show a lexicalisation of a pattern that prominently appeared first in 4th c. bce.

Even in terms of frequency-based prototypicality, reflexive occupies the 13% of the overall distribution of voice-features in 3rd c. bce, in comparison to a mere 1.2% that the same feature occupies in the sum of the extant instances in 4th c. In practice, this means that the complex relation between the filler and the filled gets entrenched, so that it subsumes conceptually the sense of a verb proper, as shown in Figure 16:
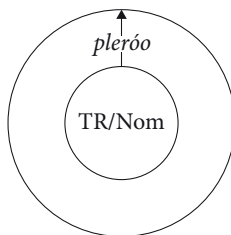

Figure 16.   Frequency-based entrenched reflexive sense of *pleróo*

The same conclusion is drawn if we compare the confidence ellipses around the exemplars corresponding to the instantiations of the variable of voice. What this test returns is a depiction of the regions that represent the prototypical radius around the category that is tested for. In other words, it reveals the pattern of correlation between senses and the various instantiations of voice, as an entrenched configuration. Even at a level of 95% of confidence, which allows for a very extensive fuzzy periphery, there is no overlapping between the region of "influence" between

the instantiations of VOICE category. In this regard, compare the three plots in Figure 17, corresponding to 6th/5th, 4th and 3rd centuries, respectively:
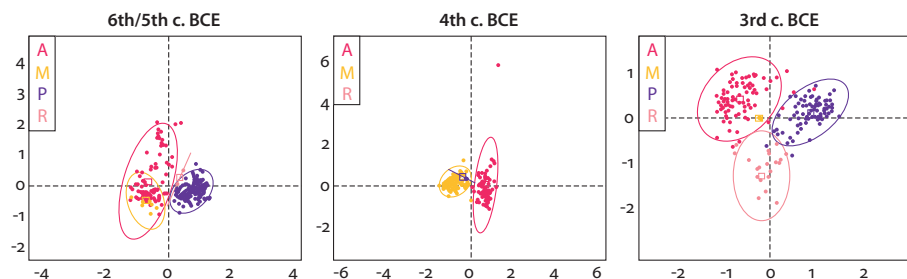

Figure 17. Concentration ellipses for the category of VOICE

What the above plots tell us is quite revealing: First, it seems that VOICE has been indeed a determining factor for the evolution of the lexical senses of *pleróo*. Second, it shows how a grammatical possibility like PASSIVE has evolved into a lexical-internal entrenched pattern, namely REFLEXIVE, which is sharply distinct in terms of its distribution. In this connection, compare with the distribution of VOICE for 6th/5th c. BCE, where overlapping implies undifferentiated configurations.

5.   Conclusions

This paper can be seen as an exploration of the possibility of an integrated analysis that unifies corpus-based statistical techniques such as hierarchical clustering and multiple correspondence analysis with more introspective analyses that assume the demarcation of intuitively valid schemas such as senses and prototypical gestalts. When implementing a statistical analysis of that sort, someone who aims at advancing his analysis beyond the mere description of the clusters produced is confronted with the daunting task of a finer-grained evaluation at a level below the atomicity of senses. The present analysis tried to give a practical argument for the plausibility of implementing an integrated analysis. It attempted to relate the following analytical aspects: first, a diachronic semantic analysis with techniques that only scarcely have been used in historical semantic research; secondly, specific shifts attested in the featural configurations constituting the behavioural profiles of senses on the one hand, with the emergence of new senses as well as the attraction of specific senses to others; third, the patterning of combination of grammatical features such as PAST or PASSIVE to semantic changes that involve their entrenchment into new senses; finally, the aforementioned shifts with a variant construal over the image schema

embedded in the construction of the verb *pleróo* that becomes crystallised and lexicalised. Thus, the connection of AUGMENT and COMPLETE in the 6th and 5th c. BCE has been found to be related to a perspectival shift that in combination with the feature of PAST profiles the semantic quality of TELICITY. The clustering of COMPLETE with the proliferation of new senses such as COMPLY and SATISFY during the 5th c. BCE somehow backs up the observation, reflecting a shift of the construal over the boundaries of the container image schema embedded in the verbal construction of FILL. The latter has been found to be facilitated through a polarisation of ACTIVE/SO and PASSIVE/S features, with the latter licensing a sense of COMPLETION that demotes the AGENTIVE argument of the construction and profiles the FILLER as its new trajector, this time as a simple ACTOR. This shift eventually in the 3rd c. BCE transfers the processual nature of the relation from the sense of FILL to that of CULMINATE and AUGMENT, but this time with a new conceptual make-up: this of REFLEXIVITY, a feature that for the first time becomes the prototypically demarked VOICE-related feature on the map. In that sense, the evolution of new senses that tend to become prototypical even in terms of frequency-based prototypicality, as is FULFILL, has been facilitated by a whole set of grammatical and semantic featural configurations, whose detection is a challenging but at the same time revealing task. This research is by no means concluded or complete. But I hope I have strengthened the view that the integration of methods that appear in pioneering works, either these are more introspective or corpus-based, is a worthwhile enterprise.

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