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Projective and other locative PPs in Greek

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The distinction between projective and non-projective locative prepositions that has been proposed in the semantic literature (Zwarts & Winter 2000) is reflected in the syntax and morphology of Greek spatial expressions. Projective PPs in Greek are always complex, formed by a spatial "adverb" and the "light" preposition *apo* marking the ground DP. In non-projective PPs, which can be either simple or complex, the light preposition alternates between *se* (in locative and goal environments) and *apo* (in source and route environments). This is attributed to the different syntactic status of the "adverb", which is shown to be a head in projectives, and an adjunct in non-projectives (cf. Theophanopoulou-Kontou 2000). The Greek data support an extended P projection analysis along the lines of Svenonius (2008; 2010) for projectives, which relates to their vector space ontology (Zwarts & Winter 2000). Non-projective expressions, on the other hand, are syntactically reduced.

1. Introduction

Greek has two classes of complex locative PPs. These are minimally different on the surface by means of the preposition marking the DP complement (*apo* vs *se*), as is shown in (1):

(1) a. I gata ine **piso** **apo** to kuti. *projective*
the cat is BACK *apo* the box
'The cat is behind the box.'

b. I gata ine **mesa** **s**-to kuti.[1] *non-projective*
the cat is IN *se*-the box
'The cat is in the box.'

Following Talmy (1975), the individual whose location or movement is being described is called *figure* (in (1): the cat), and the object or place with respect to which the figure's location is determined is called *ground* (in (1): the box). In projective expressions (Zwarts & Winter 2000), the figure is located in a "projected" region away from the ground. In (1a), that is the area behind the box (**Figure 1**, right). Projective expressions have complex denotations because they require directional information. To understand the meaning of (1a) we need a *coordinate* system, which can be either Cartesian (Zwarts & Winter 2000) or polar (Zwarts & Gärdenfors 2016; see Kracht 2008 for an approach using coordinatizers) and a *frame of reference* (Levinson 1996; Levelt 1996). In the *relative* frame of reference, there is a tripartite relation between the figure, the ground, and a point of view. That is, in (1a), the viewer (the point of view) and the cat (the figure) have to be on opposite sides of the box (the ground). Some objects such as cars and houses have *intrinsic* sides, e.g. *back* and *front*, which may also be used to determine the relevant axes (in the expressions *behind* and *in front of*, respectively). Lastly, there is the *absolute* frame, in which fixed locations such as the north pole of the earth (as in the expressions *north/east of*), or its gravitational center (as in *above/below*) are employed. In the non-projective containment relation in (1b), on the other hand, no directional information is needed. The space occupied by the cat can be modeled as a subset of the space occupied by the box.

A typical trait of projective expressions is that they can be modified by *measure phrases* (2a) and *projective modifiers* such as *diagonally* and *straight* (2b), whereas non-projective expressions typically do not allow either (3a–b):

(2) a. The tree is *ten meters* behind the house.
b. *diagonally* above the door

(adapted from Zwarts & Winter (2000): (5b)–(6))

[1] The light preposition *se* contracts before the definite determiner.

(3) a. # The cat is *five feet* on the box.
b. # The cat is *straight* at the box.

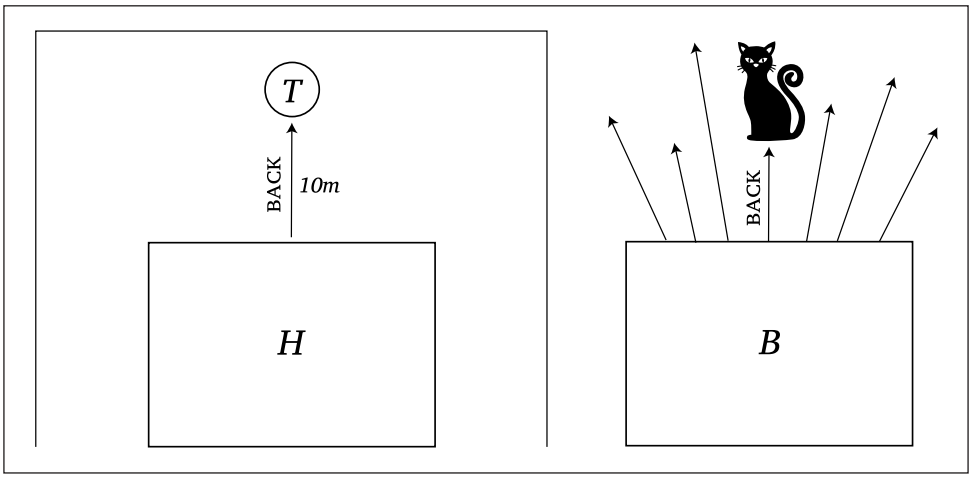

Figure 1: Left: *10m behind the house* Right: *cat behind the box*.

Given that measure phrases (henceforth: MPs) such as *ten meters* in (2a) are predicates over distance, and adjuncts like *diagonally* in (2b) are predicates over direction, Zwarts (1997) and Zwarts & Winter (2000) proposed a vector space ontology, since vectors have both magnitude and direction. Intuitively, vectors project away from the ground's boundaries and return a region in which the figure is contained (**Figure 1**, right).

Zwarts & Winter (2000) gave vector-based definitions for projective and non-projective prepositions alike. However, the assumption that all locative prepositions should be treated as vectorial has been debated. Kracht (2008) points out in this regard: "A problematic case [...] is 'in'. There seems to be no need to establish coordinate systems in order to form an opinion whether an object is in another object. There is no contradiction in this; we may simply say that the semantics works without a coordinate system." This is because *in* conveys topological information. In mathematics, a spatial relation is topological if and only if it is preserved under deformation of space. Common prepositions that are amenable to topological analyses denote containment, contact, and disjointness, such as English *in, on, out of*, and their crosslinguistic counterparts.

Zwarts (2010) explores the possibility that some prepositions involve *force* vectors instead of *spatial* ones and thus do not have geometrical but rather "force-dynamic" denotations. A prototypical force-dynamic preposition would be *against*, as in *John was leaning against the door*, but spatial relations that involve contact may alternatively receive force-dynamic analyses; for instance, English *on* might be treated as a geometrical preposition denoting *contact* or as

a force-dynamic preposition denoting *support*. According to Zwarts (2010), the force-dynamic approach can be extended to prepositions denoting containment, such as *in*, with further fine-grained distinctions cross-linguistically.[2,3]

Another class of prepositions that may be used in a locative context involve *paths*. Typically, a path is the trajectory a figure moves along (4b–d). However, some prepositions such as *around*, *along*, *over*, and their crosslinguistic counterparts are often used in a static context (5). In such cases, the PP describes the shape of the figure and/or its extension along the ground (cf. Zwarts 2003).

(4) a. John is in the pool. *locative*
b. John dived into the pool. *path (goal)*
c. The man came from the city. *path (source)*
d. The horse raced past the barn. *path (route)*

(5) a. The crowd is standing around the house.
b. There is a promenade along the river.
c. The blanket is over the chair.

Zwarts (2005) defines paths as continuous functions from the real unit interval [0,1] to points in space. As such, paths may outline trajectories of various shapes. For instance, they can be cyclical, as in (5a), or zig-zagging, as (possibly) in (5b). Paths are divided into three main subtypes: goal, source and route ones (4b–d),[4] but prepositions with locative uses tend to fall into the class of route prepositions. Svenonius (2010) labels these "locative" path prepositions "extended".

In his discussion of English prepositions, Svenonius (2010) moreover individuates a class containing prepositions that denote proximity, e.g. *near/next to*, and interpolation, e.g. *between/among*. This class disallows MP modification and omission of the ground in anaphoric identification (6a), contrasting with projectives (6b). Svenonius categorizes these prepositions together under the label "bounded" due to the unavailability of MP modification, although he acknowledges that they do not form a uniform group.[5]

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[2] Cf. German *an* / Dutch *aan*, which denote contact with a vertical surface. Another interesting case is Korean, which has distinct expressions for loose and tight containment (Choi & Bowerman 1991). On the division of labor between semantics and pragmatics or geometry and function see Zwarts (2017).

[3] The idea that some prepositions have a functional and/or force-dynamic meaning originates in the cognitive literature (Bowerman 1996; Coventry & Garrod 2004; Gärdenfors 2014 a.o.).

[4] For the typology and properties of paths see Kracht (2002), Zwarts (2005; 2008), Pantcheva (2011) and references therein.

[5] Interestingly, Piaget considered proximity and neighborhood relations "topological" when he formulated the hypothesis that children start with a topological representation of space and then switch to a Euclidean one (Piaget & Inhelder 1948/1967). This hypothesis has been disputed in modern research (see Newcombe & Huttenlocher 2000).

(6) a. There was a beach. Next *(to it), the cliffs swarmed with birds.
b. There was a beach. Above (it), the cliffs swarmed with birds.
from Svenonius (2010): his (21e) and (20f)

The picture gets more complicated as some prepositions with apparently similar denotations have different distributions and thus may belong to different classes. For instance, Zwarts & Winter (2000) note that *in* and *inside* are not interchangeable: cf. *in the air* vs. * *inside the air*. Gärdenfors (2014) argues that "*inside* seems to take a boundary as its landmark and refer to a region at one of the two sides of the boundary", hence *inside the border* but * *in the border*. It is thus possible that *inside* is vectorial, whereas *in* is not. This would explain why MP modification is sometimes possible with *inside* (7a), but never with *in* (7b):

(7) a. The nail is 1 inch inside the wall. (from Zwarts & Winter 2000; their (27))
b. * The nail is 1 inch in the wall. (mine)

These and other observations from the literature suggest that the semantic taxonomy of locative expressions is a rich one. Whether this taxonomy is reflected in the syntax of locative PPs, however, and if so, how and to what extent, is an independent question. Svenonius (2006; 2008; 2010) proposes a cartographic analysis (along the lines of Cinque 1999) of English locative PPs in terms of extended P projections (Grimshaw 1991), in which each head has a distinct semantic contribution. The various classes of prepositions result from the workings of—and the interaction between—the different parts of the extended projection, with projectives being the exponents of the most complete paradigm.

The interplay between syntax and the semantic typology of locative expressions has not received much attention in crosslinguistic studies. Ursini & Long & Zhang (2020) and Ursini & Tse (2021) investigate this interplay in Mandarin and French, respectively. The authors examine the form and behavior of projective and "region" (i.e. non-projective/"bounded") PPs, and argue that the two classes are not tied to distinct syntactic structures in a cartographic fashion, but it is rather language-specific considerations that dictate the morphosyntax of locative constructions. The semantic typology and the distribution of measure phrases are accordingly accounted for via features posited on the relevant syntactic projections. Importantly, both works find a low degree of isomorphism between semantic and syntactic complexity in locative PPs in the languages looked at.

The Greek data discussed in this paper present a different picture in this regard, in that the semantic typology is reflected in syntax and morphology. Specifically, while projective PPs support a decompositional account along the lines of Svenonius (2010), there is evidence that non-projective PPs (excluding path/"extended" locatives of the kind shown in (5)) are syntactically

reduced. The syntactic account developed here builds on a proposal by Theophanopoulou-Kontou (2000), according to which Greek complex PPs come in two frames: one in which the "adverb" is a head, and one in which it is an adjunct. Applied to the locative pair in (1), repeated below as (8), the two frames will be shown to correlate with the projective/non-projective distinction, with the status of the "adverb" (glossed with small caps) oscillating between a head in projectives (8a) and an adjunct in non-projectives (8b):

(8) a. I gata ine **piso** **apo** to kuti. *projective*
the cat is BACK *apo* the box
'The cat is behind the box.'

b. I gata ine **mesa** **s**-to kuti. *non-projective*
the cat is IN *se*-the box
'The cat is in the box.'

The paper is organized as follows: Section 2 is an introduction to the prepositional system of Greek and discusses previous analyses of locative PPs. Section 3 discusses and runs the diagnostics for projective prepositions, and then examines the behavior of the newly established classes, presenting evidence for different underlying structures. Section 4 lays out the details of the syntactic analysis and semantic composition of projective and non-projective locative PPs. Section 5 concludes.

2. Background

2.1. A crash course on the Greek prepositional system

Lechner & Anagnostopoulou (2005) classify Greek prepositions into *transitive* (9)–(10) and *intransitive* (11). Transitive prepositions obligatorily take an accusative DP-complement and can be further subdivided into *functional* (or *light*) (9a), which can serve as complements of other prepositions, thus forming complex PPs (9b), and *lexical* (10a), which cannot (10b):[6]

(9) Functional (light) prepositions: *se* 'at, to', *apo* 'from, by', *me* 'with', *gia* 'for'.

a.	s-*(to spiti)	me * (ton Petro)	gia * (ton Petro)
	at/to-the house	with the Peter	for the Peter
	'at/to the house'	'with Peter'	'for Peter'
b.	mesa s-to spiti	mazi me ton Petro	anti gia ton Petro
	inside at-the house	together with the Peter	instead for the Peter
	'inside the house'	'together with Peter'	'instead of Peter'

[6] Examples (9)–(10) are modified from Lechner & Anagnostopoulou (2005)'s (1)–(3), respectively.

(10) Lexical (heavy) prepositions: *pros* 'towards', *kata* + ACC 'according to', *mechri* 'until, up to', *os* 'until, up to', *eos* 'until, up to', *isame* 'up to', *san* 'like'.

a. pros * (to spiti) kata * (ton Petro)
towards the house according the Peter
'towards the house' 'according to Peter'

b. *konta pros to spiti *simfona kata ton Petro
near towards the house according according the Peter

The light prepositions in (9), particularly *se* and *apo*, have a wide range of uses that are associated with Case: *se* has a dative function, marking goal arguments of ditransitive verbs and some types of high applicatives (Anagnostopoulou 2003; 2005), whereas *apo* marks source arguments of ditransitives and nominal possessors, gradually replacing the genitive (Anagnostopoulou 2003; 2005). Moreover, *apo* is found in comparatives (Merchant 2009) and distributives (Michelioudakis 2020).

Intransitive prepositions may appear with or without a complement, which can be either a light PP (11a–b), or a genitive DP (11c):

(11) Intransitive prepositions

a. mesa (s-to spiti) mazi (me ton Petro) kato (apo to trapezi)
inside at-the house together with the Peter under from the table
'inside (the house)' 'together (with Peter)' 'underneath (the table)'

b. meta (apo to fagito) prin (apo ton Petro)
after from the dinner before from the Peter
'after dinner' 'before Peter'

c. iper (tu Petru) kata (tu Petru) enantion (tu Petru)
in_favor_of the Peter_{gen} against the Peter_{gen} against the Peter_{gen}
'in favor (of Peter)' 'against (Peter)' 'against (Peter)'

The intransitive prepositions that participate in the formation of spatial expressions, a list of which is given in (12), are also referred to in the literature as "adverbs" (Theophanopoulou-Kontou 2000), a term commonly found in traditional grammars, and as locative [P]s (Terzi 2010). In fact, these "prepositions" appear in a wide range of environments: not only as parts of complex PPs (11), but also as standalone locative adverbs/pro-forms (13a), verb particles (13b), and nominal modifiers (13c):

(12) *brosta* 'FRONT', *piso* 'BACK', *(e)pano* 'UP', *kato* 'DOWN', *dipla* 'SIDE', *mesa* 'IN', *ekso* 'OUT'

(13) a. kathome piso *adverb*
sit.I BACK
'I'm sitting at the back.'

b. kano piso *verb particle*
do.I BACK
'I'm moving backwards / I'm withdrawing.'

c. to piso kathisma *nominal modifier*
the BACK seat

The function and the syntactic status of these multi-faceted items are different in each case. Moreover, as is argued in this paper, their syntactic status varies within the spatial domain as well, correlating with the semantic type of the expression. For this reason, they will henceforth be referred to by the more abstract and atheoretic term *spatial words*. The small caps in the gloss indicate their "primitive" spatial meaning.[7]

2.2. Simple and complex locative PPs

Simple locative PPs are formed by *se* and the ground DP:

(14) a. Ta klidia ine s-to trapezi.
the keys are *se*-the table
'The keys are on the table.'

b. Ta ruxa ine s-tin dulapa.
the clothes are *se*-the closet
'The clothes are in the closet.'

c. I Maria ine s-to spiti.
the Mary is *se*-the house
'Mary is at home.'

d. I Maria / ta psaria / to spiti ine s-ti thalasa.
the Mary the fish the house is/are *se*-the sea
'Mary/the fish/the house is/are at/in/by the sea.'

The exact interpretation of these PPs is contextually determined, i.e. it depends on world knowledge and properties of the figure and the ground. For example, a bottle of milk is more likely to be found *in* a fridge, not *on* one, whereas a book may occasionally be lying on top of a fridge but is very unlikely to be found in it. The denotational range of simple *se*-PPs is limited to topological (14a–b) and proximity or underspecified relations (14c–d). In order to disambiguate between topological relations (15a) or express projective ones (15b), complex PPs must be used. The latter can be divided into complex *se*-PPs (15a) and complex *apo*-PPs (15b) based on the light preposition marking the ground:

[7] Unlike the light prepositions in (9), which are phonological clitics, spatial words are phonological words. On how the different uses of spatial words are interconnected see Section 4.3.

(15) a. mesa s-tin dulapa
IN *se*-the closet
'in the closet'

b. piso apo ton kanape
BACK *apo* the couch
'behind the couch'

Some spatial words can combine with either *se* or *apo*. Depending on the spatial word, the *se*-compound and the *apo*-compound may be synonymous, as in (16a–b), or express different spatial relations, as in (17a–b) (cf. Terzi 2010):[8]

(16) a. I Maria ine **brosta s**-tin tileorasi. *'in front of'*
the Mary is FRONT *se*-the TV

b. I Maria ine **brosta apo** tin tileorasi. *'in front of'*
the Mary is FRONT *apo* the TV
'Mary is in front of the TV.'

(17) a. I laba ine **pano s**-to trapezi. *'on'*
the lamp is UP *se*-the table
'The lamp is on the table.'

b. I laba ine **pano apo** to trapezi. *'above/over'*
the lamp is UP *apo* the table
'The lamp is above the table.'

Although the two kinds of complex PPs are similar on the surface, previous research has posited the existence of two distinct syntactic frames underlying complex PPs in Greek. Theophanopoulou-Kontou (2000) argued for two distinct constructions, one in which the "adverb" (i.e. the spatial word) can be omitted, and one in which it cannot. This observation, when applied to the locative domain, leads to the following generalization: in complex *se*-PPs, the spatial word can be omitted (18a), whereas in complex *apo*-PPs, it cannot (18b):

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[8] There is a confound, namely a construction in which the spatial word is adjacent to a *se*-PP but in an appositional relationship with it. In that case, the spatial word acts as a deictic particle and is typically separated by an intonational break:

(i) O Yanis ine pano (,) s-tin taratsa
the Yanis is UP *se*-the roof
'Yanis is up on the roof.'

Two spatial words, one acting as a deictic and another as part of a complex PP (in the sense described in the main text), may co-occur:

(ii) O Yanis epese kato (,) pano sta karfia / sta vraxia.
the Yanis fell.3sg DOWN UP *se*-the nails *se*-the rocks
'Yanis fell down/off onto the nails/rocks'.

(18) a. I gata ine (pano) s-to trapezi.
the cat is UP *se*-the table
'The cat is on the table.

b. I gata ine #(kato) apo to trapezi.
the cat is DOWN *apo* the table
'The cat is under the table.' / # 'The cat is from the table.'

If the spatial word is omitted from a complex *se*-PP, as in (18a), the remainder is a simple *se*-PP, which is still a locative, i.e. the type of the spatial expression is not altered. However, if the spatial word is omitted from a complex *apo*-PP, as in (18b), the locative meaning is lost. Theophanopoulou-Kontou (2000) argued that the "adverb" is a head if it cannot be omitted (18b). Following Starke (1993), she proposed that the light PP is a case-marked DP, the light preposition itself being a nominal C(omplementizer) head:[9]

(19) $[_{PP}$ piso $[_{CP}$ apo $[_{DP}$ ti Maria]]] (based on Theophanopoulou-Kontou 2000)

Although Theophanopoulou-Kontou (2000) does not discuss constructions in which the spatial word can be omitted, i.e. cases like (18a), in depth, she suggests that in the latter, the "adverb" specifies the meaning of the light-PP, with the light P being responsible for theta-role assignment (e.g. as *locative* in (18a)).

Terzi (2010) takes a different approach and proposes that spatial words are modifiers of a silent Place noun, as in (20). Terzi (2007; 2010) and Botwinik-Rotem & Terzi (2008) suggest that the role of the light prepositions *se* and *apo* is to check Case on the ground DP because the spatial word fails to do so, thus dissociating *se* and *apo* from theta roles:

(20) $[_{PPLoc}$ $[_{PLoc}$ 0 $[_{SC}$ $[_{DP}$ ø $[_{NP}$ pano Place]] $[_{PP}$ apo/se $[_{DP}$ ti Maria]]]]]
UP *apo/se* the Mary
'above/on Mary' (based on Terzi 2010: her (18))

[9] An anonymous reviewer comments that the possibility to omit the spatial word in (18a) is not compelling evidence for its adjunct status, and argues that what we see is semantic entailment. In Section 3.2, further evidence for the adjunct analysis in non-projectives is presented. Furthermore, entailment is orthogonal to the head *vs* adjunct status as there are both heads and adjuncts that do not preserve entailment, such as intensional verbs and adverbs (e.g. *allege/allegedly*). Moreover, not all complex *se*-PPs entail a simple *se*-PP, as (ia–b) show:

(i) a. I Maria ine konta s-to spiti.
the Mary is CLOSE *se*-the house
a'. 'Mary is close to home'.

b. I Maria ine s-to spiti.
the Mary is *se*-the house
b'. 'Mary is at home.'

However, in (20), complex *se*-PPs are not distinguished from complex *apo*-PPs in terms of syntactic structure. Everything else being equal, this predicts that both constructions should behave alike. Section 3 shows that this prediction is not borne out, with complex *se*-PPs differing from complex *apo*-PPs in a number of ways.

The account developed in Section 4 builds on Theophanopoulou-Kontou (2000)'s core idea that the syntactic status of the spatial word may vary and incorporates elements of Svenonius (2008; 2010)'s analysis of projectives. Specifically, it is proposed that, in complex *se*-PPs, the spatial word is an adjunct to a KP headed by *se*, whereas in complex *apo*-PPs, the spatial word is a head taking a KP complement headed by *apo*. This head is related to the vector semantics of projective expressions (Svenonius 2008; 2010), which for this reason are syntactically larger than non-projective ones. Moreover, the evidence discussed below supports Terzi (2007; 2010)'s view that *se* and *apo* are case-markers that have no semantic contribution.

3. Novel data

This section presents the novel data supporting the main claim of this paper, namely that the choice between *se* and *apo* in complex locative constructions correlates with the projective/non-projective distinction, a distinction that is reflected in the syntax. Section 3.1 discusses the diagnostics for projective denotations, i.e. measure-phrase and projective modification, and runs them on Greek complex PPs. Complex *apo*-PPs are shown to allow modification, while complex *se*-PPs are shown to resist it. Section 3.2 examines the syntactic differences between complex *apo* and complex *se* locative PPs and presents arguments for the spatial word being a head in the former and an adjunct in the latter. Section 3.3 provides additional evidence from directional expressions in support of the analysis, showing that *se* and *apo* cannot be interpreted as path prepositions in the position adjacent to the ground, and are thus to be treated as semantically empty case-markers.

3.1. Measure-phrase and projective modification as diagnostics for projective PPs

Zwarts & Winter (2000) argued that MP modification is contingent upon the formal property of upward vector-monotonicity (VMON↑). Intuitively, upward vector-monotonicity means that, in a given spatial relation, if the figure moves away from the ground along an axis described by the preposition, the truth-value of the expression is preserved. **Figure 2** illustrates this: behind the house, there are two objects that are located on the same axis: a tree and a doghouse, the tree being closer to the house. Because *behind* is a VMON↑ preposition, if (21a) is true, (21b) is also true:

(21) a. The tree is behind the house.
b. The doghouse is behind the house.

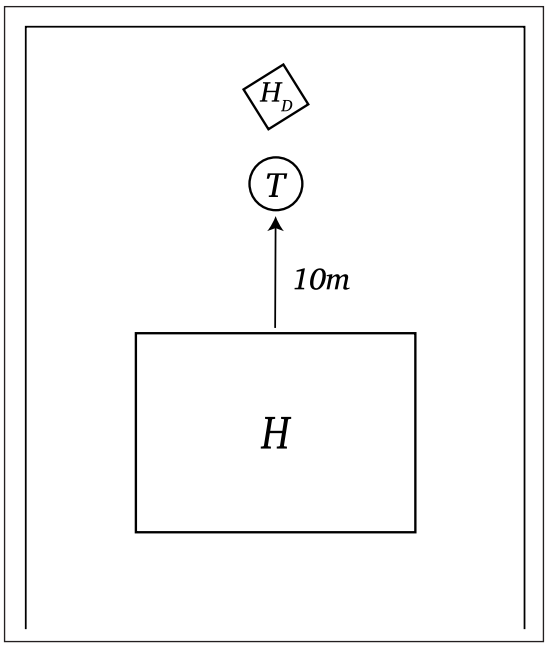

Figure 2: a house (*H*), a tree (*T*), and a doghouse (H_D).

Zwarts & Winter (2000) classify all projective prepositions, i.e. *above/over*, *below/under*, *in front of / behind*, and *beside*, plus *outside* as VMON↑. Non-projective prepositions such as *near*, *on*, *at*, *in*, *inside*, and *between* are not VMON↑, and thus disallow MP modification. Among the prepositions studied by the authors, *outside* stands out as the only non-projective preposition which is VMON↑. Therefore, while not all prepositions that are VMON↑ are projective, the opposite is true, i.e. all projective prepositions are VMON↑.[10]

Another property of projective expressions is that they can be modified by the projective modifiers *straight* and *diagonally*, which are sensitive to axis information. According to Zwarts & Winter (2000), projective modification is possible only when a unique axis can be determined. This requirement is trivially satisfied by projective prepositions, such as *above*, which defines just one UP axis, while the non-projective *outside* defines six (in a 3D space). However, *outside* can be modified by projective modifiers if it satisfies the unique axis determination constraint. For instance, when someone is waiting *outside the building*, the latter can be a paraphrase of *in front of the building* (cf. Mador-Haim & Winter 2015: fn. 10). In this case, projective modifiers are acceptable. Note, moreover, that there is a sharp contrast with regard to projective modification between *outside* (22a) and (the unambiguously topological) *out of* (22b):

[10] Even though projective expressions are expected to allow MP modification, there are some prepositions that "misbehave", such as English *beside*. Zwarts & Winter (2000) annotate the MP modification of *beside* with a question mark. Svenonius (2008) notes that *beside* may be projective but inherently specified for closeness, and lists examples with projective modification. He proposes that some speakers may have a non-vector analysis (his fn.4). In Svenonius (2010), he includes it in the class of "bounded" prepositions.

(22) a. ?The workers are waiting straight/diagonally outside the building.
b. *The workers are waiting straight/diagonally out of the building.

The rest of this subsection uses MP and projective modification as diagnostics to detect projective PPs in Greek.

Table 1 provides a list of possible combinations of spatial words with *se* and *apo*, and their respective locative meanings:

Spatial Words	**+ se**	**+ apo**
mesa	'in'	'on the other side of'[11]
ekso		'outside, out of'
pano	'on'	'above, over'
kato		'under, below'
dipla	'by, next to'	'beside'
brosta	'in front of, before'	'in front of'
piso		'behind'
deksia		'to the right of'
aristera		'to the left of'
voria		'north of'
notia		'south of'
anatolika		'east of'
ditika		'west of'
konta	'close to, near'	'close to, not far from'
makria		'far from'
anamesa	'between, among'	
kontra	'against'	
gyro	'around' (time only)	around

Table 1: Complex PPs formed with *se* and *apo*.

[11] The most common occurrence of *mesa apo* is as a route expression meaning 'through'. Here, the projective reading is given. See the discussion around (24) for the projective denotation and Section 3.3 on directional expressions for the route reading.

A quick look at Column 3 is suggestive of the projective nature of complex *apo*-PPs: no combination of a spatial word with *apo* seems to have a topological or force-dynamic meaning. Instead, one mostly finds projective denotations with all possible frames of reference, e.g. *brosta/piso apo* 'in front of / behind' that use either the intrinsic or the relative frame, and *voria/notia apo* 'north/south of' that make use of the absolute frame.[12] On the other hand, Column 2 shows that complex *se*-PPs have non-projective denotations, such as topological (*mesa se* 'in', *pano se* 'on'), force-dynamic (*kontra se* 'against'), interpolation (*anamesa se* 'between, among'), and proximity (*konta se* 'near') ones. There seem to be two apparent exceptions, namely *brosta se* 'in front of' and *dipla se* 'by, next to', which, as is shown below, behave like non-projectives according to the diagnostics.

If complex *apo*-PPs are projective and hence VMON↑, they are expected to allow MP modification. This holds for all compounds except for *konta apo* 'not far from', the canonical uses of *makria apo* 'far from', and *gyro apo* 'around' which are discussed next. Examples (23)–(24) illustrate:

(23) a. O Yanis kathete 2 m brosta / dipla apo tin tileorasi.
the Yanis sits 2 m FRONT SIDE *apo* the TV
IM: 'Yanis is sitting 2 meters in front of / beside the TV.'

b. To dentro ine 10m ekso / piso apo to spiti.
the tree is 10m OUT BACK *apo* the house
'The tree is 10m outside / behind the house.'

c. To aeroplano petuse 1000 podia pano apo to stadio.
the plane flew 1000 ft UP *apo* the stadium
'The plane was flying at 1000 ft above the stadium.'

d. O thisavros ine krimenos 50m kato apo tin eklisia.
the treasure is hidden 50m DOWN *apo* the church
'The treasure is hidden 50m under the church.'

e. I Maria kathete 2m aristera / deksia apo ti Georgia.
the Mary sits 2m LEFT RIGHT *apo* the Georgia
'Mary is sitting 2m to the left/right of Georgia.'

f. Ta Meteora vriskonte 200km voria/notia/anatolika/dytika apo to Miami.
the Meteora lie 200km NORTH/SOUTH/EAST/WEST *apo* the Miami
'Meteora lies 200 km north/south/east/west of Miami.'

An interesting case is *mesa apo*, in which the spatial word *mesa* 'IN' combines with *apo* to form a projective. Unlike English *inside*, locative *mesa apo* is not compatible with containment *within the ground*, but rather denotes containment in an enclosed region *beyond* but *adjacent to* the ground,

[12] The absolute-frame spatial words *voria*, *notia*, *anatolika*, and *ditika* can alternatively combine with a genitive DP.

roughly translating as ‘on the other side of’ or ‘behind’. It can be modified by a measure phrase (24):[13]

(24) Context: *We have dug a tunnel leading to where we think the bank’s safe is. We now see a wall, and we expect the safe to be on the other side of it.*
% To xrimatokivotio ine (2m) mesa apo afton ton tixo.
the safe is 2m IN *apo* this the wall
‘The safe is on the other (inner) side of this wall at a 2m distance.’

The next diagnostic is projective modification. As is shown in (25), all the PPs in (23) and (24) can be modified by the projective modifiers *isia* ‘straight’, and *diagonia* ‘diagonally’, except for the absolute frame *voria/notia/anatolika/ditika* ‘north/south/east/west of’, with which *diagonia* is deviant.

(25) a. O Yanis kathete isia/diagonia brosta/dipla apo tin tileorasi.
the Yanis sits straight/diagonally FRONT/SIDE *apo* the TV
‘Yanis is sitting straight/diagonally in front of / beside the TV.’

b. To dentro ine isia/diagonia ekso / piso apo to spiti.
the tree is straight/diagonally OUT / BACK *apo* the house
‘The tree is straight/diagonally outside / behind the house.’

c. To aeroplano petuse isia/diagonia pano apo to stadio.
the plane flew straight/diagonally UP *apo* the stadium
‘The plane was flying straight/diagonally above the stadium.’

d. O thisavros ine krimenos isia/diagonia kato apo tin eklisia.
the treasure is hidden straight/diagonally DOWN *apo* the church
‘The treasure is hidden straight/diagonally under the church.’

e. I Maria kathete isia/diagonia aristera /deksia apo ti Georgia
the Mary sits straight/diagonally LEFT /RIGHT *apo* the Georgia
‘Mary is sitting straight/diagonally to the left/right of Georgia.’

f. To xrimatokivotio ine isia/diagonia mesa apo afton ton tixo.
the safe is straight/diagonally IN *apo* this the wall
‘The safe is straight/diagonally behind this wall.’

[13] This construction is not accepted by some speakers, including an anonymous reviewer. Ten informants from different parts of the country were asked to evaluate on a Likert 1–5 scale possible descriptions of a picture. The examples contained *mesa apo/se* with and without projective modification. Projective use of *mesa apo* received a mean score of 2.9, topological use a mean of 1.8. Topological use of *mesa se* received a mean of 5.0, projective use 1.4. Thus, while not all speakers have *mesa apo* in their lexicon as a locative, crucially, those who do, they have it as a projective, whereas *mesa se* does not have a projective reading.

All the complex *apo*-PPs so far examined have passed the tests and can thus be classified as projectives. There are a few *apo*-compounds, however, that do not qualify as projectives. The complex *apo*-PPs *konta apo* 'close to, not far from', accepted by some speakers,[14] and *makria apo* 'far from' likely involve path denotations, as they are ambiguous between linear (air-distance) and non-linear (zig-zag) readings. The fact that their English counterparts include the preposition *from*, a source preposition, is suggestive. This assumption is further confirmed by the ill-formedness of projective modification:

(26) To farmakio ine (*[isia/diagonia]) %konta / makria apo tin eklisia.
the pharmacy is straight/diagonally close far *apo* the church

MP modification is never allowed with *konta apo*, but is acceptable with *makria apo*,[15] in which case, however, the inherent degree specification disappears (also note the different gloss):

(27) a. % Eksaxronos vrethike (* 250m) konta apo to nipiagogio tu.
6-year-old was_found 250m away *apo* the kindergarten his.cl

b. Eksaxronos vrethike 250m makria apo to nipiagogio tu.
6-year-old was_found 250m away *apo* the kindergarten his.cl
'A 6-year-old was found 250m away/*far from his kindergarten.'

Moreover, a contrast is found between *konta apo* and the standard proximity compound *konta se*. *Konta se* displays a sensitivity to the relative size of the figure and the ground (28a), which is not present with *apo*:[16]

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[14] The compound *konta apo* is not accepted by an anonymous reviewer and their informants. Several instances were found on the Internet, which were then given for evaluation to the same ten informants as in the previous footnote. The questionnaire also included (28) and examples containing *konta se*. *Konta apo* received a mean score of 2.9, while *konta se* was universally accepted with a mean score of 4.9.

[15] Thanks to anonymous reviewer for pointing this out. Example (27b) is theirs.

[16] Generally, it seems that object size does not pose any constraints in the case of projectives. For example, if Mary has a picture of her taken in front of a mountain we may utter (i):

(i) To vuno ine piso apo ti Maria.
the mountain is BACK *apo* the Mary
'The mountain is behind Mary.'

In another scenario, we might imagine that we and Mary are in front of a building. Then Mary goes around the block to the back of the building and stands behind it. If we ask ourselves what the position of the building is with respect to Mary from our POV, (iia) is a possible description, whereas (iib) is not:

(ii) a. ? Ine to ktirio brosta apo ti Maria,
is the building FRONT *apo* the Mary
'The building is in front of Mary,'

b. # Ine to ktirio brosta s-ti Maria,
Is the building FRONT *se*-the Mary
... ke gia afto den borume na ti dume.
... 'and that's why we can't see her.'

(28) a. I Chios ine konta s-tin / % [apo tin] Turkia.
the Turkey is CLOSE *se*-the *apo* the Turkey
'The island of Chios is [close to] / [not far from] Turkey.'

b. I Turkia ine konta # s-ti / % [apo ti] Xio.
the Turkey is CLOSE *se*-the *apo* the Chios
'Turkey is #[close to] / [not far from] Chios.'

Lastly, the complex *apo*-PP class contains route, or "extended" prepositional compounds, such as *gyro apo* 'around' (29a). Recall from (5) that paths may also denote the location or extension of the figure along the ground (Zwarts 2003; Svenonius 2010). As will be discussed in Section 3.3, the ground is marked by *apo* in non-projective route constructions. For this reason, some complex *apo*-PPs are ambiguous between a projective reading and a locative route ("extended") reading (29b):

(29) a. To plithos ine gyro apo to dikastirio.
the crowd is ROUND *apo* the courthouse
'The crowd is gathered around the courthouse.'

b. To rixtari ine pano apo ton kanape.
the drape is UP *apo* the couch
R1 (route/"extended"): 'The drape is over the couch.'
#R2 (projective): 'The drape is above the couch.'

Moving on to complex *se*-PPs (**Table 1**: Column 2), we see that it is a smaller inventory. All its members disallow MP and projective modification. First, consider the topological compounds for containment (30a) and contact (30b). As expected, MP modification is out:

(30) a. Ta molyvia ine (* 5 ek) mesa s-to syrtari.
the pencils are 5 cm IN *se*-the drawer
'The pencils are (* 5 cm) in the drawer.'

b. Ta molyvia ine (* 5 ek) pano s-to trapezi.[17]
the pencils are 5 cm UP *se*-the table
'The pencils are (* 5 cm) on the table.'

Note that the compound preposition *mesa se* in (30a) differs from the projective *mesa apo* of (24), in that in the latter, the figure is not contained in the ground, but in enclosed area beyond it,

[17] A reviewer asks whether *pano se* could have a projective component. Unlike English *on top of*, *pano se* has a simple contact meaning, i.e. it is not restricted to the top part of the ground. For example, if there is a sticker on the side of a desk, *pano se* can be used:

(i) Ine kolimeno ena aftokolito pano s-to thranio.
is stuck a sticker UP *se*-the desk
'There is a sticker on the desk('s side).'

whereas in (30a), the figure is contained in the ground.[18] However, there are a few cases in which MP modification with *mesa se* is felicitous:

(31) a. To karfi ine 5 xiliosta mesa s-ton tixo.
the nail is 5 mm IN *se*-the wall
'The nail is 5mm inside/into the wall.'

b. Imaste 100 km mesa s-ti Servia.
we.are 100 km IN *se*-the Serbia
'We are 100km inside/into Serbia.'

These examples likely involve embedded paths (cf. Svenonius 2010). Firstly, in (31a), the MP *5 xiliosta* '5mm' measures out the extension of the figure into the ground, while (31b) has a zig-zag reading on which one has traveled a 100km distance from the border without being at a linear distance of 100km from it at the moment of utterance. Secondly, the MPs in (31) cannot be omitted: if the MP *5 xiliosta* '5mm' in (31a) were left out, the clause would mean that the whole nail is stuck inside the wall (32a–b). Thus, (31a) does not entail (32b). This is never the case with projectives: in (23), all MP-modified constructions entail their un-modified variants.

(32) a. To karfi ine #(5 xiliosta) mesa s-ton tixo.
the nail is 5 mm IN *se*-the wall
'The nail is 5mm inside/into the wall.'

b. To karfi ine mesa s-ton tixo.
the nail is IN *se*-the wall
'The nail is in/inside the wall.'

Turning to the rest of the *se*-compounds, the force-dynamic *kontra se* 'against', and the proximity-denoting *konta se* 'near, close to' are not expected to license a MP either, and indeed, they do not. The same goes for the interpolation compound *anamesa se* 'between, among':

[18] It seems that there is no direct correspondence between Greek *mesa se/apo* and English *in/inside*. English *inside* is compatible with two different denotations, i.e. containment within the ground (as in *inside the fridge*), and containment in an enclosed region beyond the ground (as in *inside the borders*). As the examples below illustrate, Greek *mesa se* is compatible only with the former reading, while *mesa apo* only with the latter (i)–(ii). The more archaic preposition *endos* that requires a genitive complement is like *inside* in that it is compatible with both denotations (iii):

(i) mesa se/*apo to psygio
IN *se* *apo* the fridge
'in/inside the fridge'

(ii) mesa *se/apo ta synora
IN *se* *apo* the borders
'inside the borders'

(iii) endos psygiu / synoron
inside fridge.gen borders.gen
'inside the fridge/borders'

(iv) (*mesa) s-ton aera
IN *se*-the air
'in the air / on air'

Moreover, (iv) shows that *mesa se* is not equivalent to English *in*; although *mesa se* seems to share the same denotation as *in*, it is marked. One possible explanation of the ill-formedness of (iv) is that, since the air has no boundaries, the marked alternative with *mesa* is infelicitous.

(33) a. I Maria egerne (*10 ek) kontra s-ton tixo.
the Mary leaned 10 cm against *se*-the wall
'Mary was leaning (*10cm) against the wall'.

b. O Yanis itan (*2km) konta s-to parko.
the Yanis was 2km NEAR *se*-the park
'Yanis was (*2km) close to the park.'

c. I gata itan (*2m) anamesa s-ton Yani ke ti Maria.
the cat was 2m between *se*-the Yanis and the Mary
IM: 'The cat was lying between Yanis and Mary at a 2m distance from either.'

As was mentioned above, there are two *se*-compounds that at first sight seem to have projective denotations: *brosta se* 'in front of ' and *dipla se* 'by, next to'. However, both fail to pass the measure phrase and projective modification tests (compare (34a–b) with (23a) & (25a)):

(34) a. O Yanis kathete (*2 m) brosta / dipla s-tin tileorasi.
the Yanis sits 2 m FRONT SIDE *se*-the TV
IM: 'Yanis is sitting 2 meters in front of / beside the TV.'

b. O Yanis kathete (* isia / * diagonia) brosta /dipla s-ti Maria.
the Yanis sits straight diagonally FRONT/SIDE *se*-the Mary
'Yanis is sitting straight / diagonally in front of / beside Mary.'

Furthermore, in some cases, *brosta/dipla se* seem to lack a projective component altogether. In examples (35a–b), there is a sharp contrast between *brosta/dipla apo*, i.e. the "real" projective prepositional compounds, and their *se*-counterparts: only the *se*-variants are felicitous. Interestingly, the same effect obtains in English, if one uses the counterpart projective prepositions *in front of* and *beside* instead of *by*:

(35) a. I Maria agorase ena spiti brosta s / # apo ti thalasa.
the Mary bought a house FRONT *se* *apo* the sea
'Mary bought a house by /# in front of the sea.'

b. I Maria agorase ena spiti dipla s / # apo ti thalasa.
the Mary bought a house SIDE *se* *apo* the sea
'Mary bought a house by /# beside the sea.'

Here, the *se*-variants seem to merely denote proximity rather than projective geometry. The difference between *brosta se* and *dipla se* in (35a) and (35b), respectively, is that with *brosta*, but not with *dipla*, the house has to be right on the seafront, not just close to the sea. As to why the projective readings are impossible even in English, a tentative explanation would be that the sea is conceptualized as an unbounded space, and consequently no front/back/left and right boundaries can be defined (this is not the case for *under* and *above*, however, as *under/above the*

sea are fine). Moreover, *brosta/dipla se* pattern along the rest of the complex *se*-PPs with respect to the syntactic facts discussed in the next subsection.

Lastly, projective modification is impossible with *se*-compounds. Modification by *isia* 'straight' and *diagonia* 'diagonally' is acceptable in a few cases, in which, however, *straight/diagonally* modify the figure's orientation, not its location:

(36) To vivlio ine ??isia / (?)diagonia pano s-to trapezi.
the book is straight / diagonally UP *se*-the table
'The book is lying ??straight/diagonally on the table.'

Summing up, complex *se*-PPs universally disallow MP and projective modification, while complex *apo*-PPs allow both, *modulo* a few compounds that have path denotations. These are route prepositions such as *gyro apo* 'around', which would fall into Svenonius (2010)'s "extended" class, and *makria/konta apo* 'far/ not far from, close to', which likely involve source paths. The class of locative proper complex *apo*-PPs otherwise contains only projectives. On the other hand, complex *se*-PPs are "bounded"/non-projective according to the diagnostics. Their denotation range excludes projective relations, but is not uniform, including topological, proximity, force-dynamic and interpolation relations.

3.2. Evidence for different syntactic structures

Recall from Section 2.2 that Theophanopoulou-Kontou (2000) argued that the possibility to omit the spatial word correlates with its syntactic status. If it is a head, it cannot be omitted, but if it is a modifier, it can. As was shown in (18), omission is possible in complex *se*-PPs but not in complex *apo*-PPs. Thus, the spatial word is an adjunct in non-projectives (37a), and a head in projectives (37b). While the possibility to drop the spatial word is not compelling evidence for its adjunct status on its own, this section presents additional evidence that this analysis is correct.

(37) a. [$_{seP}$ SW [$_{seP}$ *se* DP]] *complex* se-*PP / non-projective*
b. [$_{swP}$ SW [$_{apoP}$ *apo* DP]] *complex* apo-*PP / projective*

The first piece of evidence comes from movement of the light PP. Complex *se*-PPs allow topic or focus-related scrambling of the functional-PP to the left of the spatial word (38), while complex *apo*-PPs do not (39):

(38) a. I valitsa ine mesa s-to aftokinito.
the suitcase is IN *se*-the car
'The suitcase is inside the car.'

b. I valitsa ine s-to aftokinito mesa.
the suitcase is *se*-the car IN
'The suitcase is inside the car.'

(39) a. I motosikleta ine piso apo to aftokinito.
the motorcycle is BACK *apo* the car
'The motorcycle is behind the car.'

b. * I motosikleta ine apo to aftokinito piso
the motorcycle is *apo* the car BACK
'The motorcycle is behind the car.'

A similar effect is found with *wh*-extraction:

(40) a. Pano se ti to evales?
UP *se* what it.cl put.2sg
'What did you put it on?'

b. Se ti to evales pano?
se what it.cl put.2sg UP

(from Terzi 2007)

(41) a. Kato apo ti to evales?
DOWN *apo* what it.cl put.2sg
'What did you put it under?'

b. * Apo ti to evales kato?
apo what it.cl put.2sg DOWN

Under the assumption that the spatial word is a head in complex *apo*-PPs, the ill-formedness of scrambled (39b) and *wh*-fronted (41b) *apo*-PPs in projectives can be attributed to illicit preposition stranding. As the examples below illustrate, Greek does not allow P stranding. This is shown for the light (42) and lexical (43) transitive prepositions of (9)–(10):

(42) a. Gia pion ine to doro?
for whom is the present
'For whom is the present?'

b. * Pion ine to doro gia?
whom is the present for
'Who is the present for?'

(43) a. San pion milai o Yanis?
like whom talks the Yanis
'Like whom does Yanis talk?'

b. * Pion milai o Yanis san?
whom talks the Yanis like
'Who does he talk like?'

Stranding is also ungrammatical in non-spatial complex PPs:

(44) a. anti gia ti Maria
instead for the Mary
'instead of Mary'

b. * gia ti Maria anti
for the Mary instead
'instead of Mary'

c. Pige o Yanis anti gia ti Maria.
went.3sg the Yanis instead for the Mary
'Yanis went in Mary's place (on Mary's behalf).'

d. * (Anti) gia pion pige o Yanis (*anti)?
instead for who went.3sg the Yanis
'Yanis went in Mary's place (on Mary's behalf).'

An anonymous reviewer comments that examples (39b) and (41b) become grammatical if modified by *(ligo) pio piso/kato* lit: '(little) more back'. The modified examples are reconstructed below:

(45) a. I motosikleta ine apo to aftokinito (ligo) pio piso.
the motorcycle is *apo* the car little more BACK

b. ? Apo ti to evales (ligo) pio kato?
apo what it.cl put.2sg little more DOWN

I suggest that these constructions involve comparatives in which the *apo*-marked DP is not the ground, but rather the standard of comparison, which is marked by *apo* in both clausal and phrasal comparatives (see Merchant 2009). This is why non-fronted variants of typical projective expressions degrade radically when modified by *(ligo) pio*:

(46) a. I gata ine (# (ligo) pio) kato apo to krevati.
the cat is little more DOWN *apo* the bed
Modified: 'The cat is further down/below than the bed.'
Unmodified: 'The cat is under the bed.'

b. Oi pinakes ine (# (ligo) pio) piso apo to piano.
the paintings are little more BACK *apo* the piano
Modified: 'The paintings are further back/behind than the piano.'
Unmodified: 'The paintings are behind the piano.'

The modified version of (46a) has an odd reading in which both the cat and the bed are below a third object, with the cat at a greater distance from it. Similarly, the modified version of (46b) has a reading in which both the paintings and the piano are behind something else. Thus, when *pio* 'more' is present, the projective reading is often unavailable because the *apo*-PP is not interpreted as the ground. For the same reason, if *piso* 'BACK' in (45a) is substituted with *kato* 'DOWN', as in (47), the reading in which the motorcycle is under the car is unavailable:

(47) I motosikleta ine apo to aftokinito (ligo) pio kato.
the motorcycle is *apo* the car little more DOWN
'The motorcycle is a bit further down (the road) than the car.'
≠'The motorcycle is under the car.'

Crucially, *apo*-PPs in comparatives can be moved, as the following example shows:

(48) Apo pion ine pio psili i Maria?
apo whom is more tall the Mary
'Who is Mary taller than?'

Therefore, while spatial constructions involving comparatives seem to be orthogonal to the present discussion, they are interesting and should be looked at in future research.

Moving on to the second piece of evidence supporting the different syntactic status of the spatial word in complex *se*-PPs *vs* complex *apo*-PPs, we observe that they have different pro-forms. In the case of complex *se*-PPs, if the referent is known, the spatial word may be used on its own for anaphoric identification of the ground, as in (49):

(49) a. I gata kathete pano s-to trapezi.
the cat sits UP *se*-the table
'The cat is sitting on the table.'

b. Eki ine ena trapezi ke i gata kathete pano.
there is a table and the cat sits UP
'(Over) there is a table and the cat is sitting on top.'

This is not the case with complex *apo*-PPs, where omission of the functional *apo*-PP does not result in an anaphoric projective pro-form, but in a different interpretation. In (50b), *piso* means 'in/at the back', rather than 'behind it'. In order to license an anaphora, the special pro-form *apopiso* must be used (50c):

(50) a. O Michalis kathete piso apo to dentro.
the Michael sits BACK *apo* the tree
'Michael is standing/sitting behind the tree.'

b. # Eki ine ena dentro ke o Michalis kathete piso.
there is a tree and the Michael sits BACK
'(Over) there is a tree and Michael is sitting in the back.'

c. Eki ine ena dentro ke o Michalis kathete apo-piso.[19]
there is a tree and the Michael sits *apo*-BACK
'(Over) there is a tree and Michael is standing/sitting behind it.'

All complex *apo*-PPs have a pro-form of the type in (50c), which is treated in Section 4 as incorporation of the light preposition *apo* into the spatial word (83). This is only possible in complex *apo*-PPs because the spatial word is a head. By contrast, non-projective pro-forms (49b) can be viewed as elliptical structures.

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[19] The *apo*-pro-forms may co-occur with *apo*-PPs as in (i), in what looks like a doubling construction. Doubling phenomena are pervasive in Greek (cf. Anagnostopoulou 2006):

i. O Michalis kathete apo-piso apo to dentro.
the Michael sits *apo*-BACK *apo* the tree
'Michael is sitting/standing behind the tree.'

Moreover, as a reviewer notes, *apo*-pro-forms may also combine with clitics. The discussion of clitic constructions falls beyond the scope of this paper.

3.3. Directional expressions

The third piece of evidence that the spatial word is a head in the projective complex *apo*-PPs and an adjunct in the non-projective complex *se*-PPs comes from directional expressions. Directional expressions built on complex non-projective PPs pattern along simple PPs, whereas directional expressions built on projective PPs follow a distinct pattern.

All locative PPs in Greek are homophonous with their goal counterparts because Greek is a V(erb)-framed language in the sense of Talmy (2000). Recall from (14) that in simple PPs, the ground is marked by *se*. Consequently, a *se*-PP may either express a locative (51a) or a goal argument (51b).[20] The goal interpretation is licensed by path verbs such as *pigeno* 'go'. Manner verbs like *xorevo* 'dance' do not admit a goal reading (52).

(51) a. I Maria ine s-ton kipo. *locative*
the Mary is *se*-the garden
'Mary is in the garden.'

b. I Maria pige s-ton kipo. *goal*
the Mary went *se*-the garden
'Mary went to the garden.'

(52) I Maria xorepse s-to saloni. *locative only*
the Mary danced *se*-the living-room
'Mary danced in the living-room.'

Simple source and route arguments are marked by *apo*. To determine whether an *apo*-PP stands for a source or a route, one has to look at the verb:

(53) a. I Maria efige apo ton kipo. *source*
the Mary left *apo* the garden
'Mary left (from) the garden.'

b. I Maria perase apo to spiti. *route*
the Mary passed *apo* the house
'Mary went/stopped by the house.'

Thus, there is an one-to-many relation between the light P and the spatial types it can express. Although the specific interpretation is co-determined by the verb, the choice between a *se*-PP and an *apo*-PP itself is not an inherent selectional property of the verb. Both verbs of (53) may alternatively combine with *se*-PPs, giving rise to goal readings, as (54a–b) illustrate:

(54) a. I Maria efige s-ti Germania. *goal*
the Mary left *se*-the Germany
'Mary went away to Germany.'

[20] Specifically, *se* marks cofinal goals, i.e. the counterparts of English *to*-PPs.

b. I Maria perase s-to saloni. *goal*
the Mary passed *se*-the living-room
'Mary moved on into the living room.'

Complex non-projective PPs follow the same pattern as simple ones, i.e. goals are homophonous with their locative counterparts (55a–b), but in sources and routes, the light preposition changes to *apo* (55c–d).

(55) Non-projective complex path PPs[21]

a. I gata ine mesa **s**-to kuti. *locative*
the cat is IN *se*-the box *(complex) se-PP*
'The cat is in the box.'

b. I gata bike mesa **s**-to kuti. *goal*
the cat got_in.3sg IN *se*-the box *(complex) se-PP*
'The cat got into the box.'

c. I gata vgike (apo) mesa **apo** to kuti. *source*
the cat got_out.3sg *apo* IN *apo* the box *(complex) apo-PP*
'The cat got out of the box.'[22]

d. I gata perase (apo) mesa **apo** to kuti. *route*
the cat passed.3sg *apo* IN *apo* the box *(complex) apo-PP*
'The cat went through the box.'

Thus, the locative complex *se*-PPs of (55a) become complex *apo*-PPs in source and route environments (55c–d), with an additional instance of *apo* optionally preceding the spatial word. Crucially, the path is reflected (via the *se/apo* shift) to the right of the spatial word *mesa*, which modifies location. This is surprising, as there is significant consensus in the literature that path

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[21] An anonymous reviewer asks with regard to examples (55c–d) whether it could be possible that Greek resorts to projective PPs to express source and route paths. This is not possible because paths have a different ontology from projectives (cf. Zwarts & Winter 2000; Zwarts 2005), and can be built on projective and non-projective locatives alike. (55c) is built on the non-projective (55a), which is presupposed, in that the cat had to first be in the box for it to get out. (55c) does not presuppose (i), which has a projective denotation:

(i) # I gata ine mesa apo to kuti.
the cat is IN *apo* the box
'The cat is on the other side of the box'.

Another way to interpret "resorting" to projectives is having the same construction with different semantics, i.e. lexical ambiguity. However, lexical ambiguity cannot derive the syntactic facts discussed in a principled manner.

[22] There is a counterpart closer to the English gloss in which the directional information contributed by *out* is not only found on the verb, but also lexicalized separately. (52c) and (i) are extensionally equivalent.

(i) I gata vgike ekso apo to kuti. *source*
the cat got_out.3sg out *apo* the box
'The cat got out of the box.'

prepositions are syntactically higher than locative ones (Jackendoff 1983; Koopman 2000; den Dikken 2010; Svenonius 2010; Pantcheva 2011), as schematized in (56):

(56) $[_{\text{PathP}}$ from $[_{\text{PlaceP}}$ inside $[_{\text{DP}}$ the box]]]

Under the assumptions: (a) that the order in (56) is (at least underlyingly) universal; and (b) that *mesa se* is a complex locative preposition, the expected order for Greek would be (57), which is ungrammatical:

(57) * I gata vgike / perase apo mesa **s**-to kuti.
the cat got_out / passed *apo* IN *se*-the box
'The cat [got out of] / [went through] the box.'

In the grammatical examples (55c–d), the path is expressed both before (optionally) and after (obligatorily) the locative modifier. The optional instance of *apo* in non-projective sources and routes is a piece of evidence for the higher Path position, which is the locus of path interpretation. The lower instance of *apo* is then best viewed as a K(ase) head, agreeing with the spatial environment. In the same vein, *se* is also to be treated as a K head not tied to locative semantics (*pace* Theophanopoulou-Kontou 2000, who views it as a theta marker) because it disappears in certain types of path environments. This blends in well with the case-marking behavior of *se* and *apo* in other domains.

The assumption that the higher instance of *apo* is the real Path preposition is supported by paths built on projectives. Projective goal PPs are homophonous with their locative counterparts as expected (58a–b), while in sources and routes, a second *apo* obligatorily occurs before the locative compound (58c–d). The fact that this instance of *apo* is obligatory is expected because, in projectives, the ground is already marked by *apo*, and as such, realizing Path is the only way to disambiguate goals from sources.

(58) Projective path PPs

a. I gata ine kato apo to trapezi. *locative*
the cat is DOWN *apo* the table
'The cat is under the table.'

b. I gata pige kato apo to trapezi. *goal*
the cat went DOWN *apo* the table
'The cat went under the table.'

c. I gata efige * (apo) kato apo to trapezi. *source*
the cat left.3sg *apo* DOWN *apo* the table
'The cat left from under the table.'

d. I gata perase ?? (apo) kato apo to trapezi. *route*
the cat passed.3sg *apo* DOWN *apo* the table
'The cat went through under the table.'

In projectives, therefore, the ground is invariably marked by *apo* in all environments, while in paths built on non-projectives, be they simple or complex (55), the marker changes to *apo* in source and route environments. This is predicted if the spatial word is a head in projectives (locative complex *apo*-PPs) and an adjunct in non-projectives (locative complex *se*-PPs). The *se/apo* alternation can then be treated as a reflex of a Path head in a local relationship with a K head. In projectives, this is not possible because the spatial word intervenes. The details of the analysis are laid out in the next section.

4. The syntax and semantics of Greek complex spatial PPs

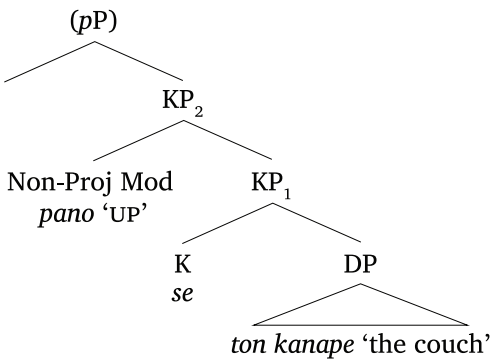
This section presents a syntactic analysis and a compositional semantics for projective and non-projective PPs in Greek. A Minimalist syntax with late insertion is adopted. The discussion proceeds as follows: Section 4.1 is concerned with non-projectives, Section 4.2 with projectives; Section 4.3 proposes an insertion mechanism connecting the various instances of spatial words throughout (and outside) the prepositional domain.

4.1. Non-projectives

Section 3 presented evidence that the spatial word in a complex *se*-PP such as (59) is an adjunct, while the light preposition is a case marker. I propose that locative *se*-PPs are syntactically reduced. Specifically, simple *se*-PPs are bare KPs, while non-projective complex PPs are KPs modified by a spatial word (60):

(59) pano s-ton kanape
UP *se*-the couch
'on the couch'

(60)



In (60), KP is the projection headed by the case-markers *se* and *apo*. Svenonius (2010) suggests that K is the locus of *eigenplace*, the function that shifts the ground individual to the region it occupies in space (Wunderlich 1991). The Greek data does not support this view because there is no strict correlation between either *se* or *apo* and *eigenplace* across all complex PPs. In

non-projectives, specifically, we saw that the choice between *se* and *apo* depends on the path environment (cf. (55)). Hence it would be unnatural to assume that K is tied to a semantic function such as *eigenplace*, while at the same time its realization is sensitive to the path context. However, *eigenplace* is independently motivated in the semantics. Therefore, we may assume that the type-shifting happens in the semantics only, as in Zwarts & Winter (2000)'s original proposal. Accordingly, K in (60) stands for the identity function.

Spatial words take the ground's *eigenplace* and return a set of regions, which can be the ground's interior, surface, neighborhood and so on. Under this analysis, vectors are not syntactically represented. This explains why (complex) *se*-PPs do not license MPs, and why there are no *se*-projectives. However, vectors could still be needed to define some relations between regions. I leave this question open for future research.

The figure is finally introduced by *small p*, a relational head which locates the figure in the space denoted by KP. I assume that there is only one kind of *p* across all locative expressions. This is a slight modification of Svenonius (2010), who proposes that containment and contact are alternative relational meanings contributed by *p*. Recall from (30) that in Greek, containment and contact are expressed by the compounds *mesa se* 'in' and *pano se* 'on', respectively. The spatial words *mesa* and *pano* are treated here as restrictive modifiers of the ground's *eigenplace* because there is no evidence that they differ syntactically from the rest of the *se*-compounds. Note that an alternative analysis in which *mesa* and *pano* are modifiers of *p*P instead of KP would entail that the figure is introduced below them, which is unwarranted. Therefore, under the proposed analysis, spatial words in non-projectives are uniformly XP-modifiers of *eigenplace*. This also means that the denotations for containment and contact are geometric.

The definitions and a sample derivation are given below (abstracting away from the verb's contribution):

(61) Types and variables

Basic types:	e	individuals
	p	points
Variables:	x_e	individuals
	p_p	points
	$r_{<p,t>}$	regions
	$P_{<<p,t>,t>}$	sets of regions

(62) $eigenplace_{<e,<p,t>>} = \lambda x_e.\ eigen(x)$

$NONPROJMOD_{<<p,t>,<<p,t>,t>>} =_{Def} \lambda r'_{<p,t>}.\ \lambda r_{<p,t>}.\ [REL(r,r')]$

where *REL* is a non-projective relation between two regions

$p_{<<p,t>,t>,<e,t>>} =_{Def} \lambda P_{<<p,t>,t>}.\ \lambda x_e.\ [\exists r\ [loc(x,r) \wedge P(r)]]$

(63) Sample derivation:

i gata (ine) pano s-ton kanape
the cat (is) UP *se*-the couch
'The cat is on the couch.'

a. $[\![DP_{ground}]\!] = c_e$
b. $[\![\textit{eigenplace}\ DP]\!] = \lambda x_e.\ [\textit{eigen}(x)](c)$
c. $[\![KP_1]\!] = \textit{eigen}(c) = C_{<p,t>}$
d. $[\![\text{Non-Proj Mod } KP_1]\!] = \lambda r'_{<p,t>}.\ \lambda r_{<p,t>}.\ [ON(r,r')]\ (C)$
e. $[\![KP_2]\!] = \lambda r_{<p,t>}.\ ON(r,C)$
f. $[\![p\ KP_2]\!] = \lambda P_{<<p,t>,t>}.\ \lambda x_e.\ [\exists r\ [\text{loc}(x,r) \wedge P(r)]](ON(r,C))$
g. $[\![DP_{fig}\ p']\!] = \lambda x_e.\ [\exists r\ [\text{loc}(x,r) \wedge ON(r,C)]]\ (g)$
h. $[\![pP]\!] = \exists r\ [\text{loc}(g,r) \wedge ON(r,C)]$

Going through the steps in (63), the couch is first type-shifted from an individual to a region via the *eigenplace* function (63a–c). The non-projective modifier *pano* then takes the eigenplace and returns a property of regions that qualify as the couch's surface (63d–e). Finally, *small p* introduces the figure, i.e. the cat, and existentially closes the region variable (63f–h). The resulting (63h) states that there is a region *r* such that the location of the cat is *r*, and *r* is the surface of the couch.[23]

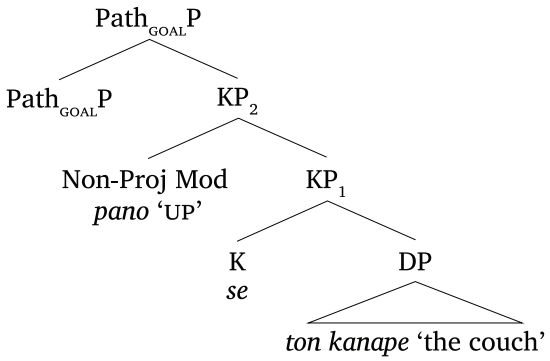
I assume that locative KPs can alternatively merge with Path, with the figure being introduced higher. KP is then interpreted as a start, end, or transitory location, according to the type of the Path head (goal *vs* source *vs* route). The *se/apo* alternation itself is a reflection of the relationship between K and either of these higher Path heads. Because in the present analysis *p*/Path and K are sisters, this can be modeled in terms of selectional features, but it can also be viewed as case assignment / feature valuation. For the present purposes, nothing hinges on this. The following examples illustrate: *p* and $Path_{GOAL}$ take *se* (64), while $Path_{SOURCE}$ and $Path_{ROUTE}$ take *apo* (65):

(64) Non-projective goal path

a. (I gata anevike) pano s-ton kanape.
the cat got_on UP *se*-the couch
'The cat jumped onto the couch.'

[23] In the absence of an overt modifier, i.e. in simple *se*-PPs, we may assume that there is a silent modifier taking the ground's *eigenplace* and returning a property of regions shared by the ground's *eigenplace* and neighborhood. This ensures, on one hand, that there is no type mismatch between the ground and *p* but is also independently motivated by the underspecified 'at' denotations of simple *se*-PPs. Note that the denotation of the silent modifier is different from the proximity modifier *konta* 'close', which returns only the neighborhood of the ground, i.e. excluding its *eigenplace*.

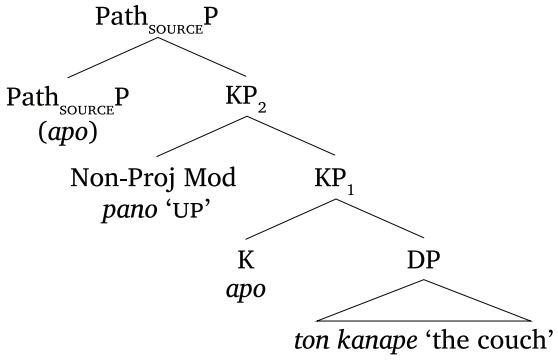
b.



(65) Non-projective source (or route) path

a. (I gata efige) ?(apo) pano apo ton kanape.
the cat left *apo* UP *apo* the couch
'The cat got off the couch.'

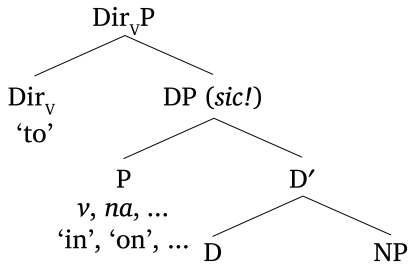
b.



I suggest that Path$_{GOAL}$ has no exponent in (64) because it is licensed by path verbs, possibly via a checking/Agree operation between V and Path. Path$_{SOURCE}$/Path$_{ROUTE}$ can be instead lexicalized by *apo* (65), but realization is optional in non-projectives because path is reflected on K. Moreover, realization of Path$_{SOURCE}$/Path$_{ROUTE}$ is possible only in complex PPs because in the absence of a spatial word, there would be two adjacent occurrences of *apo*, i.e. * *apo apo*, which we may assume is blocked at PF.

The analysis of Greek non-projective complex PPs advanced here is similar to Pesetsky (2013)'s account of directional constructions in Russian. Pesetsky takes the locative preposition P not to be part of the extended projection but rather to be an adjunct to the ground DP (66). For Russian, this ensures that the DP is not assigned oblique case by P, but remains nominative (or is assigned the accusative by DIR$_V$ if the ground is animate, feminine, or pronominal):

(66)

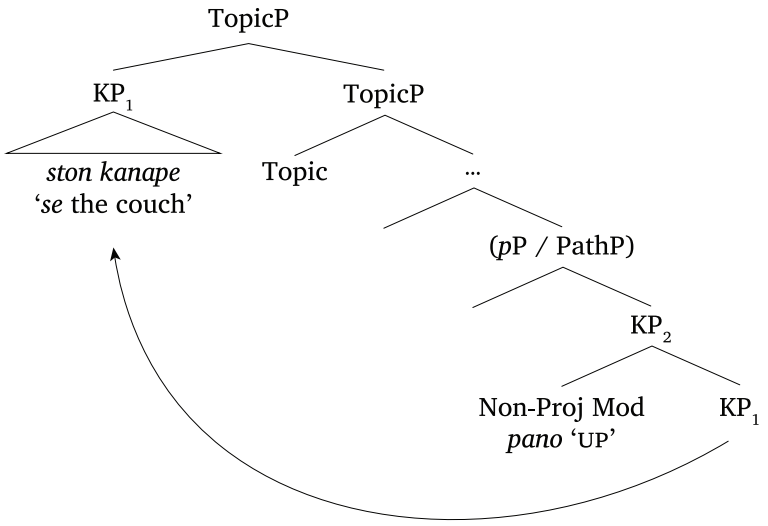


Pesetsky (2013; his (91))

The counterpart of Pesetsky's P in the present account is the spatial word *qua* non-projective modifier in (60), which also does not project. In both accounts, this allows the case of the ground DP to be unaffected by the locative modifier and remain sensitive to higher heads. Furthermore, in both languages, the locative modifier may appear as a head in a different construction. In Greek, the spatial word is a head in projectives, and an adjunct in non-projectives (in path and locative constructions alike), whereas in Russian, it is an adjunct in paths, and a head in locatives (projectives included).

Lastly, the adjunct analysis of the spatial word in non-projectives accounts for the ability of the ground KP to move without the spatial word (38)–(40). Example (67) shows this for scrambling/fronting of the *se*-PP, where KP$_1$ raises to a higher topic position:

(67)

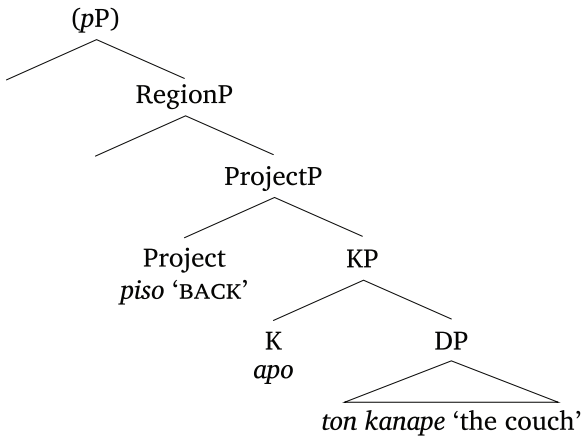


4.2. Projectives

The analysis of Greek projective PPs builds on Zwarts & Winter (2000)'s vector account and assumes a decomposition similar to Svenonius (2008; 2010). Unlike in the non-projective PPs discussed in the previous section, the spatial word in projectives is part of the extended P projection. The structure of a projective PP like (68) is given in (69):

(68) piso apo ton kanape
BACK *apo* the couch
'behind the couch'

(69)



The following types and variables are used:

(70) Types and variables

Basic types:	e	individuals
	p	points
	v	vectors
Variables:	x_e	individuals
	p_p	points
	v_v	vectors
	$r_{<p,t>}$	regions
	$V_{<v,t>}$	vector spaces
	$P_{<<p,t>,t>}$	sets of regions

Firstly, the ground is type-shifted from an individual into a region via the *eigenplace* function (71), as in non-projectives.

(71) $\textit{eigenplace}_{<e,<p,t>>} = \lambda x_e.\ \textit{eigen}(x)$

The Project head is responsible for the vector semantics of projective expressions. There are different instantiations of Project corresponding to the varying directions *up*, *down*, *front*, *back*, *left*, *right*, etc.[24] These are realized by the respective spatial words. (73) illustrates this for *piso* 'BACK', which returns the vector space for 'behind'. The entry for Project uses Zwarts & Winter

[24] We can assume that a unique *IN* or *OUT* axis is determined in the projective occurrences of *mesa apo* 'on the other (inner) side of' and *ekso apo* 'outside'.

(2000)'s definition. Measure phrases adjoin at the ProjectP level, restricting the length of the vectors. Thus, a measure phrase like *deka metra* 'ten meters' has the entry in (74).

(72) $PROJECT_{<<p,t>,<v,t>>} =_{Def} \lambda r_{<p,t>}.\ \lambda v_{v}.\ ext(v, r) \wedge c(axis, v) > |v_{\perp axis}|$

(73) $piso_{<<p,t>,<v,t>>} =_{Def} \lambda r_{<p,t>}.\ \lambda v_{v}.\ ext(v, r) \wedge c(\text{–}front, v) > |v_{\perp \text{–}front}|$

(74) $deka\ metra =_{Def} \lambda v_{v}.|v| = 10\text{m}$

The Region head shifts the vector space back to a region. The semantic entry for Region in (75) is a modification of Zwarts & Winter (2000)'s *loc*⁻ and returns the set of projected regions instead of introducing a figure and predicating its location.[25] This has the advantage that the projected region can be the argument of either a relational small *p* head introducing the figure, or a Path head, as was the case with non-projectives.[26]

(75) $\text{Region}_{<<v,t>,<<p,t>,t>>} =_{Def} \lambda V_{<v,t>}.\ \lambda r_{<p,t>}.\ connect(r) \wedge \forall p \in r\ \exists v \in V[e\text{-}point(v) = p]$

(76) $p_{<<p,t>,t>,<e,t>>} =_{Def} \lambda P_{<<p,t>,t>}.\ \lambda x_{e}.\ [\exists r\ [loc(x,r) \wedge P(r)]]$

(77) Sample derivation

i gata (ine) piso apo ton kanape
the cat is BACK *apo* the couch
'The cat (is) behind the couch.'

(78) Composition

a.	$[\![DP_{ground}]\!]$	=	c_{e}
b.	$[\![$*eigenplace* DP$]\!]$	=	$\lambda x_{e}.\ [eigen(x)](c)$
c.	$[\![KP]\!]$	=	$eigen(c) := C_{<p,t>}$
d.	$[\![$Project KP$]\!]$	=	$\lambda r_{<p,t>}.\ \lambda v_{v}.\ [ext(v, r) \wedge c(front, v) > \lvert v_{\perp \text{–}front}\rvert]\ (C)$
e.	$[\![$ProjectP$]\!]$	=	$\lambda v_{v}.\ ext(v, C) \wedge c(front, v) > \lvert v_{\perp \text{–}front}\rvert := BACK_{C}$
f.	$[\![$Region ProjectP$]\!]$	=	$\lambda V_{<v,t>}.\ \lambda r_{<p,t>}.\ [connect(r) \wedge \forall p \in r\ \exists v \in V[e\text{-}point(v) = p]]\ (BACK_{C})$
g.	$[\![$RegionP$]\!]$	=	$\lambda r_{<p,t>}.\ connect(r) \wedge \forall p \in r\ \exists v \in BACK_{C}[e\text{-}point(v) = p] := BACKREG_{C}$

[25] This projection corresponds to Svenonius (2008; 2010)'s Deg, which comes in two guises, one that licenses a MP in its specifier, and one that does not. Svenonius assumes that MPs are arguments of Deg because projective modifiers (*straight* and *diagonally*) always follow MPs, which he takes to be adjuncts to LocP (here: ProjectP). However, there is no other evidence that MPs are syntactic arguments, and it is possible that the order of modification is due to semantic considerations, with mathematical properties of vector spaces being relevant (Svenonius 2008: fn. 3).

[26] *connect* is an addition to the definition that restricts the range of regions to connected ones, a problem that does not arise in Zwarts & Winter (2000)'s account. Thanks to an anonymous reviewer for pointing this out.

h. $[\![p \text{ RegionP}]\!] = \lambda P_{<<p,t>,t>}.\ \lambda x_e.\ [\exists r\ [\text{loc}(x,r) \wedge P(r)]](\textit{BACKREG}_C)$

i. $[\![\text{DP}_{\text{fig}}\ p']\!] = \lambda x_e.\ [\exists r\ [\text{loc}(x,r) \wedge \textit{connect}(r) \wedge \forall p \in r\ \exists v \in \textit{BACK}_C[\textit{e-point}(v) = p]]]\ (g)$

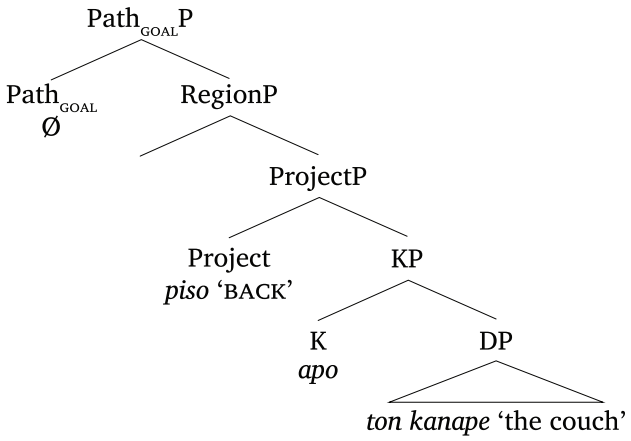
j. $[\![pP]\!] = \exists r\ [\text{loc}(g,r) \wedge \textit{connect}(r) \wedge \forall p \in r\ \exists v \in \textit{BACK}_C[\textit{e-point}(v) = p]]$

Note that RegionPs and non-projective KPs have the same semantic type, i.e. $<<p,t>,t>$, which is why both may combine with either *p* or Path. This opens the possibility that Region is nominal in its categorial features. While silent nouns have been proposed in previous analyses of Greek spatial expressions (Terzi 2010), they were not tied to projectives. In the current proposal, spatial words in non-projectives modify the ground's *eigenplace* within the same syntactic projection, whereas in projectives, there are two regions, the ground's *eigenplace*, on one hand, and the projected area, on the other, which project separately (in the syntax). A consequence thereof is that the ground DP in projectives is deeply embedded, and thus its case is unaffected by the higher Path or *p* heads. The ground is invariably marked by *apo* across all environments, which can be modeled as a selectional property of Project, or alternatively as inherent case assignment. The examples below illustrate:

(79) Projective goal path

a. (i gata pige) piso apo ton kanape
the cat went BACK *apo* the couch
'The cat went behind the couch.'

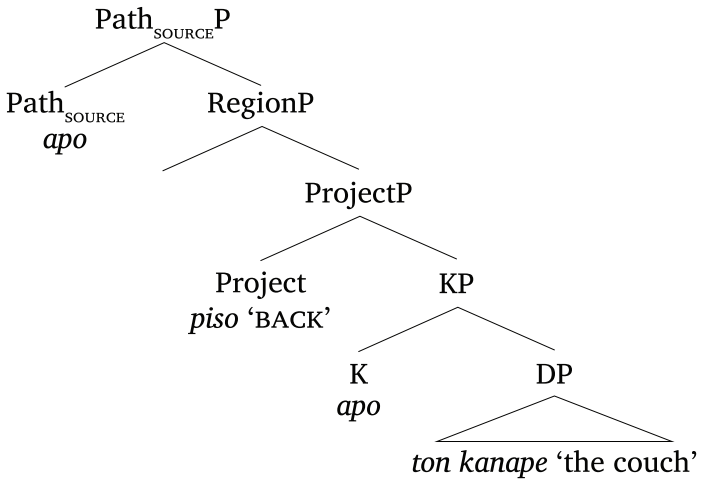
b.



(80) Projective source (or route) path

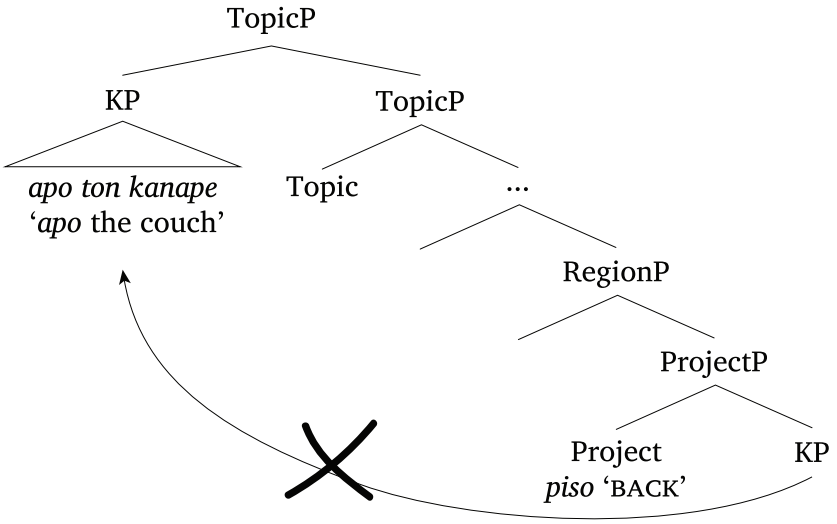
a. (i gata efige) apo piso apo ton kanape
the cat left *apo* BACK *apo* the couch
'The cat left from behind the couch.'

b.



Unlike in non-projectives, spatial words in projectives cannot be stranded because they are heads, specifically, instantiations of Project. Consequently, KP cannot move without pied-piping Project (cf. (39b)–(41b)), as is shown in (81):

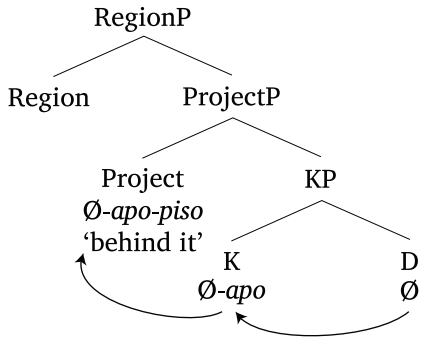
(81)



Lastly, the proposed analysis provides a way to account for the projective pro-forms discussed in (50c), repeated below as (82). In (83), an empty/defective D moves and incorporates into Project via K in a roll-up fashion:

(82) Eki ine ena dentro ke o Michalis kathete **apo-piso**.
there is a tree and the Michael sits *apo*-BACK
'(Over) there is a tree and Michael is standing/sitting behind it.'

(83)



4.3. A note on insertion

In the analysis above, it was shown that the syntactic and/or categorial status of spatial words may vary. For example, in the projective compound *pano apo* 'above', *pano* realizes Project, while in the non-projective compound *pano se* 'on', it serves as the exponent of a topological modifier. Further uses of spatial words as verb particles and nominal modifiers were illustrated in (13). Even though the inventory of spatial words is small, being best described as a semi-closed class, their distribution is wide and too pervasive to be reduced to accidental homonymy. Instead, what seems to characterize spatial words in Greek is *contextual allosemy* (Marantz 2013). *Allosemy* refers to the property of having multiple meanings, while *contextual* implies that the choice among these meanings depends on the context. In a late-insertion framework such as Distributed Morphology, spatial words like *pano* can be treated as exponents of different nodes. The lexical information associated with each spatial word is represented only once in the lexicon as a root. Accordingly, the representation of *pano* in the lexicon would be √UP. Following Embick & Marantz (2008), roots are acategorial and are categorized in the syntax. Project, which is a special type of a P head associated with projective semantics, is then a complex head which categorizes spatial roots such as √UP. The semantic interpretation depends on the root and the syntactic context. In the context of Project, √UP will be interpreted as 'above', while in the context of an adjectival categorizer, it will be interpreted as 'upper'. As each functional head also bears its own features, this approach would allow for the different nodes to be realized by more specific vocabulary items. In Greek, however, there are no exponents associated with these features. For this reason, only the spatial word is realized in projectives, non-projectives, and spatial adjectives alike.

5. Conclusions

This paper has shown that the semantic typology of spatial relations is partially reflected in the grammar of Greek via the projective/non-projective split. While some types of spatial relations may be cognitively more complex than others, e.g. projective *vs* topological relations, it is an independent empirical question whether this complexity is reflected in the syntax. Although

nuances between types of locative expressions are found across languages, it is not very often that one finds clear evidence for distinct underlying structures. Further crosslinguistic research is needed to assess the interplay between the syntax and semantics of spatial expressions.

Typological implications of this interplay may also be of interest. In many Germanic and Slavic languages, the case of the ground correlates with the path environment, regardless of the type of the locative relation involved (e.g. it can be either projective or non-projective). By contrast, in Greek, the case of the ground may correlate with the type of the spatial relation (grounds are marked by *apo* in projectives, by *se* in non-projectives). Thus, in languages that only have a case strategy to disambiguate between locative and path environments, the case of the ground is not expected to correlate with the type of the spatial relation. This option is enabled in V-framed languages because path readings are licensed or disambiguated by the verb.

Abbreviations

2 = second person, 3 = third person, cl = clitic, gen = genitive, sg = singular

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Competing interests

The author has no competing interests to declare.

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