



A Split-Scope Semantics for Determiner Spreading*

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NELS 57 @ CUNY. October 16-18, 2026.

1 Introduction and background

- Consider the Greek noun phrase in (1), where what looks like a single noun phrase contains two determiners.

- (1) Greek (Alexiadou 2014:40)
- to** kokino **to** vivlio
the red **the** book
 ‘the red book’

- This is a phenomenon in the syntax of modification known as determiner spreading (DS) or poly-definiteness, for which Greek is one of the best studied cases.
- DS presents very clear syntactic and semantic puzzles.
- What licenses the “extra” determiner?
- And, how does the noun phrase compose with this “extra” determiner?

2 Syntactic Preliminaries

- DS occurs in a number of languages, but not always with the same properties.
- Alexiadou (2014) compares DS in Greek, Hebrew, and Swedish.
- The basic patterns look superficially similar, but Alexiadou notes that these patterns differ with respect to recursivity, predicativity, and restrictivity.
- I will refer to “spreading” patterns that pattern with Greek with respect to these characteristics as Greek-type DS.

*I would like to thank Dorothy Ahn, Ryan Walter Smith, Yimei Xiang, Maria Kouneli, Mark Baker, Ariela Ye, Jiayuan Chen, and the members of the Meaning Across Languages lab at Rutgers for feedback on earlier versions of this work.

2.1 Recursivity

- Greek DS is recursive (2), meaning there can be an “extra” determiner for each adjective.
- (2) Greek (Alexiadou & Wilder 1998:303)
- to** megalo **to** kokino **to** vivlio
the big **the** red **the** book
 ‘the big red book’
- Hebrew is like Greek in this regard, but not Swedish.

2.2 Predicativity

- In Greek (3), adjectives such as ‘only’, ‘former’, or ‘current’ that cannot occur in predicative syntactic positions also cannot occur in DS.

- (3) Greek (Alexiadou 2014:57)
- * o **monos** tu o erotas
 the **only** his the love
 Intended: ‘his only love’

- Hebrew and Swedish do not show any spreading restrictions related to the predicativity of the adjective.

2.3 Restrictivity

- Adjectives in Greek DS must be interpreted restrictively, i.e. for DS of the form *the AP the NP*, the context must contain at least one individual that satisfies the NP predicate but not the AP predicate.

- For example, (4a) lacks DS and has two possible interpretations: there are only efficient researchers and they will all be fired (non-restrictive) or the efficient researchers have been chosen to be fired out of a larger group of researchers (restrictive).
- Example (4b) with DS only has the restrictive reading.

(4) Greek (Kolliakou 2004:270)

- a. O diefthindis dilose oti **i kali erevnites**
 the director declared that **the competent researchers**
 tha eprepe na apolithun.
 be should PRT fired
 ‘The director declared that the competent researchers would be fired.’
- b. O diefthindis dilose oti **i kali i**
 the director declared that **the competent the**
ierevnites tha eprepe na apolithun.
researchers be should PRT fired
 ‘The director declared that the competent researchers would be fired.’

- Such interpretational effects are not found with DS in Hebrew or Swedish.
- Given these differences, a basic typology of DS emerges.

(5)

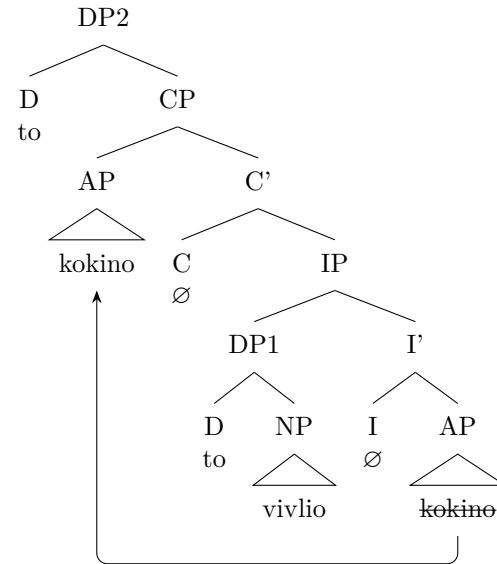
	Recursive?	Predicative?	Restrictive?
Greek	✓	✓	✓
Hebrew	✓	✗	✗
Swedish	✗	✗	✗

- Alexiadou suggests that a recursive pattern that spreads regardless of adjective type and with no interpretive effects like in Hebrew is best analyzed as definiteness agreement.
- She also suggests that a non-recursive pattern like the Swedish one is best analyzed with a split DP structure.
- Neither of these will extend to Greek.

2.4 Analysis of Greek-type determiner spreading

- Alexiadou (2014); Alexiadou & Wilder (1998) argue Greek DS involves a reduced relative clause (RRC) structure.
- This is highly debated within Greek (Alexiadou 2014; Alexiadou & Wilder 1998; Androutsopoulou 1995; Campos & Stavrou 2004; Kariaeva 2004; Kolliakou 2004; Lekakou 2017; Lekakou & Szendrői 2012; Panagiotidis & Marinis 2011; Tsiakmakis et al. 2021 a.o.).
- But proposals for other languages with Greek-type DS – Kipsigis (Kouneli 2019, 2021), Maltese (Winchester 2019), Rukiga (Asimwe et al. 2023), and Magahi (Sharma 2026) – favor a RRC analysis.
- Alexiadou; Alexiadou & Wilder build on the raising analysis of relative clauses in Kayne (1994), in which relative clauses involve a determiner taking a clausal complement.
- Specifically, they propose that DS occurs when a determiner takes a RRC complement with a subject DP and predicate AP.
- DS involves special ‘predicate-raising’ RRCs, in which the AP raises to SpecCP (6).

(6)



- This structure captures the discussed properties of Greek DS as follows:
 1. recursivity – DP1, the subject of the RRC, could be another complex DP with a determiner introducing a RRC
 2. predicativity – the adjectives are merged as predicates in a RRC
 3. restrictivity – a general characteristic of RRCs and indirect modification (Cinque 2010; Sproat & Shih 1988)

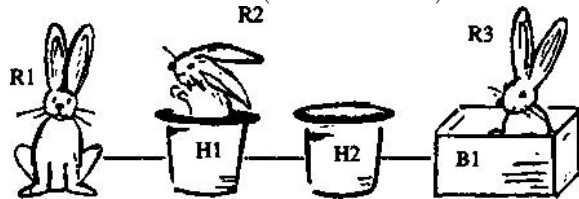
3 Determiner Spreading Semantics

- With the basic assumption that a definite determiner contributes an IOTA operator, DS raises a straightforward question about how noun phrases with DS compose.
- Within the RRC syntax, I propose that DS can be analyzed in the same way Bumford (2017) analyzes Haddock descriptions.

3.1 Bumford (2017) on Haddock Descriptions

- Haddock descriptions are definite descriptions such as *the rabbit in the hat* uttered in the context in (7).

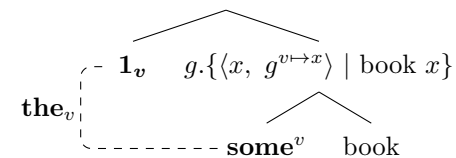
(7) the rabbit in the hat (Haddock 1987)



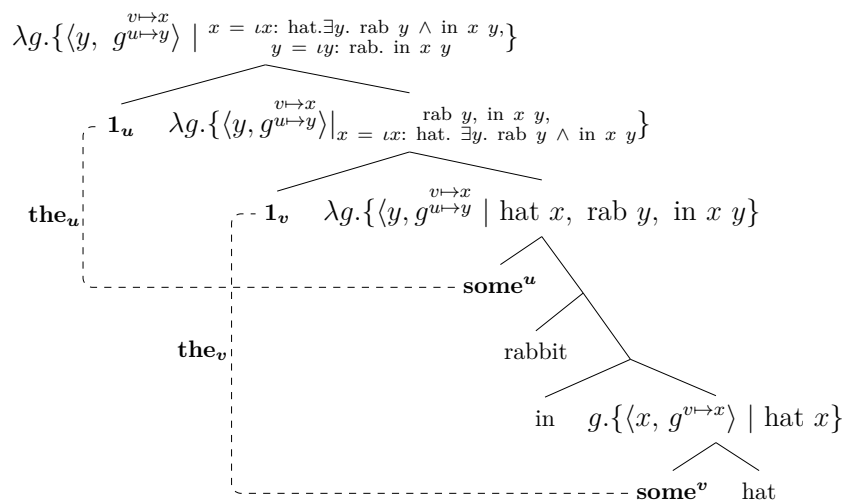
- If the definite article *the* is thought to require uniqueness of the predicate it combines with, the description *the hat* should be infelicitous in (7).
- However, it is felicitous, seemingly because *the rabbit in the hat* does not require a unique rabbit or a unique hat.

- It only requires a unique rabbit in a hat and, more surprisingly, a unique hat containing a rabbit.
- To explain this, Bumford (2017) proposes a semantic decomposition of definiteness into the following two operations:
 1. building a set of witnesses that satisfy the restricting noun phrase (represented by *some*)
 2. testing this set for uniqueness (represented by *1*)
- For a usual definite description *the* NP, this means that *the* first introduces a discourse referent satisfying its NP complement by allocating an address in the discourse state and reserving that address for an individual satisfying the NP property.
- This first step is equivalent to a dynamic semantic indefinite determiner.
- Then, the second step involves inspecting the set of potential outputs.
- If all the outputs assign the designated variable to the same entity, then the computation proceeds.
- Otherwise, it crashes.
- This second step introduces the uniqueness requirement often assumed to be associated with definite determiners.
- Bumford (2017:561) schematizes this as shown below.

$$\lambda g. \begin{cases} G & \text{if } |G_v| = 1, \text{ where } G = \{\langle x, g^{v \mapsto x} \rangle \mid \text{book } x\} \\ & G_v = \{g'v \mid \exists \beta. \langle \beta, g' \rangle \in G\} \\ \emptyset & \text{otherwise} \end{cases}$$



- Then, the crucial innovation to allow for Haddock descriptions is allowing these two steps to be performed at different times, meaning other operations can occur in between.
- When there are two determiners present, this means both of them can introduce referents before either of them tests for uniqueness.
- This allows for the definites in Haddock descriptions to include the relation between them as part of the predicate tested for uniqueness.
- Bumford schematizes this as shown below.¹



- So what allows for the felicity of Haddock descriptions in this approach is that a referent x is introduced satisfying the description *hat*.
- Then, a referent y is introduced satisfying the description *rabbit*.
- x and y must satisfy the relation *in* x y .

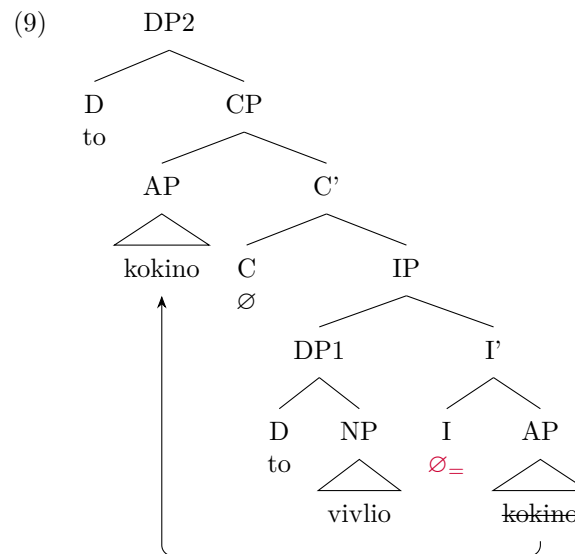
¹Bumford’s notation works as follows: “variables bound by quantifiers and lambdas are sometimes formally restricted, so that $\lambda y : \text{rab. in } x \ y$ is equivalent to $\lambda y. \text{rab } y \wedge \text{in } x \ y$; and $\forall y. \text{rab. in } x \ y$ is equivalent to $\forall y. \text{rab } y \Rightarrow \text{in } x \ y$; etc.” (Bumford 2017:563).

- Then, when uniqueness testing is done, this relation is included in the uniqueness.
- So, what we need is a unique rabbit that is in a hat and a unique hat that has a rabbit in it.
- Thus, there is no issue with the Haddock description in (7).

3.2 Determiner spreading with split-scope definites

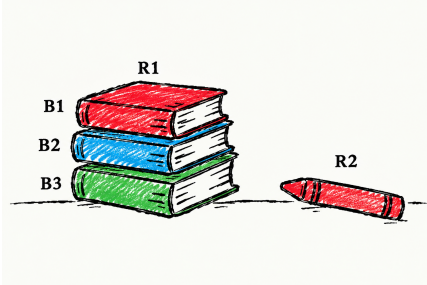
- While Haddock descriptions and DS both seem to involve an issue with multiple determiners, Haddock descriptions straightforwardly involve two referents.
- However, I argue that if we treat the RRCs involved in Greek-type DS as identificational copular clauses, we get a parallel to Haddock descriptions.
- So, for (8) we get the structure in (9).

(8) **to** kokino **to** vivlio
the red **the** book
 ‘the red book’

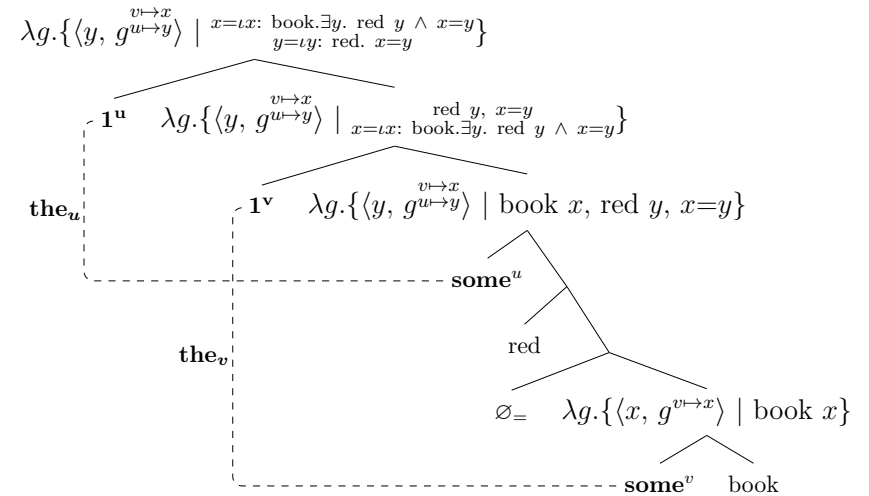


- Assuming the denotation $\lambda x.\lambda y. x = y$. for $\emptyset =$ and that predicate-raising RRCs allow the adjective to combine with the determiner, the interpretation of (9) works out to be *the red thing that is (equal to) the book*.
- However, evaluating this phrase runs into the same issue Haddock descriptions have.
- Greek-type DS is necessarily restrictive, meaning (8) is only felicitous in a context with multiple books.
- Additionally, it remains felicitous in a context with multiple red things.

(10) *to kokino to vivlio* (lit: ‘the red the book’)



- This is the same issue that arises when using *the rabbit in the hat* in a context with several rabbits and several hats.
- Unsurprisingly then, the proposal from Bumford (2017) will also solve this issue in a parallel way.



- So, there does not need to be a unique book or a unique red thing, but only a unique book and a unique red thing related by equality.
 - Before comparing other approaches, I want to consider whether DS is the sort of place we should expect split-scope to apply.
 - Putting aside whether *in the hat* is treated as a type of RRC, Bumford actually shows that split-scope can apply in full relative clauses as well.
- (11) *Context: At a hospital with many doctors and rabies patients, only one doctor actually manages to cure a rabies patient and only that one rabies patient actually gets cured.*
the doctor who cured the rabies patient
- The definite description is felicitous in (11), despite their being no unique rabies patient (or unique doctor).
 - So, in an analysis of Greek-type DS as RRCs, there's no reason we would not expect split-scope definites to be possible.

3.3 Comparison to other approaches

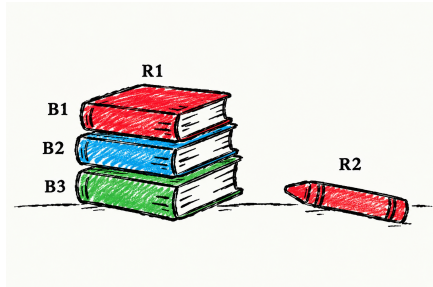
3.3.1 Separating D and iota

- The split-scope analysis has been shown to work for DS, so now let us compare how it fares as compared to other approaches.
- The main semantic puzzle in DS is that we seem to get too many IOTAS.
- It seems then that proposals which involve separating IOTA and the determiner could suffice without the assumptions I have made about the RRC being identificational.
- For example, Coppock & Beaver (2015) propose the non-saturating denotation for *the* in (12).

(12) **Lexical entry:** *the*
 $the \rightsquigarrow \lambda P.\lambda x.[\partial(|P| \leq 1) \wedge P(x)]$

- While the denotation in (12) does not contribute IOTA or require existence, it still imposes uniqueness.
- It doesn't allow for $|P| \geq 2$, but as we have seen this is actually a requirement for DS (the restrictive reading).
- So even if *the* in the *the red the book* does not turn *book* into an individual, it still requires that there be at most one book in the context.

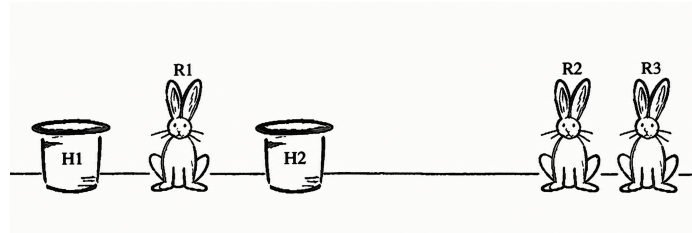
(13) *to kokino to vivlio* (lit: 'the red the book')



- However, the next step might be removing any presuppositions from the determiner, and treating it just as an identity function.

- Lekakou & Szendrői (2012) assume a version of this, as do Ahn & Kouneli (to appear) for Kipsigis DS.
- This would allow for *the red the book* to be interpreted as *the red book* without any issues related to multiple books or multiple red things.
- However, the interpretation of split-scope definites can show us that a kind of uniqueness is still needed, which such an account of definite determiners will not account for.
- Ryan Walter Smith (p.c.) suggests the following kind of illustrative example.

(14) *#the rabbit next to the hat*

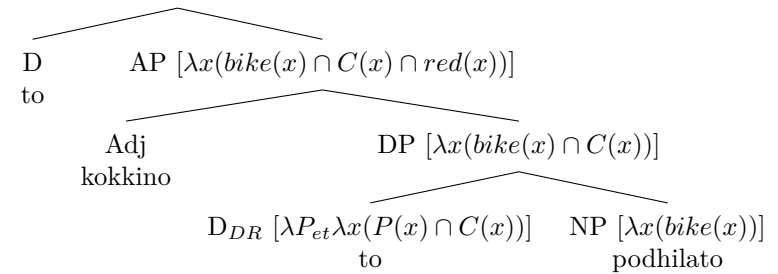


- If definite determiners did not contribute any kind of uniqueness, but referentiality and uniqueness only come from a higher IOTA type-shifter after the entire noun phrase has composed, we would expect *the rabbit next to the hat* to be felicitous in (14), contrary to fact.
- However, the split-scope analysis predicts this oddness because while uniqueness testing can be delayed, each determiner does contribute uniqueness.
- For *the rabbit in the hat*, this allows the relation *in* to be considered in the uniqueness testing.
- For (14), this means that we would need a unique rabbit-hat pair related by *next to*.
- Since the pairs **R1-H1** and **R1-H2** both satisfy the relation *next to*, the split-scope analysis correctly rules out (14).

3.3.2 Determiner spreading as an adjectival partitive

- In the only other existing semantic account of DS I am aware of, Ettxeberria & Giannakidou (2019) liken DS to an “adjectival partitive”.
 - They also note that DS is not the only place where *the* seems to be non-saturating.
 - Greek also allows the use of *the* together with certain quantifiers.
- (15) Greek (Ettxeberria & Giannakidou 2019:423, citing Giannakidou 2004:121)
- o kathe fittis
the every student
‘each student’
- Ettxeberria & Giannakidou propose that the determiner in DS is performing a domain restricting (D_{DR}) function similar to its use in quantification above.
 - They propose the following flexible type account of the determiner.
- (16) **Types for D**
Saturating: $et \rightarrow e$ (IOTA)
Non-saturating: $et, ett \rightarrow et, ett$ (D_{DR} on Q); $et \rightarrow et$ (D_{DR} on NP or AP)
- Ettxeberria & Giannakidou derive the interpretation of *to kokkino to podhilato* (lit: ‘the red the bike’).
 - They treat C as an anaphoric variable and relate DS to partitivity, proposing that a non-singleton requirement on C forces the restrictive reading of DS as an “adjectival partitive” (i.e., *the red the bike* $\approx$ *the red one of the bikes*).

DP [$\iota(\lambda x(bike(x)) \cap C(x) \cap red(x))$]

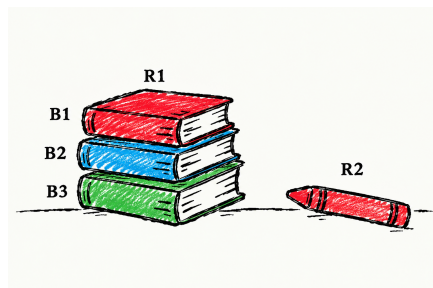


- However, the proposed non-singleton requirement on C does not actually guarantee a restrictive reading.
- It is not enough to require that there be more than one thing in the context to license DS.
- Rather, there must be more than one bike in the context for *to kokkino to podhilato* (lit: ‘the red the bike’) to be felicitous.
- This would amount to a non-singleton requirement on $\{x \mid bike(x)\} \cap C$ rather than just C itself.
- Finally, the split-scope analysis does not require positing a flexible semantics for the determiner and applies straightforwardly within the proposed syntax.

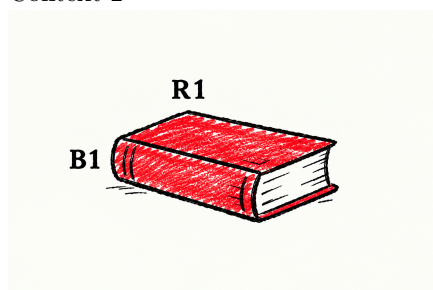
3.4 The Restrictive Interpretation

- With the issue of multiple IOTAs addressed, I will now turn to the restrictive reading associated with Greek-type .
- As previously noted, Greek-type DS of the form *the AP the NP* requires that a context where the intersection of the AP and NP is a proper subset of the NP.
- For *to kokino to vivlio* (lit: ‘the red the book’), this means it is felicitous in Context 1 (17) but not Context 2 (18).

(17) Context 1



(18) Context 2



- Campos & Stavrou (2004); Kolliakou (2004) note that more than just coming with a restrictive interpretation, adjectives in DS are interpreted as focused.
- In fact, DS blocks the possibility of focus being placed on the noun.
- In (19a) with DS ‘pen’ cannot be focused, but in (19b) without DS it can be.

(19) Greek (Campos & Stavrou 2004:147)

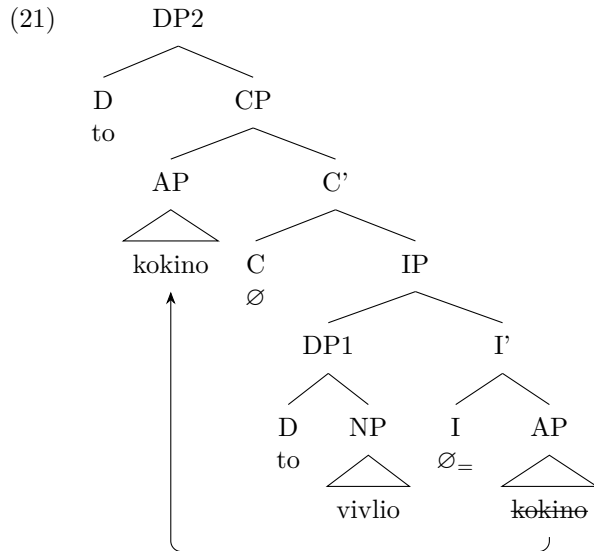
- a. *i asimenja i PENA
the silven the pen
Intended: ‘the silver PEN’
- b. i asimenja PENA
the silven pen
‘the silver PEN’

- While the interpretation of the adjectives in DS seems to involve exclusive focus, this exclusion is not interpreted at the propositional level (20).

(20) Greek (modified from Asimwe et al. 2023:1331, citing Kolliakou 2004)

I mikres i gates itan pinasmenes, opos episis ke i
the young the cats were hungry as also and the
megales (i gates).
big the cats
‘The young cats were hungry, and so were the old ones.’

- Exclusive focus interpreted at the propositional level in (20) would necessarily mean that the non-young cats were not hungry.
- So, while I will pursue focus as an explanation for the restrictive reading, the proposed analysis will have focus interpreted at the DP level.
- This requires the exclusion of potential referents.
- The exclusive focus contributed by the adjective in *i mikres i gates* (lit: ‘the young the cats’) requires that there are non-young cats.
- The semantics of DP-internal focus then proceed as follows.
- Assuming focus invokes *alternatives* (Rooth 1992, 2016), the lexical elements inside the DP all get *ordinary* values and *focus* values.
- For non-focused elements, the focus value is just the set of the ordinary value.
- For focused elements, the focus value includes all alternatives of the ordinary value.
- For *to kokino to vivlio* (lit: ‘the red the book’) with the structure in (21), the adjective ‘red’ is focused and so its alternatives will be all other (color) adjectives.



- So, ignoring the specifics of the split-scope denotations for simplicity, we have roughly the following *ordinary* values (22) and *focus* values (23).

$$(22) \quad \begin{aligned} \llbracket \text{AP} \rrbracket^o &\approx \lambda x.\text{red}(x) \\ \llbracket \text{DP2} \rrbracket^o &\approx \iota x. [\text{red}(x) \wedge x = \iota y.\text{book}(y)] \end{aligned}$$

$$(23) \quad \begin{aligned} \llbracket \text{AP} \rrbracket^f &\approx \{\lambda x.P(x) \mid P \text{ is an } \langle e, t \rangle \text{ predicate}\} \\ \llbracket \text{DP2} \rrbracket^f &\approx \{\iota x.[P(x) \wedge x = \iota y.\text{book}(y)] \mid P \text{ is an } \langle e, t \rangle \text{ predicate}\} \end{aligned}$$

- Then, a modified version of Rooth (1992, 2016)’s Alternative Licensing for DP-internal focus will derive the restrictive reading.
- The notation $x \sim y$ means that x is a DP containing a focused element, and y is the antecedent for this focus.

(24) **DP-internal Alternative Licensing**

$x \sim y$ requires that the semantic element y is an element of $\llbracket x \rrbracket^f$ that is distinct from $\llbracket x \rrbracket^o$

- For the current example, the antecedent y will be the other, non-red book(s) in the context.

- Then, (24) requires $\llbracket y \rrbracket^o \in \llbracket \text{DP2} \rrbracket^f \wedge \llbracket y \rrbracket^o \neq \llbracket \text{DP2} \rrbracket^o$.
- In other words, this requires a focus alternative that is a book that is not the red book, exactly as required by the restrictive reading.

4 Conclusion

- The current proposal addresses the issue of multiple determiners in the semantic composition of Greek-type DS.
- The analysis uses the split-scope machinery from Bumford (2017), deriving DS in a way parallel to Haddock descriptions within the RRC syntax proposed by Alexiadou (2014); Alexiadou & Wilder (1998).

A Formalization from Bumford (2017)

The formal fragment presented here is a part of what is presented in Bumford (2017:586-590). It is essentially unchanged from how Bumford presents it. The only difference, besides an occasional change in wording, is I give a derivation for DS exactly parallel to Bumford’s derivation of the relative reading of Haddock descriptions.

A.1 Notation

The formal fragment here exploits the continuized mode of composition from Barker (2001); Barker & Shan (2008, 2014). The dynamic semantics is powered by the nondeterministic state monad, a technique developed in Charlow (2014).

Model Assumptions Models consist entities, relations, and functions. Model theoretic stuff is displayed in **sans-serif**, e.g., *likes* is the function that takes two arguments and returns true if the one likes the other.

Language and Metalanguage Functions are characterized by lambda terms. Interior lambdas may be elided, so that $\lambda x_0 \dots x_n.M$ abbreviates $\lambda x_0 \dots \lambda x_n.M$. Following Barker & Shan (2014), some lambda terms are visualized using “towers”:

$$\frac{\dots [\] \dots}{T} \equiv \lambda k. \dots (kT) \dots$$

Bracketing Conventions Function application is left associative. Parentheses are omitted, except where necessary for grouping. Dots separate variable-binding operators from the expressions they scope over, and have lower precedence than everything except for braces and slashes.

A.2 Grammar and combinatorics

A.2.1 Types

Type Constructors Type Constructors Unary types include entities e , truth values t , and discourse contexts σ (modeled here as functions from variables to entities). Constructed types take one of the following forms, where α and β are any two types:

- $\alpha \rightarrow \beta$, the type of a function from α to β .
- $\{\alpha\}$, the type of a set of α objects.
- $\alpha * \beta$, the type of an α object paired with a β object, in that order.

Type Abbreviations To keep type descriptions readable, the following type synonyms are used:

- $D_\alpha \equiv \sigma \rightarrow \{\alpha * \sigma\}$, the type of updates corresponding to constituents of type α .
- $K_\alpha^\rho \equiv (\alpha \rightarrow D_\rho) \rightarrow D_\rho$, the type of generalized quantifiers with base type α and return type D_ρ .
- $F_\alpha \equiv D_\alpha \rightarrow D_\alpha$, the type of filters on updates.

The notation $m :: \alpha$ indicates that m is of type α .

A.2.2 Scope

$$m // n := \begin{cases} m n & \text{if } m :: \alpha \rightarrow \beta, n :: \alpha \\ \lambda k. m(\lambda f. n(\lambda x. k(f // x))) & \text{otherwise} \end{cases}$$

$$m \backslash n := \begin{cases} n m & \text{if } n :: \alpha \rightarrow \beta, m :: \alpha \\ \lambda k. m(\lambda x. n(\lambda f. k(x \backslash f))) & \text{otherwise} \end{cases}$$

$$m \parallel n := \begin{cases} \lambda x. mx \wedge nx & \text{if } m :: \alpha \rightarrow \beta, n :: \alpha \rightarrow \beta \\ \lambda k. m(\lambda p. n(\lambda q. k(p \parallel q))) & \text{otherwise} \end{cases}$$

A.2.3 Binding

$$\eta x := \lambda g. \{(x, g)\}$$

$$m^* := \lambda kg. \bigcup \{k x g' \mid \langle x, g' \rangle \in m g\}$$

A.2.4 Evaluation

$$m^\Downarrow := \begin{cases} m \eta & \text{if } m :: (\alpha \rightarrow D_\alpha) \rightarrow \beta \\ m(\lambda n. n^\Downarrow) & \text{otherwise} \end{cases}$$

$$m^\Downarrow := \lambda k. m(\lambda n. k n^\Downarrow)$$

$$m^\Downarrow := (m^\Downarrow)^*$$

The grammar is essentially categorial, though information about categories is omitted information to work expressly with types, since the concerns here are entirely semantic. Composition is direct: any well-typed sequence of applications is predicted to have a meaning, and any object-language expression is expected to be ambiguous between the different ways of combining its constituent expressions using the combinators above. Also, note that technically only η , $\star$, and $\parallel$ are part of the grammar; the other combinators are just abbreviations for sequences of applications of these.

A.3 Fragment: Definite description

Item	Type	Denotation
rabbit	$e \rightarrow t$	rab
hat	$e \rightarrow t$	hat
in	$e \rightarrow e \rightarrow t$	in
some _u	$(e \rightarrow D_t) \rightarrow K_e^\rho$	$\lambda ck g. \bigcup \{k x g' \mid x \in D_e, \langle \mathbf{T}, g' \rangle \in c x g^{u \rightarrow x}\}$
the _u	$K_{(e \rightarrow D_t) \rightarrow K_e^\rho}^e$	$\lambda kg. \mathbf{1}_u(k \text{ some}_u) g$
$\mathbf{1}_u$	F_α	$\lambda mg. \begin{cases} G, & \text{if } G_u = 1, \text{ where } G = m g, \\ G_u = \{g' \mid u \mid \exists \alpha. \langle \alpha, g' \rangle \in G\} \\ \emptyset, & \text{otherwise} \end{cases}$

A.3.1 Derivation: relative definite reading

[[the rabbit in the hat]] =

$$\begin{aligned}
 & \left(\frac{\mathbf{1}_u[]}{\text{some}^u(\lambda x.[])} \parallel \left(\frac{[]}{\text{rab}} \parallel \frac{[]}{\text{in}} \parallel \left(\frac{\mathbf{1}_\nu[]}{\text{some}^\nu(\lambda y.[])} \parallel \frac{[]}{\text{hat}} \right) \right) \right) \rightsquigarrow \\
 & \left(\frac{\mathbf{1}_u[]}{\text{some}^u(\lambda x.[])} \parallel \left(\frac{[]}{\text{rab}} \parallel \frac{[]}{\text{in}} \parallel \frac{\mathbf{1}_\nu[]}{\lambda g. \bigcup \{ [] g^{\nu \mapsto y} \mid \text{hat } y \}} \right) \right) \rightsquigarrow \\
 & \left(\frac{\mathbf{1}_u(\mathbf{1}_\nu[]) }{\text{some}^u(\lambda x g. \bigcup \{ [] g^{\nu \mapsto y} \mid \text{hat } y \})} \right) \rightsquigarrow \\
 & \left(\frac{\mathbf{1}_u(\mathbf{1}_\nu[]) }{\lambda g. \bigcup \{ [] g^{\nu \mapsto y} \mid \text{hat } y, \text{rab } x, \text{in } y x \}} \right) \rightsquigarrow \\
 & \left(\mathbf{1}_u \left(\mathbf{1}_\nu \left(\lambda g. \left\{ \langle x, g^{\nu \mapsto y} \rangle \mid \text{hat } y, \text{rab } x, \text{in } y x \right\} \right) \right) \right)^* \rightsquigarrow \\
 & \frac{\lambda g. [] g^{\nu \mapsto y}}{x}, \text{ where } x = \iota x : \text{hat}. \exists y. \text{rab } y \wedge \text{in } x y \\
 & \quad y = \iota y : \text{rab}. \text{in } x y.
 \end{aligned}$$

A.3.2 Derivation: determiner spreading

Adding the predicates *red*, *book*, and *=* allows for deriving the meaning of a DP with DS in a parallel way.

(25)	<i>Item</i>	<i>Type</i>	<i>Denotation</i>
	red	$e \rightarrow t$	red
	book	$e \rightarrow t$	book

[[to kokino to vivlio]] =

$$\begin{aligned}
 & \left(\frac{\mathbf{1}_u[]}{\text{some}^u(\lambda x.[])} \parallel \left(\frac{[]}{\text{red}} \parallel \frac{[]}{=} \parallel \left(\frac{\mathbf{1}_\nu[]}{\text{some}^\nu(\lambda y.[])} \parallel \frac{[]}{\text{book}} \right) \right) \right) \rightsquigarrow \\
 & \left(\frac{\mathbf{1}_u[]}{\text{some}^u(\lambda x.[])} \parallel \left(\frac{[]}{\text{red}} \parallel \frac{[]}{=} \parallel \frac{\mathbf{1}_\nu[]}{\lambda g. \bigcup \{ [] g^{\nu \mapsto y} \mid \text{book } y \}} \right) \right) \rightsquigarrow \\
 & \left(\frac{\mathbf{1}_u(\mathbf{1}_\nu[]) }{\text{some}^u(\lambda x g. \bigcup \{ [] g^{\nu \mapsto y} \mid \text{book } y \})} \right) \rightsquigarrow \\
 & \left(\frac{\mathbf{1}_u(\mathbf{1}_\nu[]) }{\lambda g. \bigcup \{ [] g^{\nu \mapsto y} \mid \text{book } y, \text{red } x, = y x \}} \right) \rightsquigarrow \\
 & \left(\mathbf{1}_u \left(\mathbf{1}_\nu \left(\lambda g. \left\{ \langle x, g^{\nu \mapsto y} \rangle \mid \text{book } y, \text{red } x, = y x \right\} \right) \right) \right)^* \rightsquigarrow \\
 & \frac{\lambda g. [] g^{\nu \mapsto y}}{x}, \text{ where } x = \iota x : \text{book}. \exists y. \text{red } y \wedge = x y \\
 & \quad y = \iota y : \text{red}. = x y.
 \end{aligned}$$

This derivation allows the RRC to directly compose with *the red*, like *in the hat* does with *the rabbit*. If instead the derivation involved the “trace” of the AP, in this system that would amount to using the null gap pronoun in the “trace” position and a null version of the relative pronoun from Barker & Shan (2014:38-47). This would also require allowing the relative pronoun to combine with an AP on the left instead of an NP for DS.

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