Reflexive Pronouns

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1. Introduction

In English, the paradigm reflexive pronouns are formed by appending 'self' or 'selves' to a pronoun stem, as in the following.[1]

myself	yourself	himself	herself	itself
ourselves	yourselves	themselves	oneself	

Other constructions count as reflexive, including the following.

Jay respects his **own** mother
Jay and Kay respect **each other**

At the moment, we have little to say about the latter example, since it involves a plural construction. However, we do offer a unified account of 'self' and 'own', according to which they are alternative spellings of an underlying reflexive morpheme.

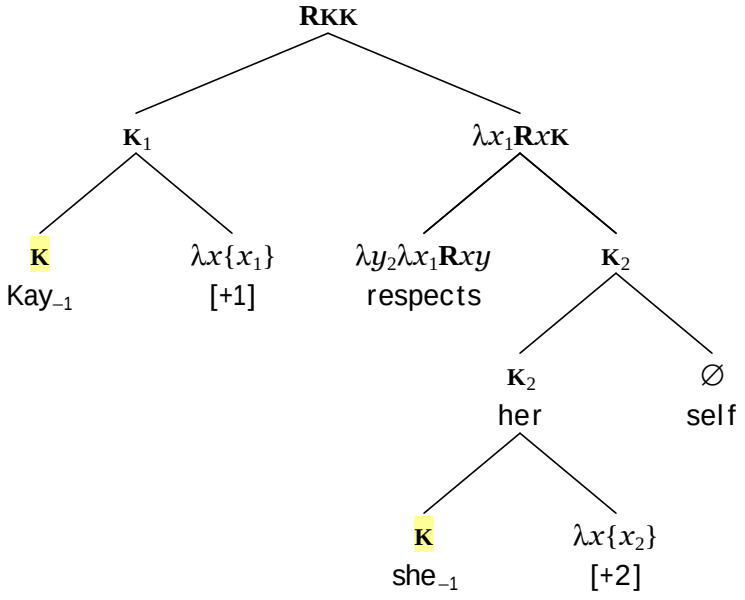
2. Reflexive Pronouns are neither Deictic nor Lazy

Before presenting our proposal, we first consider the question whether reflexive pronouns are deictic, and the question whether they are duplicating (lazy) pro-forms. Consider the following simple example.

(1) Kay respects herself

First, it is fairly clear that the pronoun stem 'her' is not deictic. When we utter 'herself' we are not allowed to point at just any female and say that Kay respects *her*, unless it happens to be Kay, in which case the pointing act is redundant.

Granted it is not exophoric, 'her' must be anaphoric, in which case the obvious candidate to serve as its antecedent is 'Kay'. The question then is whether 'her' is lazy-anaphoric to 'Kay'. At first glance, this seems plausible, as seen in the following semantic calculation.



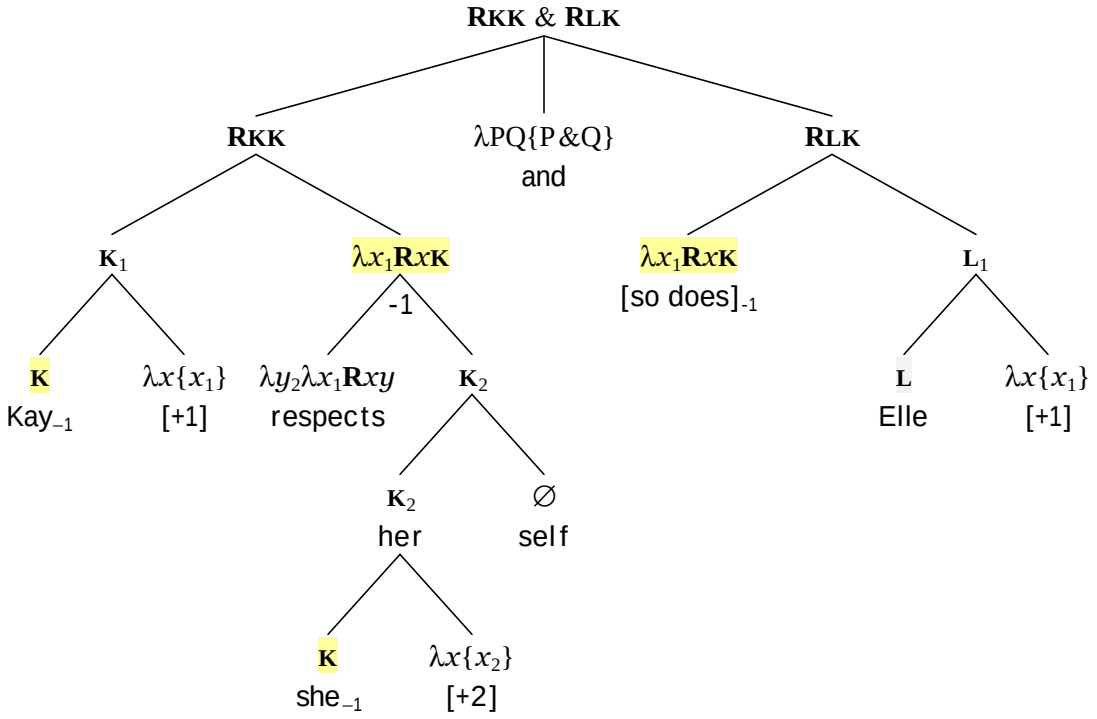
[1] There are also colloquial and dialectical variants, including 'his self', 'them self', 'their selves'.

Here, the morpheme 'she' is lazy-anaphoric to 'Kay', and accordingly receives the same semantic value. The only puzzling feature is the presence of 'self'. Perhaps, we can simply say that this is a *purely syntactic matter*.

So far, it looks like 'herself' is a lazy pronoun standing in place of 'Kay'. Unfortunately, this hypothesis falls prey to the next example.

(2) Kay respects herself, and so does Elle

Our current hypothesis is that 'so does' is a pro-VP, which in this particular case is anaphoric to 'respects herself'. Supposing that 'so does' and 'her' are both lazy pro-forms, we have the following semantic-tree.



Thus, according to this analysis, the sentence says that Kay respects Kay and Elle respects Kay. But the sentence in question does not say that Elle respects Kay; it rather says that Elle respects Elle.

3. Further Grammatical Oddities

In this section, we consider a few more grammatical oddities of reflexive pronouns. First, the pronoun-cases in English are somewhat mysterious. Whereas 'myself' and 'yourself' are genitive, 'himself' and 'themselves' are accusative, and 'herself' and 'itself' could be genitive *or* accusative.[2]

Next, we observe that a reflexive pronoun is severely restricted as to what it can be anaphoric to. For example, in the sentence

(1) Kay's mother respects herself

[2] This conflict does not occur in certain U.S. dialects which make all the forms genitive. We later propose that, notwithstanding the move to make the pronoun *sound* genitive, the underlying grammatical form is accusative, in virtue of which the pronoun serves as the object of the verb.

'her' *cannot* be anaphoric to 'Kay'. Insofar as 'her' is anaphoric to *any* phrase, it is anaphoric to 'Kay's mother'.

Next, consider the following example.

(2) I hope Kay respects me

In this example, 'me' is presumably anaphoric to 'I'. But we cannot replace 'me' by 'myself', which produces the following.

(2′) I hope Kay respects *myself*

Let us *very* briefly consider syntactic solutions to this problem. The simplest way to prohibit the move from (2) to (2′) is to adopt the following rule.

Clause-Mate Rule: A reflexive pronoun must be anaphoric to a clause-mate.

Here, α and β are clause-mates precisely when the smallest clause containing α is the same as the smallest clause containing β. Notice that, in (2′), the clause-mate rule requires 'myself' to be anaphoric to 'Kay', in which case it is ill-formed because of agreement failure. Notice also that the following is not ruled out.

(3) I hope Kay respects herself

Unfortunately, the clause-mate rule faces problems in the following examples.

(4) Jay's mother respects *himself*
(5) Jay and Kay respect *himself*
(6) Jay believes himself to be intelligent

In (4) and (5), 'Jay' is a clause-mate 'himself', so the clause-mate rule does not rule out 'himself' being anaphoric to 'Jay'. In (6), 'himself' is not a clause-mate of 'Jay', so the clause-mate rule prohibits this, even though it is well-formed.[3]

An improved syntactic solution is offered by the following restriction.

Predicate-Mate Rule: A reflexive pronoun must be anaphoric to a predicate-mate.

Here, α and β are predicate-mates precisely when they are both arguments of the same predicate, the precise definition of which we take for granted for the moment. How does the predicate-mate rule deal with the above examples. In (2′) 'I' is an argument of 'hopes', but 'myself' is an argument of 'respects', so 'myself' cannot be anaphoric to 'I'. In (3) 'herself' and 'Kay' are both arguments of 'respects', so 'herself' is anaphoric to 'Kay'. In (4), the predicate-mate of 'himself' is 'Jay's mother', not 'Jay', so the former and not the latter must be its antecedent. Similarly, in (5), the predicate-mate of 'himself' is 'Jay and Kay', not 'Jay', so the former and not the latter must be the antecedent. Example (6) presents a problem if 'believes' subcategorizes for two arguments – a nominal subject and a nominalized sentence object. In that case, 'himself' has no predicate-mate. On the other hand, if 'believes' *as used in this example* subcategorizes for three arguments – including a nominative

[3] This presumes that 'himself to be intelligent' is a clause. See footnote 4.

subject, an accusative direct object, and a "dative" indirect object[4] – then 'himself' is a predicate-mate of 'Jay'.[5]

One can explore syntactic approaches to reflexive pronoun anaphora in much greater depth, but we prefer to take a completely different approach.

4. Our Proposal – Role-Anaphora

We propose to analyze reflexive pronouns as an independent species of pronouns, which are not anaphoric in the usual sense. Whereas ordinary pronouns are directly-anaphoric to NPs, reflexive pronouns are directly-anaphoric, not to NPs, but to roles, which explains their peculiar distributional features. For example, in

Jay's mother respects ∗himself∗

the reflexive pronoun is directly-anaphoric to the subject-role, and is indirectly-anaphoric to whatever fills this role. In this particular case, the subject role is filled by 'Jay's mother'. The latter controls agreement features of the pronoun, and accordingly syntactically rules out 'himself', since it does not agree in gender. Similarly, in

Jay and Kay respect ∗himself∗

the reflexive pronoun is directly-anaphoric to the subject-role, which in this case is filled by the phrase 'Jay and Kay', which also syntactically rules out 'himself', since it does not agree in number. Finally, in.

Kay's mother respects herself

'herself' is not (indirectly) anaphoric to 'Kay', since 'Kay' does not fill the subject role Rather, 'Kay's mother' fills the subject-role, and so 'herself' is (indirectly) anaphoric to 'Kay's mother'.

5. The Categorial Implementation

First, we propose that essentially-anaphoric pronouns are fundamentally semantically *vacuous*. We propose to implement this categorially as follows, where 'e' is the essentially-anaphoric pronoun root.

type(e)	=	N→N
⟦e⟧	=	$\lambda x\{x\}$

In other words, the denotation of 'e' is the identity function on the set of entities.

Second, we propose a **reflexive morpheme** [ref_1], which is variously spelled – 'self' and 'own' and ∅[6] – and which is categorially rendered as follows.[7]

[4] More specifically, the indirect object is a 'to' phrase, in this case 'to' + non-finite-verb, sometimes called an infinitive.
[5] This maneuver also rescues the clause-mate rule from this example.
[6] In other words, the reflexive morpheme may be unpronounced.
[7] Here, we presume that a reflexive pronoun is anaphoric to the subject-role. In a later section, we consider whether a reflexive pronoun can be anaphoric to other roles.

$$\text{type}(\mathsf{ref}_1) = N_1 \rightarrow (N \times N_1)$$
$$[\![\mathsf{ref}_1]\!] = \lambda x_1 \{x_1 \times x\}$$

Recall that the cross-operator is ambiguous. On the one hand, it is a primitive type-operator, which behaves a lot like logical 'and'. On the other hand, it is a primitive lambda-calculus operator, which behaves a lot like ordered-pair formation. These two operators are connected, however, by the restriction that $\text{type}(\alpha \times \beta) = \text{type}(\alpha) \times \text{type}(\beta)$.

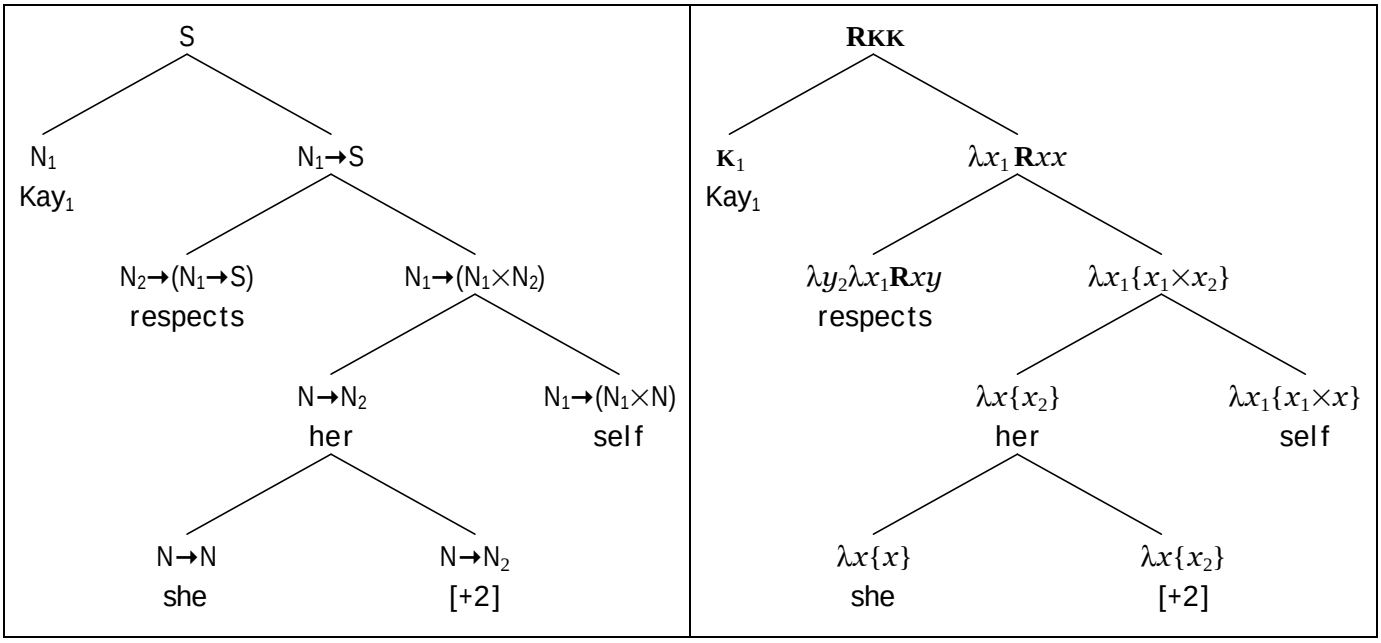
In any case, the underlying idea is that $[\![\mathsf{ref}_1]\!]$ takes a nominative-marked item x_1 and delivers a *pair* of items – including the original nominative-marked item x_1, plus the associated unmarked item x, which in turn can enter into further syntactic/semantic compositions.

6. Examples

In order to see how this semantics works, we work out several examples.

1. Example 1

Kay respects herself



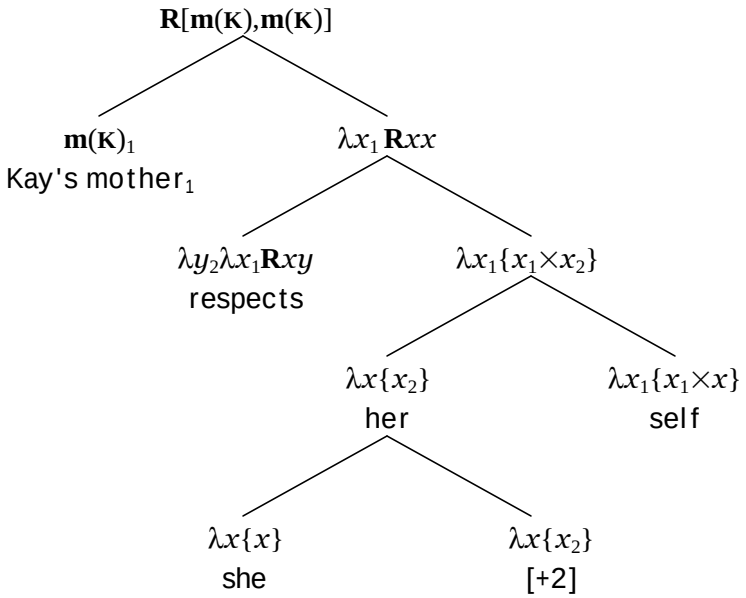
The critical derivation – $[\![\text{respects}]\!] \oplus [\![\text{herself}]\!] \vdash [\![\text{respects herself}]\!]$ – is given as follows.

(1)	$\lambda y_2 \lambda x_1 \mathbf{R}xy$ respects	$N_2 \rightarrow (N_1 \rightarrow S)$	1	Pr
(2)	$\lambda x_1\{x_1 \times x_2\}$ herself	$N_1 \rightarrow (N_2 \times N_1)$	2	Pr
(3)	x_1	N_1	3	As
(4)	$x_1 \times x_2$	$N_1 \times N_2$	23	2,3,λO
(5)	x_1	N_1	(23)a	4,×O
(6)	x_2	N_2	(23)b	4,×O
(7)	$[\lambda y_2 \lambda x_1 \mathbf{R}xy]\langle x_2 \rangle$	$N_1 \rightarrow S$	1(23)b	1,6,λO
	$\lambda z_1 \mathbf{R}zx$			AV[8], λC
(8)	$[\lambda z_1 \mathbf{R}zx]\langle x_1 \rangle$	S	123	5,7,λO
	$\mathbf{R}xx$			λC
(9)	$\lambda x_1 \mathbf{R}xx$ respects herself	$N_1 \rightarrow S$	12	3,8,λI

2. Example 2

The following is nearly identical to the previous example, but it further illustrates how a reflexive pronoun has no choice as to its nominal antecedent.

Kay's mother respects her**self**

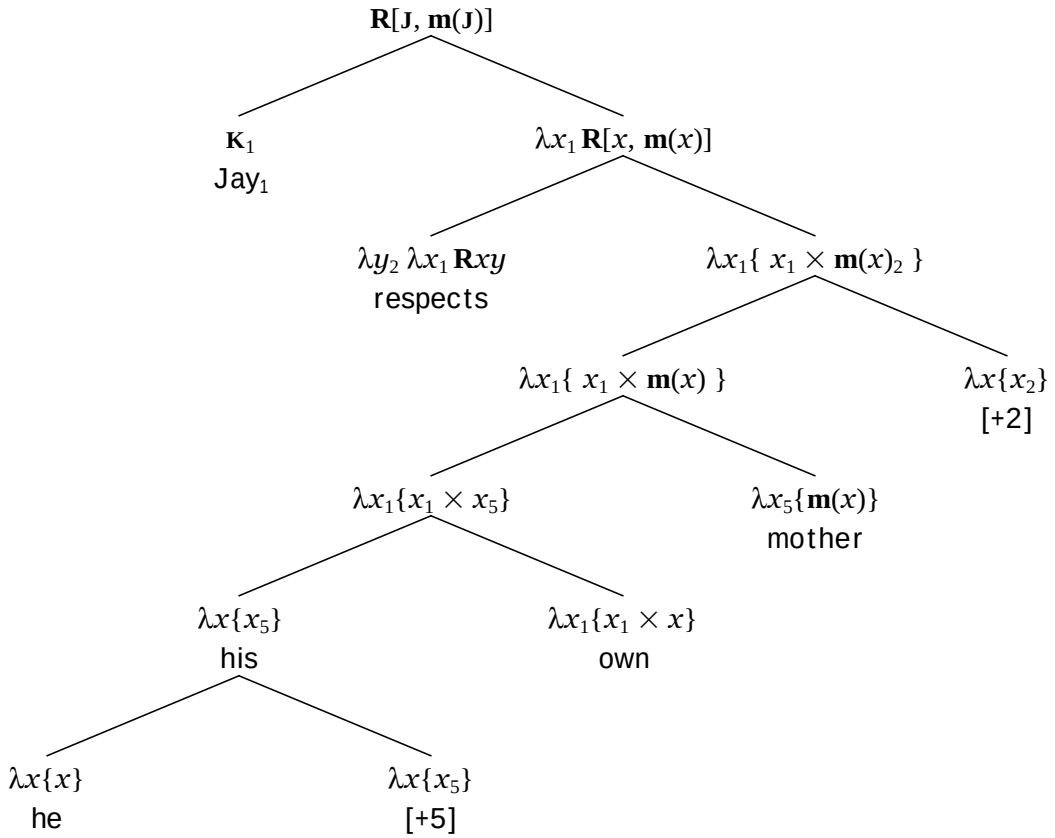


3. Example 3

The following example illustrates how 'own' works as a variant of [ref].

[8] 'AV' is short for 'alphabetic variance'. As it stands, $[\lambda y_2 \lambda x_1 \mathbf{R}xy]\langle x_2 \rangle$ cannot be simply calculated since y is not free for x in $\lambda y_2 \lambda x_1 \mathbf{R}xy$, so we must first convert $\lambda y_2 \lambda x_1 \mathbf{R}xy$ into an alphabetic variant, $\lambda z_2 \lambda x_1 \mathbf{R}xz$.

Jay respects his **own** mother



The derivation of ⟦his own mother⟧ includes the following important steps.

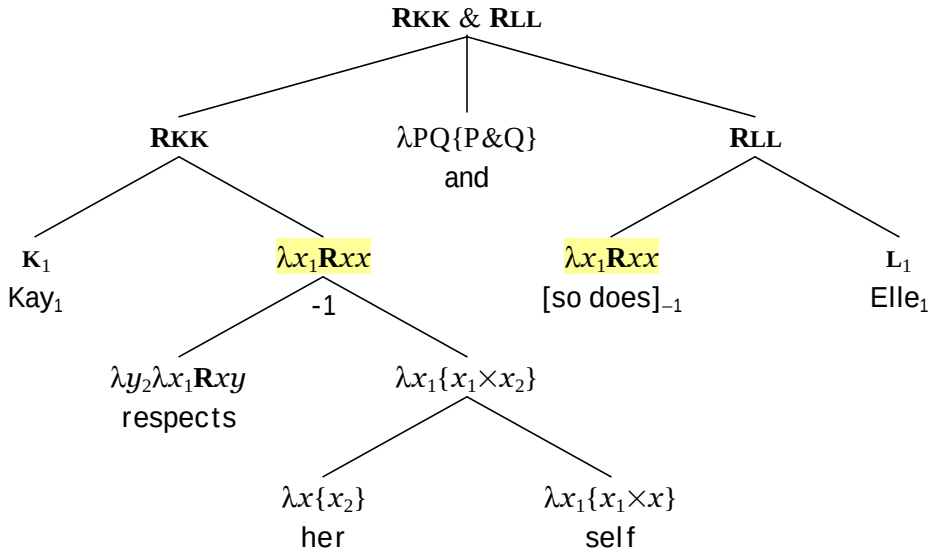
(1)	$\lambda x\{x_5\}$	his	$N \rightarrow N_5$	1	Pr
(2)	$\lambda x_1\{x_1 \times x\}$	own	$N_1 \rightarrow (N \times N_1)$	2	Pr
(3)	x_1		N_1	3	As
(4)	$x_1 \times x$		$N_1 \times N$	23	2,3,λO
(5)	x_1		N_1	(23)a	4,×O
(6)	x		N	(23)b	4,×O
(7)	x_5		N_5	1(23)b	1,6,λO
(8)	$x_1 \times x_5$		$N_1 \times N_5$	123	5,7,×I
(9)	$\lambda x_1\{x_1 \times x_5\}$	his own	$N_1 \rightarrow (N_1 \times N_5)$	12	3,8,λI

(1)	$\lambda x_1\{x_1 \times x_5\}$	his own	$N_1 \rightarrow (N_1 \times N_5)$	1	Pr
(2)	$\lambda x_5\,\mathbf{m}(x)$	mother	$N_5 \rightarrow N$	2	Pr
(3)	x_1		N_1	3	As
(4)	$x_1 \times x_5$		$N_1 \times N_5$	13	1,3,λO
(5)	x_1		N_1	(13)a	4,×O
(6)	x_5		N_5	(13)b	4,×O
(7)	$\mathbf{m}(x)$		N	2(13)b	2,6,λO
(8)	$x_1 \times \mathbf{m}(x)$		$N_1 \times N$	213	6,7,×I
(9)	$\lambda x_1\{x_1 \times \mathbf{m}(x)\}$	his own mother	$N_1 \rightarrow (N_1 \times N)$	21	3,8,λI

4. Example 4

The following example illustrates how reflexive pronouns interact with pro-VPs.

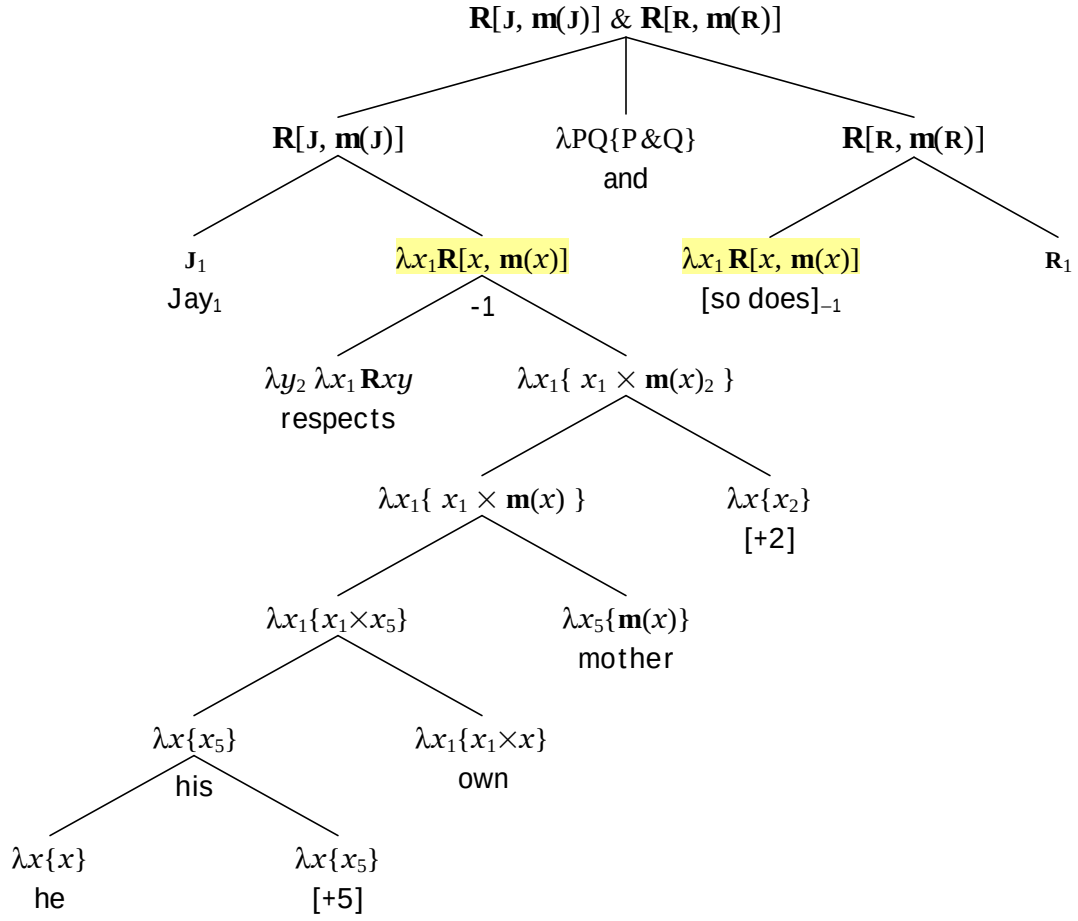
Kay respects herself, and so does Elle



5. Example 5

The following example also illustrates how reflexive pronouns interact with pro-VPs.

Jay respects his own mother, and so does Ray

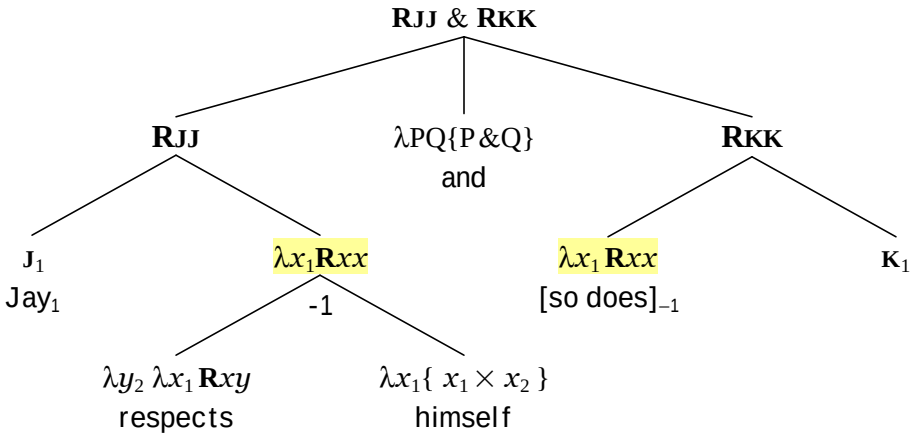


7. Semantic Gender and Restricted Lambda-Abstracts

Consider the following sentence

Jay respects himself and so does Kay

This sentence seems *semantically ill-formed*, supposing Kay is not male, and it also seems *syntactically ill-formed*, supposing 'Kay' is not masculine. So, how do we block the following tree?



In order to block the above derivation, we introduce **semantic gender**,[9] according to which English gender-inflections serve to pick out objects of a particular gender, so for example, 'he' is restricted to male objects, and 'she' is restricted to female objects.[10]

In order to implement this inside the lambda-calculus, we enlarge its syntax and combinatorial rules, as follows.

1. Restricted Lambda-Abstraction

Where Φ is any formula, θ is any case-marker or null, V is any variable of type $\mathfrak{I}^1$,[11] and Ε is any expression of type $\mathfrak{I}^2$, the following expression is an expression of type $\mathfrak{I}^1 \rightarrow \mathfrak{I}^2$.

$$\lambda V_\theta / \Phi / \Epsilon$$

2. Restricted Lambda-Conversion

Where Φ is any formula, V is any variable of type $\mathfrak{I}^1$, θ is a case-marker or null, Ε is any expression of type $\mathfrak{I}^2$, and Σ is an expression of type $\mathfrak{I}^1$, we have the following.

$$[\lambda V_\theta / \Phi / \Epsilon]\langle \Sigma_\theta \rangle = \Epsilon[\Sigma/V] \text{ provided } \Phi[\Sigma/V]$$
$$= \text{※} \text{ otherwise}$$

Here, '※' indicates the expression does not compute.

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[9] Many languages – including Latin, German, French, Italian, Spanish – have **syntactic gender**, according to which a common noun is masculine, feminine, or neuter, for (largely) syntactic reasons. For example, in German, a dog is obligatorily masculine, and a cat is obligatorily feminine. Also, a married woman is feminine, but an unmarried woman and a wife are neuter!

[10] Exactly how an object without sex organs becomes male or female [e.g., ships are often referred to via 'she'] is left open.

[11] $\mathfrak{I}^1$ is simple unless θ is null.

Note that the new lambda-abstracts correspond to *function-restriction*. Specifically, in set theory, if ϕ is a function from set A to set B, and A' is subset of A, then the **restriction of ϕ to A'** is, by definition that function that assigns $\phi(a)$ to each element a of A', and is otherwise undefined. In other words:

$$\phi/A' \quad =_{df} \quad \{ \langle x,\phi(x)\rangle : x \in A' \}$$

3. New Composition Rules

In the following θ is a case-marker, or is null.

1. Lambda-Out

Expression	Type	index
$\lambda v_\theta / \Phi / \mathcal{E}$	$\mathcal{A}_\theta \rightarrow C$	i
Σ_θ	$\mathcal{A}_\theta$	j
$\Phi[\Sigma/v]$		
$\mathcal{E}[\Sigma/v]$	C	$i \times j$

Note that the formula $\Phi[\Sigma/v]$ has neither a type nor an index. Reasoning pertaining to characterizing formulas proceeds parallel to the combinatorial reasoning.

2. Lambda-In

v_θ	$\mathcal{A}_\theta$	i
$\Phi[\Sigma/v]$		
$\mathcal{E}[\Sigma/v]$	C	$i \times j$
$\lambda v_\theta / \Phi / \mathcal{E}$	$\mathcal{A}_\theta \rightarrow C$	i

In connection with λ-In, one is entitled to assume $\Phi[\Sigma/v]$.

4. Gender Morphemes

Next, we introduce three gender morphemes, as follows.

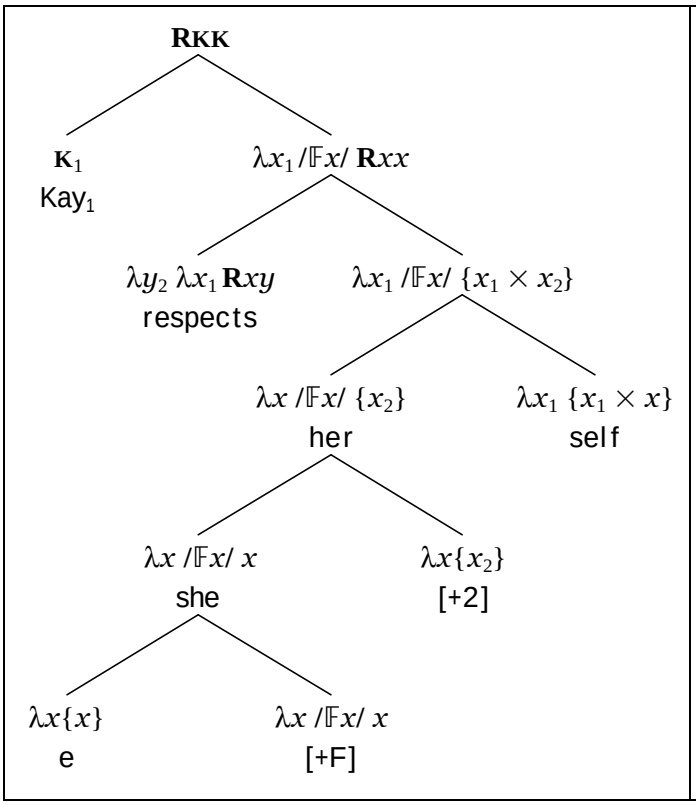
(1) $[\![+\mathsf{M}]\!] = \lambda x / \mathbb{M}x / \{x\}$ [masculine]
(2) $[\![+\mathsf{F}]\!] = \lambda x / \mathbb{F}x / \{x\}$ [feminine]
(3) $[\![+\mathsf{N}]\!] = \lambda x / \mathbb{N}x / \{x\}$ [neuter]

For example, $[\![+\mathsf{M}]\!]$ is the identity-function restricted to the class of *male entities*.

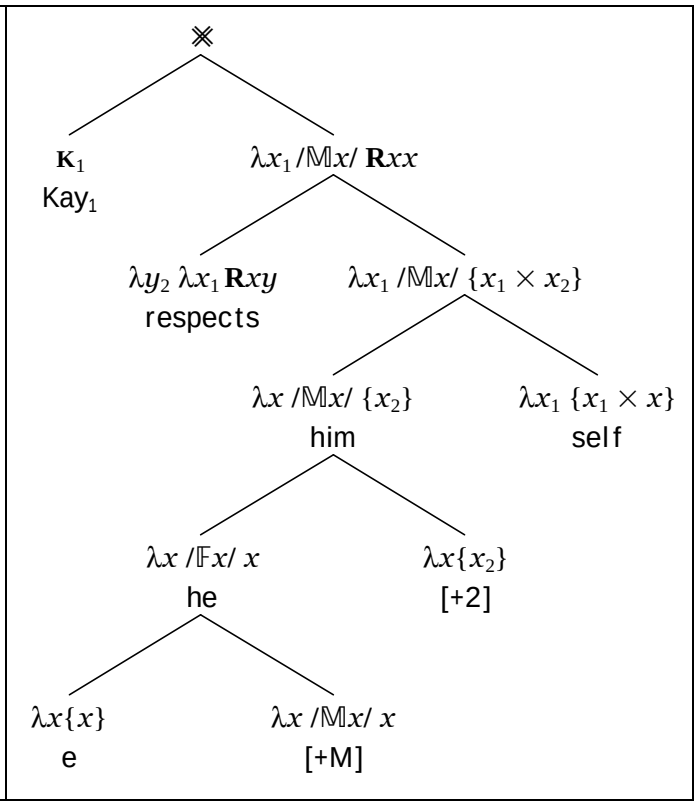
5. Examples

Supposing Kay is female [$\mathbb{F}\mathbf{k}$], and not male [$\sim\mathbb{M}\mathbf{k}$], we have the following trees

Kay respects herself



Kay respects himself



Notice that the gender-inflection percolates up through the semantic construction, so that ⟦respects himself⟧ denotes a characteristic-function restricted to male individuals. Accordingly, when ⟦respects himself⟧ is applied to Kay, a non-female individual, the result is null, and the corresponding sentence is semantically ill-formed. Notice, in particular, that 'Kay respects himself' is *not false*, but is rather truth-valueless (*without content*).

Having presented the semantics of semantic-gender, for the sake of simplifying our calculations, we propose henceforth to largely ignore gender-issues.

8. More Examples

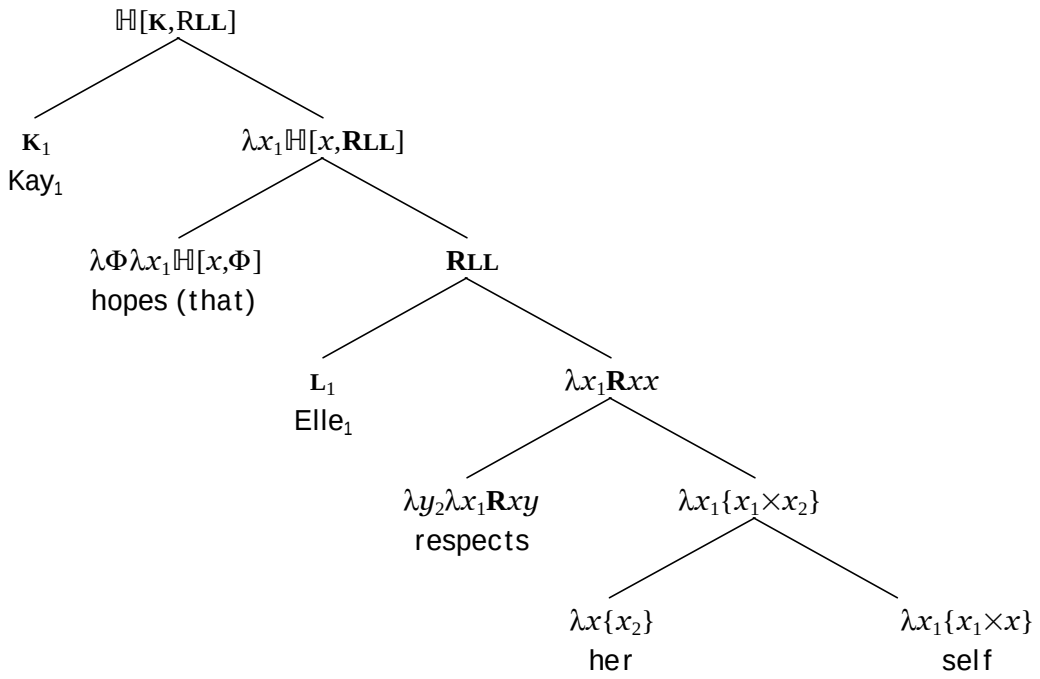
1. Embedded Sentences

We next consider an example with an embedded sentence.

Kay hopes (that) Elle respects herself

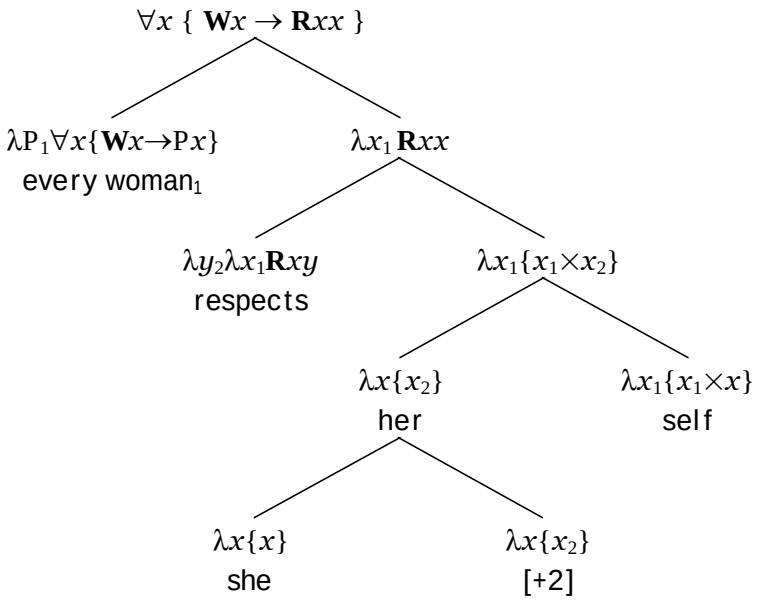
In this sentence, it is generally agreed that 'herself' cannot be anaphoric to 'Kay', but can only be anaphoric to 'Elle'. This is taken care of by the predicate-mate rule, since 'Kay' is not a predicate-mate of 'herself', but it is more naturally explained by treating 'self' as role-anaphoric, as seen in the following analysis.[12]

[12] This sentence introduces a semantic complication – specifically, the relation ⟦hopes⟧ does not stand between Kay and the truth-value **RLL**; rather, it stands between Kay and the proposition that-Elle-respects-herself, which is an intensional object. Accordingly, an adequate account of this sentence must wait until we move to *intensional semantics*, which we postpone for the moment.



2. Reflexive Pronouns Anaphoric to Quantifier Phrases

The following example shows that our proposal offers a seamless account of examples in which a reflexive pronoun is anaphoric to a quantifier phrase.

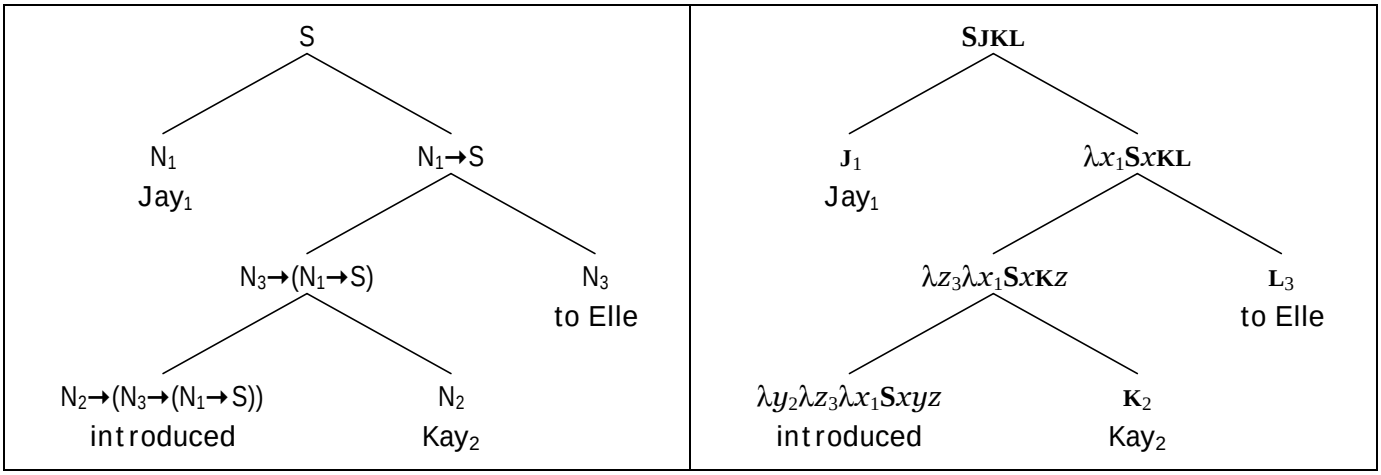


3. Di-Transitive Verbs

A di-transitive verb is one that has two objects. For example, 'sell' sub-categorizes for a nominative argument (its subject), an accusative argument (its direct object), and a dative argument (its indirect object). On the other hand, 'buy' subcategorizes for an ablative indirect object. Next, we note that some verbs naturally take reflexive direct-objects, as in the following.

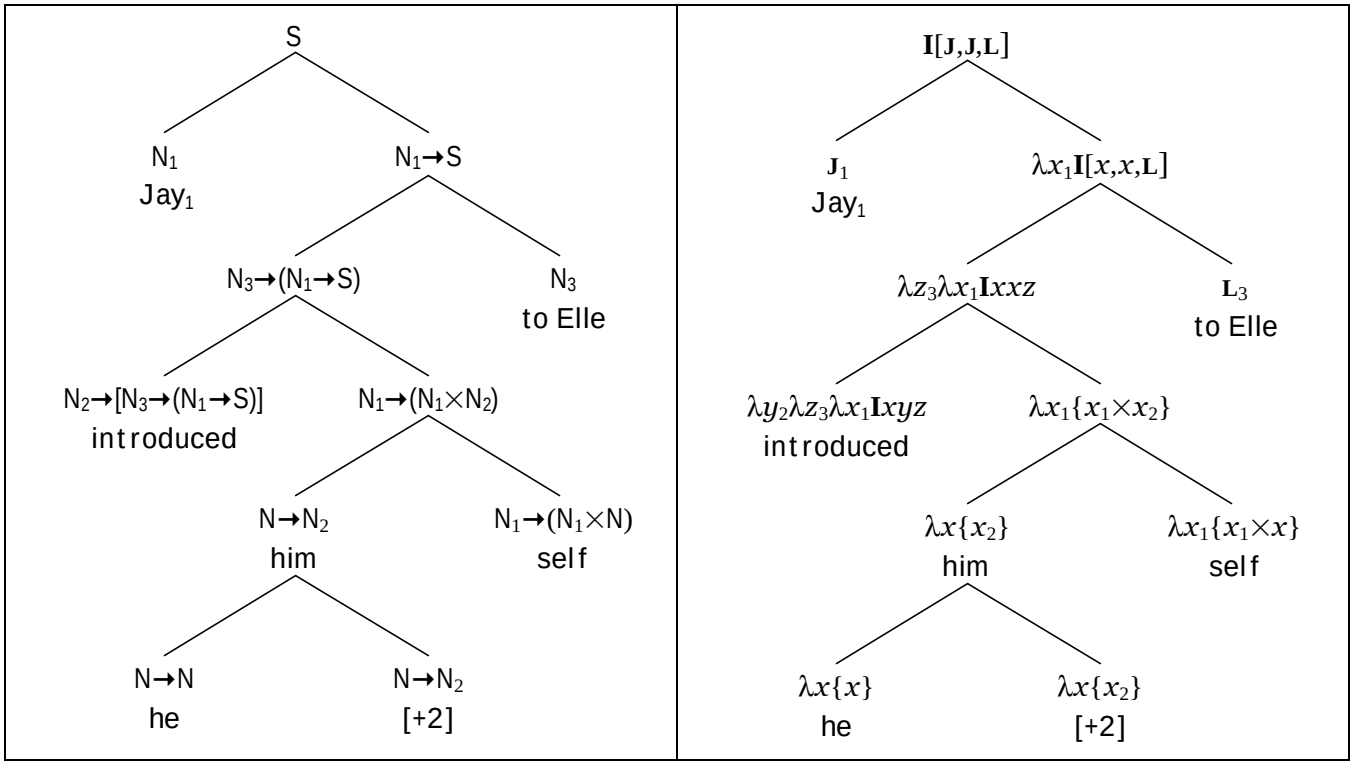
The following is a simple example.

Jay introduced Kay to Elle



The following is a corresponding example in which the direct object is reflexive.

Jay introduced himself to Elle



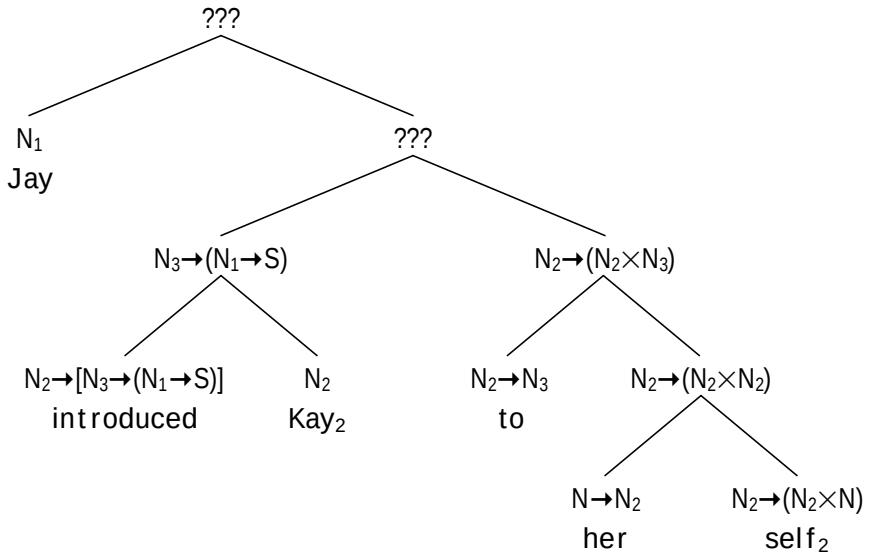
4. Can A Reflexive Pronoun be Anaphoric to an Object-Role?

So far, we have proposed that reflexive pronouns are anaphoric to subject-roles. Are there any examples in which they are anaphoric to object-roles? The following are plausible examples, if only barely.[13]

Jay introduced Kay to herself
Jay recommended Kay to herself

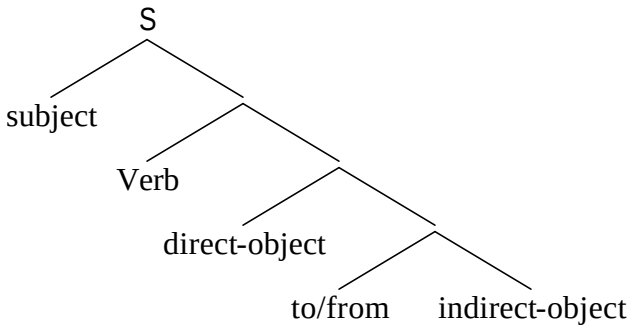
[13] We might understand this by imagining that Jay is a psycho-analyst who is treating Kay.

If we analyze this using the earlier proposed syntactic analysis of di-transitive verbs, we obtain the following syntactic tree for the first one.



Here, the subscript 2 in '$self_2$' indicates that it is anaphoric to object-role. The problem is that, by the time we get to the second rank (from the top), we have nothing left to play the accusative role. Originally, we started with 'Kay_2', but that has already been absorbed by '*introduced*'.

We accordingly propose a secondary syntactic analysis of di-transitive verbs as follows.



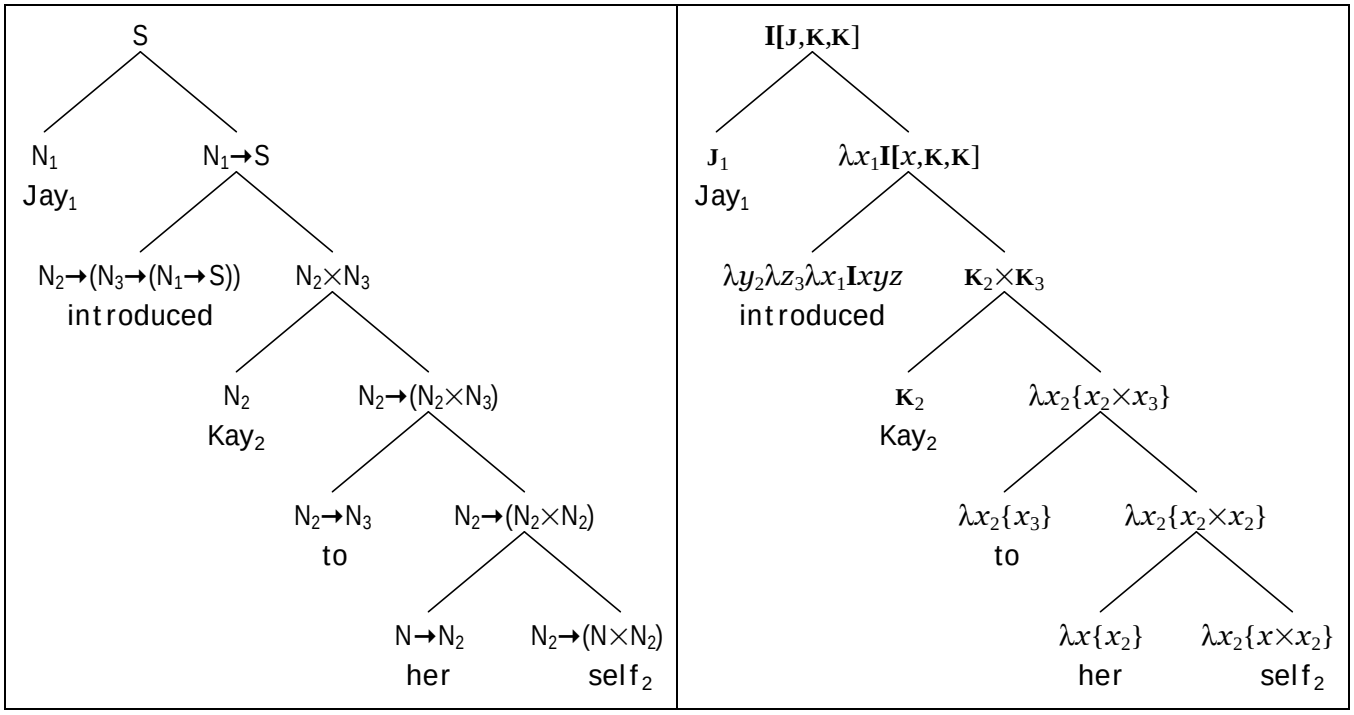
By way of evidence for this structure, we offer the following example involving coordinate conjunction. In particular, each of the following is well-formed.

Jay *introduced* **Kay to Elle** and **Fay to Ray**

With this syntactic model in mind, we now offer the trees for our earlier example.[14]

[14] Since the argument node for '*introduced*' is a product-type $(N_2 \times N_3)$, we might be inclined to take the type of '*introduce*' to be $(N_2 \times N_3) \rightarrow (N_1 \rightarrow S)$, rather than $N_2 \rightarrow (N_3 \rightarrow (N_1 \rightarrow S))$. This, however, defeats our attempt to conjoin '*Kay to Elle*' and '*Fay to Ray*'. So we prefer to maintain the binary-branching structure.

Jay introduced Kay to herself



Note that '**self**' is subscripted by '2', which indicates that '**self**' is anaphoric to the object-role, which in this sentence is played by '**Kay**'.

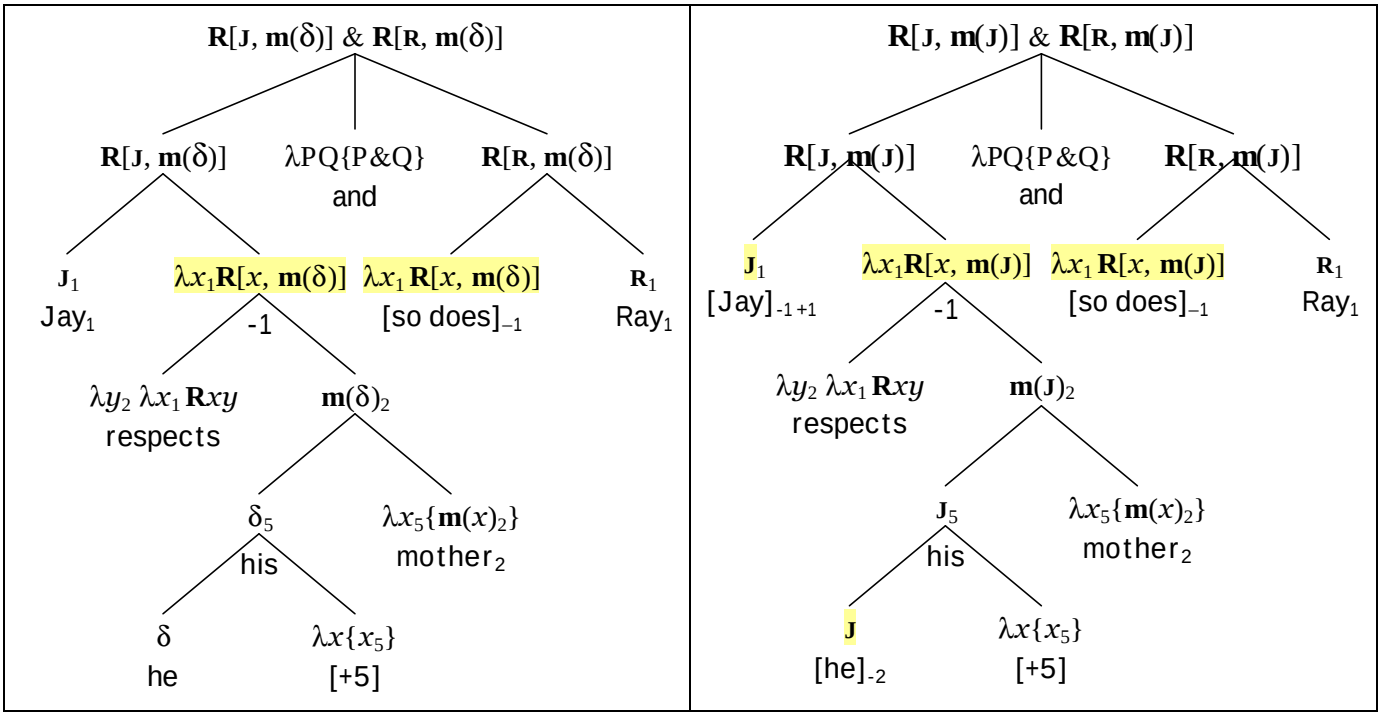
9. Quasi-Reflexive Pronouns

So far, all examples of reflexive pronouns have been overtly marked by either '**self**' or '**own**'. As it turns out, many other pronoun occurrences may be fruitfully analyzed by proposing covert occurrences of [**ref**]. Consider the following example.

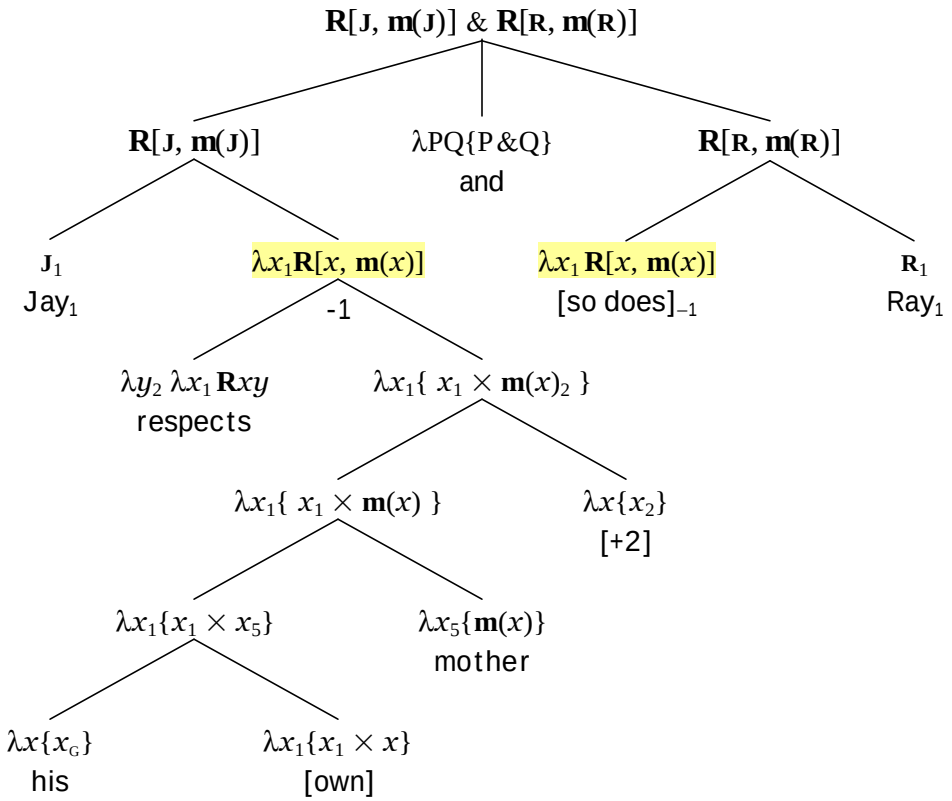
Jay respects his mother, and so does Ray

There are different readings of this sentence according to how we read '**his**', but the important point to bear in mind is that, however we read '**his**', this reading must be *duplicated* in our reading of '**so does**', since it duplicates the content of its antecedent.

We have already considered the two simplest readings. One treats the pronoun stem '**he**' as demonstrative, in which case it denotes a salient (male) individual. The other treats '**he**' as lazy-anaphoric to '**Jay**', in which case it indirectly denotes Jay. These give us the following two semantic calculations.



According to the first reading, Jay and Ray both respect the salient man's mother, whereas according to the second reading, Jay and Ray both respect Jay's mother. There is a further reading, however, according to which Jay respects Jay's mother and Ray respects Ray's mother. It is given by the following tree, which posits a covert (unpronounced) occurrence of 'own'.



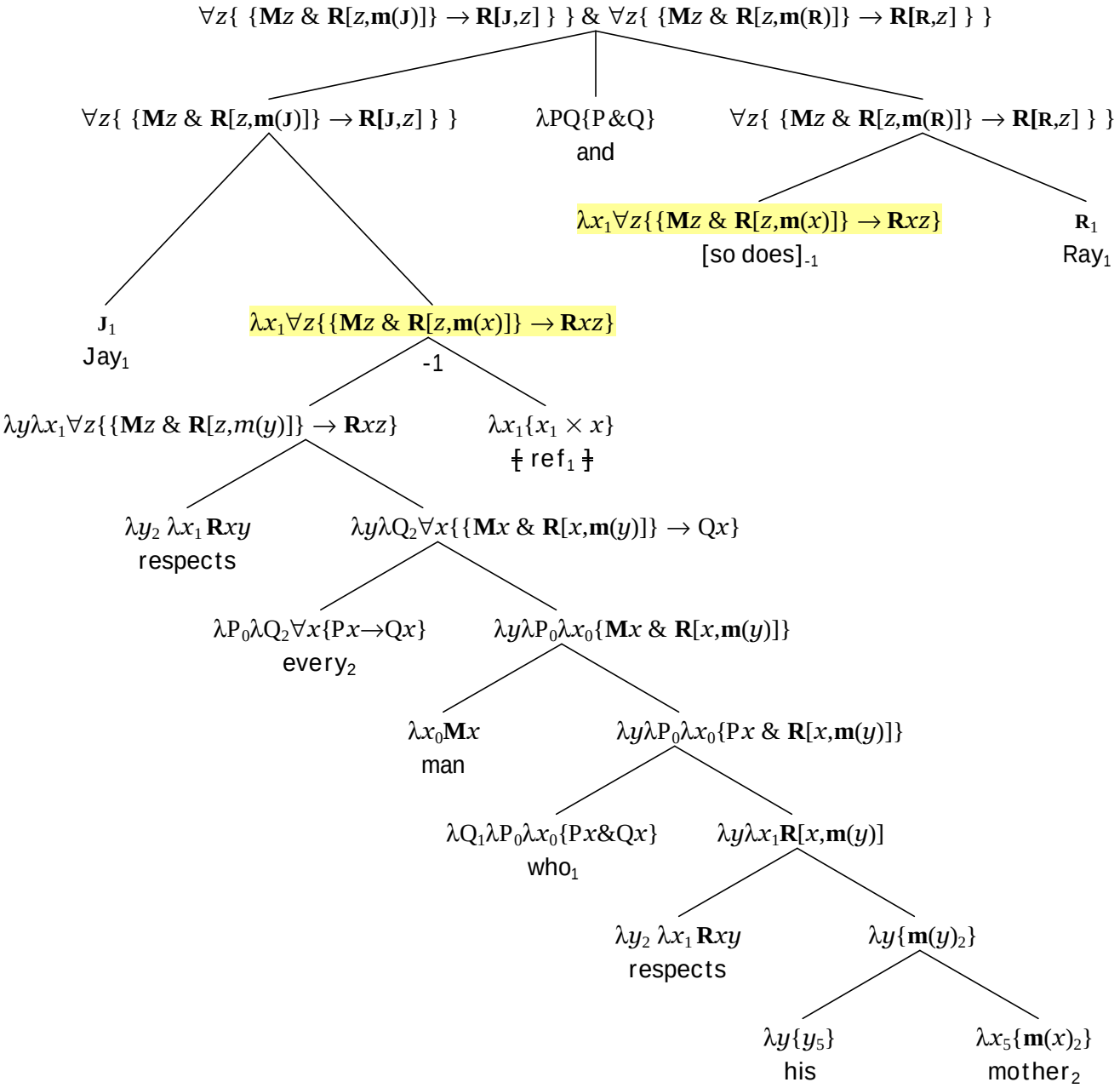
In the previous example, the reflexive morpheme is optionally pronounced 'own'. In the following example, one reading requires that the reflexive morpheme remains unpronounced.

Jay respects every man who respects his mother, and so does Ray

First, 'so does' is lazy-anaphoric to 'respects his mother'. That still leaves the analysis of 'his', which admits four readings.

(1) 'his' is exophoric to a salient male individual
(2) 'his' is lazy-anaphoric to 'Jay'
(3) 'his' is reflexively-anaphoric to 'every man'
(4) 'his' is reflexively-anaphoric to 'Jay'

We have an account in hand for the first three readings. The fourth reading may be obtained by the following calculation, in which we posit a covert reflexive morpheme between 'man' and 'respects'.[15]



[15] In the tree, we extrapose [ref] in order to conserve space. Recall that, semantically speaking, it does not matter what order sister nodes are written.