

The internal readings of symmetrical adjectives and adverbs

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1 Introduction

A sentence like *Anna and Bill talked to different students* has two readings: one in which it means that Anna and Bill talked to students who are different from a certain group of students who were mentioned in the previous discourse, and another in which it means that the student that Anna talked to was different from the student that Bill talked to. The first reading is called the *external reading* because in it the sentence says that the students being talked about are different from the students referred to outside of the sentence, whereas the second reading is called the *internal reading* because in it the sentence says that each of the two students being talked about is different from the other student, also mentioned inside the sentence. We will refer to *different* and other similar predicates that can give rise to a type of interpretation that can be called an internal reading as symmetrical predicates, following Culicover & Jackendoff (2005). One of the principal aims of this paper is to point out that some symmetrical predicates are syntactically adverbials and the properties of such adverbial symmetrical predicates pose a problem for some of the existing theories of symmetrical predicates.

Sentence (1) is one example that will be discussed in what follows. Since sentence (1) can express roughly the same meaning as the internal reading of sentence (2), it seems sensible to regard the adverb *differently* as an instance of the type of expression that can give rise to an internal reading just like the adjective *different*, as claimed in Yatabe (1988). In what follows, it will be shown that the existing theories of internal readings cannot capture the properties of sentences like (1) and (2) in a sufficiently general fashion, and an alternative HPSG-based theory will be proposed. In the course of presenting that theory, a novel analysis of the semantics of reciprocal pronouns will also be laid out and will be shown to be an improvement over the existing analyses such as the one proposed in Heim et al. (1991).

Note that sentences like (3), in which a symmetrical predicate is used as a modifier of a singular nominal, will be viewed as representing a separate grammatical phenomenon, and will thus be ignored in this paper. The word *different* that is used in a sentence like (3) looks and sounds the same as the word *different* used in a sentence like (2) as a modifier of a plural nominal, but as shown in Beck (2000) and Brasoveanu (2011), the two types of adjectives, namely the one that is used in a sentence like (2) and the one that is used in a sentence like (3), are morphologically distinct from each other in languages like German. This observation indicates that the kind of symmetrical predicate used as a modifier of a singular nominal in a sentence like (3) should be regarded as something distinct from the kind of symmetrical predicate used as a modifier of a plural nominal in a sentence like (2).

2 Beck (2000) and Charnavel (2015)

Let us start with an examination of the theory proposed in Beck (2000) and adopted in Charnavel (2015).

In this theory, what is called a *cover reading* of a plural noun phrase plays an important role. A cover reading is a reading of a plural noun phrase that is distinct from a distributive reading and a collective reading (although the distributive reading could be regarded as a type of cover reading). Specifically, a plural noun phrase is said to have been given a cover reading when it is interpreted as denoting a group consisting of smaller groups. For instance, in a sentence like *The missionaries founded two new schools*, the noun phrase *the missionaries* is said to have been given a cover reading if the sentence is taken to mean something like “Missionary Group A founded School 1, and Missionary Group B founded School 2”.

The theory proposed in Beck (2000) is based on the idea that the interpretation of a sentence like (2) can be derived by merely assuming that the noun phrase whose head is modified by a symmetrical predicate, e.g. the noun phrase *different ways* in sentence (2), is given a cover reading. When a noun phrase like *different ways* is given a cover reading, the detail of the denotation is not grammatically but contextually determined; as far as the grammar is concerned, the noun phrase can be interpreted as a group consisting of pretty much any kinds of smaller groups. The subject *different people* in sentence (2) can refer to a group consisting of Person 1, Person 2, and Person 3, and the noun phrase *different ways* can refer to a group consisting of a set of ways in which Person 1 aged, a set of ways in which Person 2 aged, and a set of ways in which Person 3 aged. Assuming that the word *different* inside *different ways* means that the three sets that make up the denotation of *different ways* are distinct from each other, the sentence is predicted to mean that Person 1 aged in certain ways, Person 2 aged in certain ways, Person 3 aged in certain ways, and those three sets of ways of aging were distinct from each other. This interpretation is indeed the internal reading of this sentence.

This theory derives the internal reading of the sentence without adding anything new to the theory of grammar, and therefore can be said to be a maximally simple theory of the reading. There are, however, two problems with this theory.

First, as acknowledged in Beck (2000), it turns out that something new does need to be added to the grammar in order to make it possible to deal with a sentence like (4), in which the noun phrase containing a symmetrical predicate and another plural noun phrase that is semantically associated with it are not co-arguments of the same predicate. In the case of sentence (2), it is arguably possible to regard the preposition *in* as a marking preposition, so *different people* and *different ways* can arguably be viewed as co-arguments of the verb *aged*. As a consequence, if the verb is given the cumulative reading, we get truth conditions that constitute the internal reading. On the other hand, in the case of sentence (4), *Luise and Franz* and *different operas* cannot be viewed as co-arguments of the same predicate, so the grammar cannot give rise to the internal reading unless some new mechanism is added to it. The same is true for the example in (5), discussed in Moltmann (1992). Unless some special mechanism is added to the grammar, the sentence is expected to mean that both John and Mary hold the belief that more than one man married Sue, an interpretation that is different from the internal reading.

Second, it is obvious that Beck's theory cannot be applied to sentence (1), since an adverb like *differently* cannot be given a cover reading.

3 Kubota & Levine (2016)

Next, let us examine the theory proposed in Kubota & Levine (2016). In this theory, it is claimed that the internal reading of a sentence like (2) involves *respectively* interpretation. *Respectively* interpretation is the kind of interpretation that we see in a sentence like *Mary and John read Joyce and Atwood respectively*. According to Kubota and Levine, a *respectively*-type relation holds between *different people* and *different ways* in sentence (2), and the sentence as a whole is interpreted as saying something along the lines of "Person 1, Person 2, etc. underwent the A-type aging, the B-type aging, etc., respectively, and the A-type aging, the B-type aging, etc., were different from each other."

Unlike Beck's theory, this theory can deal with examples like (4) and (5) without any problem.

As noted in Kubota & Levine (2016), however, there are some differences in behavior between the internal readings of symmetrical predicates and *respectively* interpretation, and it has yet to be shown how those differences could be accommodated in their theory. For instance, noun phrases coordinated by *or* can give rise to *respectively* interpretation but not to internal readings, as already pointed out in Carlson (1987). (See Yatabe & Tam (2019) for one possible account regarding under what circumstances noun phrases coordinated by *or* could give rise to *respectively* interpretation.) The example in (6) is a sentence discussed in Eggert (2000) in which noun phrases coordinated by *or* are given *respectively* interpretation, and the example in (7) is a sentence discussed in Carlson (1987) which shows that noun phrases coordinated by *or* do not give rise to internal readings of symmetrical predicates. Here and elsewhere, the asterisk preceding an example sentence means that the sentence does not allow an internal reading. Carlson (1987) points out that (7) does not have an internal reading even though the sentence in (8), which resembles (7), has the same truth condition as (9).

Furthermore, like Beck's theory, the theory proposed in Kubota & Levine (2016) cannot be applied to sentences like (1), because an expression like *differently*, which does not denote any kind of plurality, cannot be given *respectively* interpretation. The view that the adverb *differently* does not express any kind of plurality receives support from comparison of the sentences in (10) and (11). The sentence in (10) can mean that Pat walked in more than one way, but sentence (11) does not allow such interpretation.

4 Brasoveanu (2011)

The third theory I will examine is the theory proposed in Brasoveanu (2011), especially that part of the theory that is concerned with the internal readings of *different* used as a modifier of a plural nominal.

This theory makes use of a mechanism that Brasoveanu calls *plural info states*, which is essentially a sequence of assignments. This mechanism allows a single expression to receive multiple semantic interpretations, depending on which assignment it is interpreted under. For example, when a sentence like *John and Mary read different books* is interpreted, the discourse referent corresponding to the subject and the discourse referent corresponding to the object could respectively receive the values 'John' and 'Book A' from assignment 1 and the values 'Mary' and 'Book B' from assignment 2. Given such assignments, the sentence as a whole would mean "John read Book A, Mary read Book B, and Book A and Book B are different from each other," according to the theoretical framework formulated in Brasoveanu (2011).

Although there is some similarity between this theory and Kubota and Levine's theory, Brasoveanu's theory

appears to be in a better position to deal with a sentence like (1). An analysis along the following lines is conceivable within this theory. Suppose the subject noun phrase *different people* and the adverb *differently* in sentence (1) respectively receive the values ‘Person A’ and ‘differently than Person B’ from assignment 1 and the values ‘Person B’ and ‘differently than Person A’ from assignment 2. Given such assignments, the sentence as a whole turns out to mean ‘Person A aged differently than Person B, Person B aged differently than Person A, and Person A and Person B are different from each other,’ which is the interpretation that poses a problem for Beck’s theory and Kubota and Levine’s theory alike.

However, sentences like (4) and (5), which pose a problem for the simple, unaugmented version of Beck’s theory, are problematic for this theory as well. It is not obvious how the theory could be made compatible with such examples.

5 Barker (2007)

The theory proposed in Barker (2007) is based on the view that symmetrical predicates like *different* are scope-taking elements, and as such it is capable of dealing with examples like (4) and (5). For instance, sentence (5) is assigned the correct internal reading in this theory if the word *different* used in the sentence takes scope immediately below the noun phrase *John and Mary*. Furthermore, the theory straightforwardly captures the low acceptability of a sentence like (12), noted in Carlson (1987). Here again the asterisk means that the sentence does not have an internal reading. A sentence like this is predicted not to have an internal reading in Barker’s theory because there is an island in this example that prevents *different* from taking a sufficiently wide scope. Although Barker formulates his theory only with respect to an adjective like *different*, the theory is likely applicable to adverbial symmetrical predicates such as *differently* as well.

As pointed out in Kubota & Levine (2016), however, Barker’s theory has trouble dealing with sentences like (13), involving more than one symmetrical predicate. (Note that I am assuming that the adjective *different* in the subject noun phrases in (1), (2), and (13) merely means ‘various’ and is not a symmetrical predicate. Because of this assumption, sentences (1) and (2) each contain only one symmetrical predicate.)

6 An HPSG-based alternative

As we have seen, none of the previous theories is capable of analyzing sentences like (1), (2), (4), (5), and (13) in a sufficiently general fashion. Below, I propose an alternative analysis, which is based on the idea that symmetrical predicates like *different* and *differently* always have implicit arguments and that the meaning of such an implicit argument may involve that of a reciprocal pronoun. The proposed analysis is similar in important respects to what is proposed in Charnavel (2015) as an analysis of symmetrical predicates used as modifiers of *singular* nominals; this latter analysis is also based on the view that symmetrical predicates have implicit arguments whose content may involve that of a reciprocal pronoun. I will argue below that Charnavel is incorrect in not applying the same analysis to symmetrical predicates used as modifiers of *plural* nominals.

The analysis of reciprocal pronouns that I will be relying on below is illustrated in (14). The analysis is based on the following two assumptions. First, I assume that the symbol *D* used in the illustration has the same function as the floating *each* in a sentence like *The scholars each read a book*. Second, I assume that the word *each other* with subscript *i* and superscript *j* means “those members of the set $a(i)$ that are distinct from the individual $a(j)$ ”, where *a* is the assignment. This analysis of reciprocal pronouns is similar in spirit to the non-scopal analysis proposed in Williams (1991), as opposed to the scopal analysis proposed in Heim et al. (1991), and is justified by the fact that, unlike the analysis proposed in Heim et al. (1991), it can deal with an example like (15), discussed in Chaves (2014, p. 854), when combined with the analysis of right-node raising defended in Yatabe & Tam (2019). In the theory defended in Yatabe & Tam (2019), a right-node-raised expression is allowed to have different meanings in different conjuncts (due to the constraint stated in (23b) of Yatabe & Tam (2019)). Thus, the reciprocal pronoun *each other* in sentence (15) can be associated with the meaning $[\text{each other}]_{i+j}^i$ in the first conjunct and with the meaning $[\text{each other}]_{i+j}^j$ in the second conjunct, and retain those two meanings even after it has been right-node-raised. Assuming that the DPs *Tom* and *Mary* are given *i* and *j* respectively as indices, the sentence as a whole is correctly predicted to mean “Tom shouted Mary’s name and Mary cried Tom’s name”.

In order for this theory of reciprocal pronouns to be descriptively adequate, it needs to be assumed that there is a constraint that governs the relationship between the subscript and the superscript of a reciprocal pronoun, since otherwise a representation like (16) would be predicted to be a possible syntactic structure that meant “Mary talked to John about herself”. Simplifying somewhat, what the constraint in question has to state is the following: each member of the set of entities denoted by the subscript index of a reciprocal pronoun must be

contained in the set consisting of the entities denoted by each superscript index of that reciprocal pronoun. The representation in (14) satisfies this constraint because the entities denoted by the subscript index of the reciprocal pronoun here (namely Alex and Chris) are each contained in the set of entities denoted by the superscript index (namely j) on the assumption that the set of entities that the particular occurrence of the silent distributor D distributes over (Alex and Chris, in the case at hand) counts as the set of entities denoted by the subscript on that occurrence of D (which is identical to the superscript index on *each other* here). The sentence in (15) also satisfies (the appropriately rigorously formalized version of) the constraint because (when the sentence is given the analysis sketched in the previous paragraph) the reciprocal pronoun in the sentence is associated with the subscript $i + j$ and with two superscripts, namely i and j , and the entities denoted by the subscript (namely Tom and Mary) are both contained in the set consisting of the entities denoted by i (namely Tom) and the entities denoted by j (namely Mary).

The way (1) and (2) are analyzed in the proposed theory is illustrated in (17) and (18) respectively. In these illustrations, what is shown inside parentheses are meant to be the content of the implicit argument of each occurrence of the symmetrical predicates. This proposal is based on the following two assumptions. First, I assume that the meaning of an implicit argument is added to the Minimal Recursion Semantics (MRS) representation of a sentence after the scope relations expressed in that MRS representation have all been fully resolved. The parenthesized portions of (17) and (18) are thus assumed to be present in the MRS representations but not in the syntactic representations. The string *each other*, used in these illustrations, is meant to stand for an elementary predication inside an MRS representation, and therefore not subject to Binding Condition A, which applies to anaphors contained in syntactic representations. And second, I assume that the phrase *different ways* in (2) is a dependent plural and is synonymous with the phrase *a different way* that is used in a context that does not allow use of a dependent plural. More generally, I assume that a plural noun phrase can have the semantics of a singular noun phrase when it is used as a dependent plural. As noted in Heim et al. (1991), this assumption is justified by the existence of an example like (19), where the expression *their noses* is arguably a dependent plural noun phrase that is semantically interpreted as singular. Given these assumptions, the representation in (17) means “Each of the (various) people ages differently than the other people age”, and the representation in (18) means “Each of the (various) people ages in a way that is different from the ways that the others age”.

The proposed analysis captures the various properties of internal readings in the following way. First, this analysis can deal with cases like (4) and (5) in which the nominal modified by a symmetrical predicate and the plural expression that is the licenser of the internal reading are not co-arguments of the same predicate. For example, sentence (5) can be analyzed as in (20). The noun phrase *different men* here is regarded as a dependent plural that has a singular meaning. There is no significant difference between this case and the case shown in (18).

Second, the island effect seen in (12) can be given the kind of explanation that is suggested in Charnavel (2015) for cases involving a symmetrical predicate modifying a *singular* nominal. The explanation goes as follows. Example (12) must be associated with a representation like (21) in order to receive the intended internal reading. Now, suppose that the ‘minimal clause’ containing the elementary predication version of *each other* has to have an antecedent elsewhere in the MRS representation. Suppose also that a ‘clause’ in an MRS representation is allowed to be an antecedent for a ‘clause’ containing the elementary predication version of *each other* if and only if the latter can be obtained by replacing a variable used in the former with the elementary predication version of *each other*. These two suppositions, taken together, require that the noun phrase *different men* in (12) should take the matrix clause as its scope, in violation of whatever island constraint that makes a relative clause a scope island (see Charnavel (2015) for details of this line of analysis).

It is claimed in Charnavel (2015) that the availability of the internal reading of a symmetrical predicate modifying a *plural* nominal is *not* sensitive to island constraints. Charnavel defends this claim citing the example in (22), discussed in Beck (2000). This example, however, does not contradict the analysis that I am advocating in this paper; the sentence can be analyzed without postulating long-distance dependency across scope islands, since the silent distributor D that licenses the internal reading of this example can be assumed to be inside the relative clause.

And third, a sentence like (13) is correctly predicted to be possible in the proposed account because it can be associated with a representation like the one in (23).

It is to be noted that, unlike Barker’s theory and Kubota and Levine’s theory, the proposed account is not applicable to examples like (24) and (25). This, however, is not a problem, as long as the analysis proposed in this paper is combined with the analysis proposed in Yatabe & Tam (2019), which deals with those cases of internal readings of symmetrical predicates that involve left- or right-node raising. Both (24) and (25) could be analyzed as involving left- or right-node raising and thus can be handled by this latter theory.

- (1) Different people age differently.
- (2) Different people age in different ways.
- (3) Each staffer went to a different city.
- (4) Luise and Franz saw a premiere of different operas.
- (5) John and Mary believe that different men married Sue.
- (6) If the cup is too small or too large, then you should go up or down, respectively, in cup size.
- (7) *Different men refused to call up Mary or Susan.
- (8) John refused to call up Mary or Susan
- (9) John refused to call up Mary, and John refused to call up Susan.
- (10) Pat walked in different ways.
- (11) Pat walked differently.
- (12) *The two gorillas saw a woman who fed different men.
- (13) Different people age differently for different reasons.
- (14) [Alex and Chris]_i D_j saw [each other]_i^j.
- (15) Tom shouted and Mary cried each other's names.
- (16) Mary_i talked to John_j about [each other]_{i+j}^j
- (17) [Different people]_i D_j age differently (than [each other]_i^j ages)
- (18) [Different people]_i D_j age in different (from the ways that [each other]_i^j ages) ways
- (19) The seals each balanced a baloon on their noses. (from Heim et al. (1991))
- (20) [John and Mary]_i D_j believe that different (from the man that [each other]_i^j believes married Sue) men married Sue.
- (21) *[The two gorillas]_i D_j saw a woman who fed different (from the man_k that [each other]_i^j saw a woman who fed t_k) men.
- (22) Ottilie und Maria haben Bücher gelesen, die zu verschiedenen Schlüssen kamen.
'Ottilie and Maria read books that came to different conclusions.'
- (23) [Different people]_i D_j age differently (than [each other]_i^j ages) for different (from the reasons for which [each other]_i^j ages) reasons.
- (24) Different people discovered America and invented bifocals.
- (25) John saw and reviewed different films.

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