On the Syntax and Semantics of *vice versa*

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Abstract

This work focuses on the syntax and semantics of the expression *vice versa*, and shows that its syntactic distribution is much more flexible than semantically related expressions. Although *vice versa* usually appears in clausal coordinate environments, it can in principle occur in any other type of construction. Second, it can occur as an embedded verb phrase or even as a noun phrase, rather than as an adjunct. This suggests that *vice versa* is a propositional anaphor that corresponds to a converse of a propositional antecedent. Finally, although the predicates singled out to be interchanged are usually nominal, they can in fact be of virtually any part of speech. I argue that a possible account of the interpretation of *vice versa* lies at the interface between logical form (with rich decompositional lexical semantics along the lines of Pustejovsky (1995)), and pragmatics (drawing from independent work by Hobbs (1990) and Kehler (2002)).

1 Introduction

The expression *vice versa* has not received much attention beyond Fraser (1970), McCawley (1970), and Kay (1989). To my knowledge, there has never been an explicit account of its syntax and semantics. In a nutshell, *vice versa* is characterized by describing the converse of a proposition described by a preceding clause (henceforth the 'antecedent'). This is illustrated in (1). Optionally, *vice versa* can co-occur with a clause that overtly describes its the denotation, as (2) illustrates. As I will show, the traditional view that *vice versa* is an adverb is undermined by the fact that the presence of the overt clause is optional – as (1) already show – and by the fact that *vice versa* can occur in subject and complement NP environments.

(1) a. Tom kissed Mary, and vice versa.

   b. Either Tom kisses Mary, or vice versa.

   c.*Vice versa, and Sue likes Tom.

(2) Tom likes Mary, and vice versa, $\left\{ \begin{array}{l} \text{Mary likes Tom} \\ \text{*Sue likes Tim} \end{array} \right\}$

As far as previous accounts, Fraser (1970) suggests that the interchange targets pairs of NP structures, McCawley (1970) claims that the interchange targets pairs of 'elements in a clause', and Kay (1989) claims that the interchange targets participants in the scene that is evoked by the antecedent. None of these proposals is explicit about how the distribution and interpretation of *vice versa* should proceed.

This paper is structured as follows. In section 2 I discuss the syntactic properties of *vice versa* in more detail, and conclude that its syntax is rather unique when compared with semantically related expressions like *conversely*, or *contrariwise*. The evidence suggests that *vice versa* is a mixed category that can function as a clause, a verbal phrase, a nominal phrase, or an adverbial.

2   Syntactic properties

When compared with semantically related expressions like *conversely*, it is clear that *vice versa* has a more flexible distribution. While the former cannot occur without a clausal host, the latter can stand alone, as the data in (3) show. This suggests that *conversely* is simply an adverb, but that *vice versa* is not.[1]

(3) a. Fred likes Mary, and vice versa (, Mary likes Fred).

   b. Fred likes Mary, and conversely *(, Mary likes Fred).

A more crucial difference is that *vice versa* can occur as an NP without a clausal host, while *conversely* cannot, as illustrated in the contrast between (4) and (5). Interestingly, in (4ab) *vice versa* is paraphrasable as a gerund clause (i.e. *they all liking it and I hating it* and *assigning an Object to a String*). I follow Malouf (2000) and Kim and Sag (2005) in assuming that gerunds and complementizers are mixed categories. They are nominal structures externally, but verbal structures internally.

(4) a. It's better that [[they all hate it and I like it], instead of [vice versa]$_{NP}$.

   b. [You can assign a String to an Object] but [[vice versa]$_{NP}$ is not allowed]. [http://java.itags.org/java-intermediate/171646/]

(5) a. ?*It's better that they all hate it and I like it, instead of conversely.

   b.*You can assign a String to an Object but conversely is not allowed.

The distribution of *vice versa* is not limited to S and NP environments. In (6) we can also see examples where it occurs as a base form VP, in which case it shares the subject with the antecedent clause. Note that the examples in (6a,b) involve comparative structures, not coordination.

(6) a. It is easier [[to change the font size to fit the margins]$_{VP}$ [than [vice versa]$_{VP}$]].

   b. [[You can [find just as many things that Mac OS X stole from Windows]$_{VP}$] [as you can [vice versa]$_{VP}$]].

   c. Can I link your blog to mine and you vice versa?[2]

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[1]Of course, ellipsis allows certain adverbs to be conjoined with a sentence, as in *Kim read many books, and* (*Kim read many books*) *very quickly*. This does not seem to be possible for *conversely*.

[2]http://www.parenting-blog.net/entertainment/expecting-mums-games-to-keep-you-busy/

The data suggest that *vice versa* can correspond to any kind of verbal clause, finite or non-finite, as the examples in (7) illustrate. This is relevant because conjunction does not allow finite conjuncts to be conjoined with non-finite conjuncts, and yet such clauses can be conjoined with *vice versa*. Compare (7) and (8).

(7) a. [Fred likes Mary, and vice versa].
([FORM *fin*])

    b. [To draw him to Sue, and vice versa], we must coordinate our efforts very carefully.
([FORM *inf*])

    c. [Tom mentioning Sue and vice versa] both came as a big surprise.
([FORM *prp*])

(8) a.*[Tom whistled]$_{\text{FORM } fin}$ and [Mary walking]$_{\text{FORM } prp}$.

    b.*Sue [[bought something]$_{\text{VFORM } fin}$ and [come home]$_{\text{FORM } prs}$].

    c.*[[Tom mentioning Sue]$_{\text{FORM } prp}$ and [she mentioned him]$_{\text{FORM } fin}$] came as a big surprise.

If *vice versa* is a clausal element then it should be possible to embed it under adjunction, as if it were a regular sentence. This prediction is borne out in (9).

(9) a. [An actor who is good at comedy is also good at drama], but not necessarily [vice versa]$_S$.

    b. [[Tom saw Mary]$_S$, [and probably [vice versa]$_S$]].

    c. [[Tom helped Mary]$_S$ [on Tuesday]] and [[vice versa]$_S$ [on Thursday]].

In order to account for the distribution of *vice versa*, I adopt the type hierarchy in Figure 1, based on Malouf (2000, 95). I assume that the type *verbal* is compatible with the usual verb forms (e.g. [FORM {*fin*,*inf*,*prp*,*psp*,...}]). The exception is the part of speech *gerund*, which is not finite.
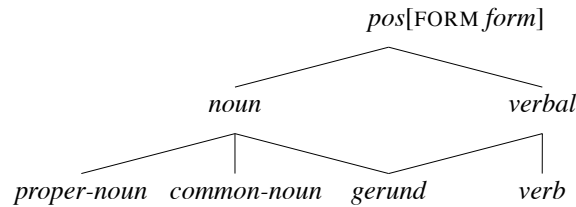

Figure 1: Gerund as a mixed category between nominal and verbal

The lexical entry for *vice versa* in (10) allows for all of the realizations discussed so far. In this paper I adopt the feature geometry of Sign-Based Construction

Grammar (Sag, 2010), since it provides a simpler feature geometry than standard HPSG Pollard and Sag (1994). Because the part of speech of this expression is type-underspecified as *verbal*, the word is compatible with any verb form, including a nominal non-finite gerundial realization and a finite verbal realization.

(10) Lexical entry for *vice versa* (preliminary version)

$$\begin{bmatrix} word \\ \text{PHON} \langle \textit{vice versa} \rangle \\ \text{SYN} \begin{bmatrix} \text{CAT } verbal \\ \text{VAL } \langle (NP) \rangle \end{bmatrix} \end{bmatrix}$$

This word can function as an S or a VP without further assumptions, given that no phrasal rule in Sag (2010) requires daughters of type *phrase*. The signature requires that the mother nodes of a syntactic tree are phrases and the daughters can be either words or phrases. Similarly, the usual labels NP, VP, and S do not require the sign to be of type *phrase*.

(11)
$$\text{NP} = \begin{bmatrix} \text{SYN} \begin{bmatrix} \text{CAT } noun \\ \text{VAL } \langle \rangle \end{bmatrix} \end{bmatrix} \quad \text{VP} = \begin{bmatrix} \text{SYN} \begin{bmatrix} \text{CAT } verb \\ \text{VAL } \langle NP \rangle \end{bmatrix} \end{bmatrix} \quad \text{S} = \begin{bmatrix} \text{SYN} \begin{bmatrix} \text{CAT } verb \\ \text{VAL } \langle \rangle \end{bmatrix} \end{bmatrix}$$

2.1 Adverbial use

As already mentioned noted, *vice versa* can optionally combine with a clausal sister, a 'follow-up' sentence which makes it explicit in what way the reversal/interchange of the antecedent is to be interpreted. More examples are given in (12).

(12) a. Fred loves Mary, and vice versa (, Mary loves Fred).

  b. I think [Fred loves Mary, and vice versa (, Mary loves Fred)].

  c. It's not clear if they are ready to face Fred, let alone vice versa (, if Fred is ready to face them).

Such follow-up clauses need not be a phonological variant of the antecedent. The interchange is neither syntactic or semantic because a paraphrase suffices, as the data below illustrate. If the clause does not have the same truth conditions, oddness ensues as shown by (14).

(13) a. Market structure can influence transaction costs, and vice versa, the level of transaction costs can affect market structure.

  b. Diarrhea can occur with no visible tissue damage and, vice versa, the histological lesions can be asymptomatic.

(14) Tom likes Mary, and vice versa, $\left\{ \begin{array}{l} \text{Mary likes Tom} \\ \text{*Sue likes Tim} \end{array} \right\}$

Not surprisingly, *vice versa* can be realized as a VP modifier, as (15) shows. I consider that the follow-up clause is the head of the structure rather than *vice versa*. This is motivated by cases like (16). Although *vice versa* can function as an NP, the oddness of (16) results from the impossibility of conjoining an S with an NP.

(15) It's easier to take her to the doctor than vice versa, to take the doctor to her.

(16) Boys tagged girls, and vice versa, $\left\{ \begin{array}{l} \text{girls tagged boys} \\ \text{*girls tagging boys} \end{array} \right\}$

The distributional facts discussed so far in this paper can be captured by revising the lexical entry in (10) as shown in (17). As before, the fact that this word is of part of speech *verbal* allows it to occur in nominal and verbal environments. The value of SEL(ECT) allows it to optionally combine with a head clause. The subject NP is also optional, and thus *vice versa* can operate either as a VP or as an S.

(17) Lexical entry for *vice versa* (revised version)

$$
\begin{bmatrix}
word \\
\text{PHON} \langle \textit{vice versa} \rangle \\
\text{SYN} \begin{bmatrix} \text{CAT} \begin{bmatrix} verbal \\ \text{SEL} \left\langle \left(\begin{bmatrix} \text{SYN} \begin{bmatrix} \text{CAT } verbal \\ \text{VAL } \boxed{2} \end{bmatrix} \\ \text{SEM} \mid \text{INDEX } \boxed{s} \end{bmatrix} \right) \right\rangle \end{bmatrix} \\ \text{VAL } \boxed{2} \langle \text{ (NP) } \rangle \end{bmatrix} \\
\text{SEM} \mid \text{INDEX } \boxed{s}
\end{bmatrix}
$$

The tag $\boxed{s}$ ensures that the situation described by the follow-up clause is the same as the one denoted by *vice versa*, thus ruling out cases like (16). The rule that allows adverbials to combine with a head phrase is (18). This rule licenses constructions where a daughter selects the head via SELECT, such as adjunction constructions and structures where a determiner combines with a nominal host. For a more comprehensive discussion about this grammar fragment see Sag (2010).

(18)

$$
\textit{head-functor-cx} \Rightarrow \begin{bmatrix}
\text{MTR} \begin{bmatrix} \text{SYN } \boxed{2} \end{bmatrix} \\
\text{HD-DTR } \boxed{1} \\
\text{DTRS} \left\langle \begin{bmatrix} \text{SYN} \begin{bmatrix} \text{CAT} \begin{bmatrix} \text{SELECT } \langle \boxed{1} \rangle \end{bmatrix} \end{bmatrix} \end{bmatrix}, \boxed{1} \begin{bmatrix} \text{SYN } \boxed{2} \end{bmatrix} \right\rangle
\end{bmatrix}
$$

Let us consider some examples of this analysis at work. If *vice versa* is realized as *verb* with a saturated valence, then it can be coordinated with verbal clause. The host clausal selected by SEL(ECT) clause is optional, as illustrated in Figure 2.

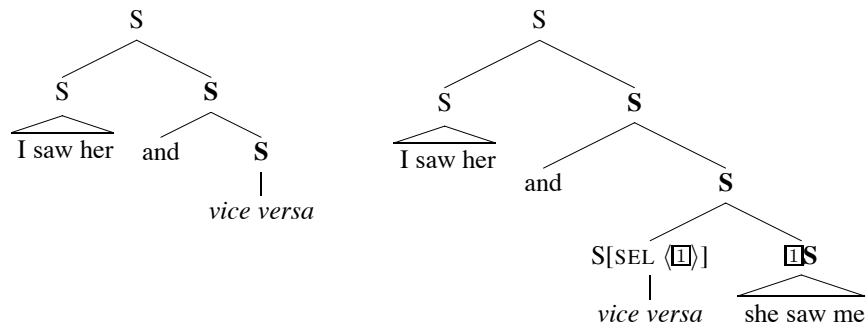Figure 2: Clausal *vice versa* (head path in bold)

Because *vice versa* can be of type *gerund*, it can occur as an embedded NP argument, as the trees in Figure 3 illustrate. Finally, when *vice versa* is realized with a non-empty valence, then it can be a VP complement, as shown in Figure 4.
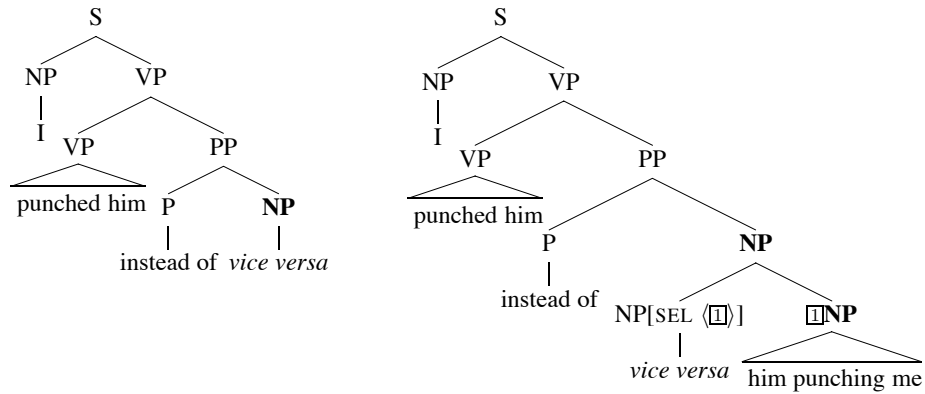

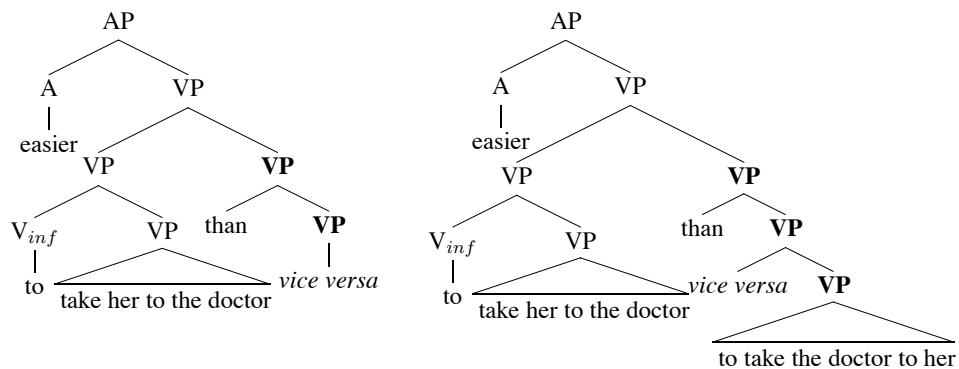Figure 3: Noun phrase *vice versa* (head path in bold)

Figure 4: Verb phrase *vice versa* (head path in bold)

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2.2 Intra- and extra-clausal antecedents

I now consider whether there is a syntactic relationship between *vice versa* and its antecedent, and conclude that virtually any clause can function as the antecedent.

The data in (4) above show that *vice versa* can be embedded as an NP. Interestingly, the antecedent can also be embedded in this fashion as (19) illustrates.

(19) [That Tim praised Mary]$_{NP}$ is just excellent, and so is [vice versa]$_S$.

This predicts that it is possible for *vice versa* to be in object position and that the antecedent can be in subject position, in the same clause. Such a prediction is borne out in the examples shown in (20).

(20) a. [A younger man falling for an older woman]$_{NP}$ is more likely than [vice versa]$_{NP}$.

   b. The likelihood of [a man harassing a woman]$_{NP}$ is higher than [vice versa]$_{NP}$.

Although the interchange triggered by *vice versa* typically occurs between co-arguments of the same verb, the data in (6) and (21) show that the antecedent can be a complex sentence with more than one verb.

(21) a. [Everyone on John's friend list knows that he's dating Susan] and [vice versa].[3]

   b. [Tom sang and I danced], but not vice versa.

   c. [When doctors see FES in a patient, they should also look for OSA], and [vice-versa].[4]

   d. [No student can sit where the teachers sit], and vice versa.

   e. [What is good for Kosovo is good for Europe], and vice versa.

At last, in opposite end of the distributional spectrum, we have cases where the antecedent is not in the same sentence as *vice versa*. As noted by an anonymous reviewer, the examples like (22) show that any discourse recent/salient proposition is a potential antecedent for *vice versa*.

(22) a. (Speaker A) It seems that Fred really loves Kim.

   b. (Speaker B) Yes, I agree. And vice versa.

The conclusion to draw from data discussed so far is that there are no syntactic constraints governing the relationship between *vice versa* and its antecedent. Moreover, we have also seen that the expression *vice versa* does not depend on the presence of coordination. The main constraint seems to be the existence of a preceding discourse salient proposition, suitable for a converse interpretation.

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[3][http://www.brazencareerist.com/2010/09/08/3-mba-lessons-thank-you]
[4][http://www.sciencedaily.com/releases/2010/04/100401125918.htm]

2.3 Coherence-based restrictions

The *vice versa* expression can occur in various non-headed environments such as coordination (*and*, *or*, *but*, *let alone*, and *instead of*) and comparative sructures. The data in (20) show that *vice versa* can occur in subordination constructions as well, contra Fraser (1970). In (23) below, I provide evidence that *vice versa* can occur in conditionals. These data still contain coordinations, however, and contrast with the odd examples in (24).

(23) a. [I'll be happy if she helps Tom] and [surprised if vice versa].

b. The spacecraft will [[turn right if the sun is behind the moon] and [turn left if vice versa]].

c. The angle of sight must be [added to the angle of elevation if the target is above the gun] and [subtracted if vice versa].
(Encyclopædia Britannica, vol.25, p.62)

(24) a. ?*Tom will help Mary if/while vice versa.

b. ?*Some of the best chess players in the world are admittedly horrible chequers players, while vice versa.

I suspect that this contrast is due to pragmatic coherence conditions. For example, Hobbs (1990) and Kehler (2002) argue that certain connectors and constructions allow certain pragmatic *Resemblance*, *Cause-effect*, and *Contiguity* relations. In particular, conjunction is compatible with a parallel resemblance relation. I propose that *vice versa* imposes a similar *Resemblance* relation between its propositional content and the antecedent. In examples like (24) the coherence relation triggered by *if*/*while* applies to the same pair of clauses that the resemblance relation imposed by *vice versa*, and thus a clash occurs. In (23), however, such clash does not occur since the clauses combined via *if* are *vice versa* and its antecedent.

I thus revise (17) as shown in (25). The semantics of *vice versa* is the output P_2 of a *vice-versa* relation that applies to a propositional antecedent R. Crucially, the two propositions P_1 and P_2 must cohere in a resemblance relation. For more on the role of resemblance coherence see §3.2.1.

(25) Lexical entry for *vice versa* (near-final version)

$$
\begin{bmatrix}
\textit{word} \\
\text{PHON } \langle\, \textit{vice versa} \,\rangle \\[4pt]
\text{SYN}
\begin{bmatrix}
\text{CAT}
\begin{bmatrix}
\textit{verbal} \\
\text{SEL } \left\langle \left(
\begin{bmatrix}
\text{SYN}
\begin{bmatrix}
\text{CAT } \textit{verbal} \\
\text{VAL } \boxed{2}
\end{bmatrix} \\
\text{SEM } | \text{ INDEX } \boxed{s}
\end{bmatrix}
\right) \right\rangle
\end{bmatrix} \\
\text{VAL } \boxed{2} \langle\, (\text{NP}) \,\rangle
\end{bmatrix} \\[4pt]
\text{SEM}
\begin{bmatrix}
\text{INDEX } \boxed{s} \\
\text{FRAMES } \left\langle \boxed{P_1} = \dots\,, \;\; \textit{vice-versa}(\boxed{P_1},\boxed{P_2}) \right\rangle
\end{bmatrix} \\
\text{CTX } \left\langle \textit{res-coher}(\boxed{P_1},\boxed{P_2}) \right\rangle
\end{bmatrix}
$$

3 Semantic properties

There are two major possibilities for the semantic analysis of *vice versa*. One is to assume that the interchange targets a representational level of the sentence (i.e. logical form), and another is to assume, along the lines of Kay (1989), that the interchange is contextual and targets participants in the scene that is evoked by the antecedent. These views have similarities and differences. Both accounts necessarily involve some kind of interchange, but whereas the logical form account targets the semantic representation of the antecedent, the contextual account targets the discourse model needed for the speaker to interpret the antecedent of *vice versa*. Below I suggest that was is needed is a compromise between these two views, but ultimately will be unable to flesh out a *fully* explicit account of these phenomena.

3.1 Context vs. logical form

Kay (1989) argues that the interchange triggered by *vice versa* pertains to the scene evoked by the antecedent, not necessarily denotata of linguistic expressions. I take this to mean that the interchange operates on the model used by the speaker in a particular context (the set of entities relevant for the topics under discussion as well as background knowledge). It remains unclear, however, what a scene is and how many propositions it can encompass. If a scene corresponds to a single proposition, then it may become indistinguishable from the logical form of the proposition. If a scene can be more than a proposition then one must specify what can and what cannot be part of the scene evoked by a proposition. If, on the other hand, we restrict ourselves to work on the logical form / denotation level, then we have in principle a more tangible handle on the phenomena. In this paper I shall pursue this avenue, since the alternative seems to me too speculative to attempt presently.

Kay (1989) argues that the interpretation of *vice versa* can depend on the prior, contextually determined decision whether a pronoun is given a bound variable or an anaphoric interpretation. In (26) *his* may be bound by every boy or it may refer anaphorically to a particular boy mentioned earlier. The interpretation of vice versa depends on the decision made with respect to the ambiguity.

(26) [Every boy]$_i$ loves his$_{i/j}$ mother, and vice versa.

I find this evidence unconvincing, because a logical form analysis can easily deal with the interchange, as (27) shows. All that is necessary is to interchange *mother* and *boy*. The interaction with anaphora yields the two possible readings, without further stipulations. I see no reason to resort to the contextual level. Here and throughout I use to the symbol '$\bowtie$' to describe the *vice versa* interchange.

(27) a. $\bowtie (\forall x(boy(x) \rightarrow \exists y(mother(y) \wedge of(y,k) \wedge k = x \wedge loves(x,y))))=$
$\forall x(mother(x) \rightarrow \exists y(boy(y) \wedge of(y,k) \wedge k = x \wedge loves(x,y)))$

b. $\bowtie (\exists y(mother(y) \wedge of(y,k) \wedge k = z \wedge \forall x(boy(x) \rightarrow loves(x,y))))=$
$\exists y(mother(y) \wedge of(y,k) \wedge k = z \wedge \forall x(mother(x) \rightarrow loves(x,y)))$

Similarly, Nobuyuki (2006) argues that (28) shows that more than two arguments may be interchanged. I disagree with this position, and show in (29) how the interchange of the two nominals *men* and *men* obtains the intended interpretation.

(28) Women$_i$ may bring their$_i$ husbands with them$_i$, and vice versa.
(= men$_j$ may bring their$_j$ wives with them$_j$)

(29) $\bowtie (\exists x(women(x) \wedge \exists y(men(y) \wedge married(y,k) \wedge k{=}x \wedge \diamond bring(s,x,y)))) =$
$\exists x(men(x) \wedge \exists y(women(y) \wedge married(y,k) \wedge k{=}x \wedge \diamond bring(s,x,y)))$

Kay (1989) also argues that resolution of *vice versa* can depend on an ambiguity based on anaphora of sense versus anaphora of reference, shown in (30). This utterance says either that we like our neighbors or that we like the Jones's neighbors. Depending on whose neighbors it is determined contextually that we like, those people are claimed, by vice versa, to like us. Again, I fail to see why a logical form analysis would not suffice.

(30) The Jones's don't like their next door neighbors, but we do, and vice versa.

The logical form analysis may also have some advantages over a contextual approach. First, it readily explains why *vice versa* in a sentence like *John hates Mary and vice versa* cannot mean *Sue hates Fred*, no matter what the context is.[5] Second, I am not sure how the contextual account would predict the oddness of (31), since the scene evoked by this sentence could certainly license the reference to a third domino piece. This prediction is not borne out.

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[5]Imagine a context where all four individuals are in the same room, and it is common knowledge that Mary cheated on John before she started dating Fred, and that Fred cheated on Sue before she started dating John. Since the evoked scene has all of these individuals, and there are comparable relations between them, the contextual analysis wrongly predicts the impossible interchange.

(31) #A domino piece toppled another piece, and vice versa.

In what follows I focus on the semantic properties of *vice versa*, and argue that the proper analysis of the phenomena require a balance between denotations, representation, and pragmatics is called for.

3.2 Interchange phenomena

Semantically, *vice versa* requires an antecedent proposition that contains at least two interchangeable elements. Although Fraser (1970), McCawley (1970) and Kay (1989) do not agree on the details, they all argue that *vice versa* triggers the interchange of nominal entities. As such, ambiguities can arise when a clause contains more than two NPs, as Fraser (1970) first noted. Examples like (32) can have any of the interpretations listed below. Out of the blue, some of these may be less salient than others, but this is probably due to lack of context.

(32) I expect Bob to hit Kim and vice versa.

    a. (= I expect Kim to hit Bob)

    b. (= Bob expects me to hit Kim)

    c. (= Kim expects Bob to hit me)

As one would expect, the interchange hinges on semantic role compatibility:

(33) #I like the boat, and vice versa.

Although the interchanged individuals are the same in the sentences discussed so far, there is in general no requirement that the individuals described in the antecedent are the same as the ones described by *vice versa*. For example, the preferential interpretation of (34), is one where the bears in the fist conjunct are different from the bears in the second conjunct.

(34) Many men killed many bears and vice versa.

As it turns out, a closer look at the data reveals a more complex scenario than the one suggested above. In the sentence in (35) the interchange does not target nominals, but rather predicative expressions. The question, then, is what kinds of expressions can be interchanged?

(35) a. When the room is tidy, I make it a mess, and vice versa.
       (= when the room is a mess, I make it tidy)

     b. Should I soak it and then crub it, or vice versa?
       (= should I scrub it and then soak it?)

     c. If you get lost, then you get anxious, and vice versa.
       (= if you get anxious then you get lost)

The example in (36), due to an anonymous reviewer, is also consistent with an analysis based on the interchange of adjectives, as in (35).

(36) [That he is British] implies [that he is brave], not vice versa.
　　　(= that he is brave implies that he is British)

Here and throughout I refer to the interchanged elements as φ and ψ and I assume that in principle any two semantic elements can be interchanged. Below, the interchanged expressions are depicted in bold, for perspicuity. For example, in (37) we have $\varphi = anxious(s_1, x)$ and $\psi = lost(s_2, x)$. The interchange consists of switching φ and ψ, and renaming the variables s_1 and s_2.

(37) $\bowtie(\exists x(you(x) \wedge (\exists s_1\, anxious(s_1, x) \to \exists s_2\, lost(s_2, x)))) =$
　　　$\exists x(you(x) \wedge (\exists s_1\, \mathbf{lost}(\mathbf{s_1}, x) \to \exists s_2\, \mathbf{anxious}(\mathbf{s_2}, x)))$

For example, in a sentence like (38) the interchanged elements are the subject and the object. We can obtain the intended interchange as shown below.

(38) a. Tom saw Mary, and vice versa.

　　　b. $\bowtie(\exists x(Tom(x) \wedge \exists y(Mary(y) \wedge saw(s, x, y))) =$
　　　　　$\exists x(\mathbf{Mary}(\mathbf{x}) \wedge \exists y(\mathbf{Tom}(\mathbf{y}) \wedge see(s, x, y)))$

More complex examples like (39) are obtainable in exactly the same way, by interchanging argument NPs. In (39b) the interchanged NPs contain adjectives and are co-arguments of the same adjective, and in (39c) the interchanged NPs are oblique complements of the same nominal predicate *role*.

(39) a. Tom sang and Mary danced, and vice versa.
　　　　 (= Mary sang and Tom danced)

　　　b. This short man was afraid of that tall woman, and vice versa.
　　　　 (= that tall woman was afraid of this short man)

　　　c. This article focuses on the role of cognitivism in literature and vice versa.
　　　　 (= on the role of literature in cognitivism)

This line of analysis can presumably even handle cases like (40), where the order of NPs is not matter, only the variable interchange. In this case, the entire NP *every boy* is interchanged with *Mary*. Whereas in (28) the interchanged targeted are merely nominal predicates and not full NPs, the data in (40) show that this is not always the case. Thus, the interchange triggered by *vice versa* is quite flexible.

(40) Every boy saw Mary, and vice versa.

　　　$\bowtie(\exists y(Mary = y \wedge \forall x(boy(x) \to see(s, x, y)))) =$
　　　　$\exists \mathbf{x}(\mathbf{Mary} = \mathbf{x} \wedge \forall \mathbf{x}(\mathbf{boy}(\mathbf{x}) \to see(s, x, y)))$

Alas, matters are even more complex than this, as (41) shows. In this case, it seems as if two propositions are interchanged. It is as if '⋈' can interchange any pair of representations that are comparable/parallel in some way.

(41) Whenever the geese cackle, the dog barks, and vice versa.
(= whenever the dog barks, the geese cackle)

Consider now the data in (42). While it is not possible to interchange *Bob* with any NP conjunct in (42a), the example in (42b) suggests otherwise. The latter requires $\varphi = Bob(x)$ and $\psi = Mia(y)$. Again, this evidence indicates that the interchange triggered by *vice versa* is very flexible, and that unobserved interchanges are preempted by other factors rather than being structurally impossible.

(42) a. [Bob] saw [Mia and Kim], and vice versa.
(= Mia and Kim saw Bob)

b. [Bob] heard [Mia and her singing], and vice versa.
(= Mia heard Bob and his singing)

3.2.1 On the role of coherece

I believe the answer again hinges on coherence relations, namely, on resemblance. For example, Kehler (2002) argues that resemblance identifies commonalities and contrasts between corresponding sets of entities:

> For each relation, the hearer identifies a relation p_1 that applies over a set of entities $a_1 \ldots a_n$ from the first sentence S_1, and a corresponding relation p_2 that applies over a corresponding set of entities $b_1...b_n$ from the second sentence S_2. Coherence results from inferring a common (or contrasting) relation p that subsumes p_1 and p_2, along with a suitable set of common (or contrasting) properties q_i of the arguments a_i and b_i.
>
> (Kehler, 2002, 15)

For example, in a sentence like *Dick Gephardt organized rallies for Gore, and Tom Daschle distributed pamphlets for him* the parallel arguments p_1 and p_2 correspond to the relations denoted by *organizing rallies for* and *distributed pamphlets for* respectively. The common relation p that subsumes these is roughly *do something to support*. The parallel elements a_1 and b_1 are Dick Gephardt and Tom Daschle, who share the common property q_1 of being high-ranking democratic politicians. The parallel elements a_2 and b_2 correspond to the meanings of *Gore* and *him*, which share a trivial common property q_2 in that they denote the same individual. Kehler (2002) argues that this kind of relation explains why medial gapping and ATB extraction pattern with symmetric coordination and not other structures.

I conjecture that the resemblance relation *res-coher* introduced by the lexical entry of *vice versa* plays a pivotal role in its interpretation (see (25)). I propose that the antecedent's semantics S_1 determines the semantics of *vice versa* (S_2) as follows. *res-coher* requires that S_1 and S_2 identify the relations $p_1(a_0, ..., a_{i-1}, a_i, a_{i+1}, ..., a_j, a_{j+1}, ..., a_n)$ and $p_1(a_0, ..., a_{i-1}, a_j, a_{i+1}, ..., a_i, a_{j+1}, ..., a_n)$, respectively. In other words, the only difference between the identified relations is that a_i and a_j are interchanged. On independent grounds, these two elements must be comparable for the resemblance relation to hold, and thus we predict that adjectives cannot be interchanged with prepositions, that a non-predicative NP cannot be interchanged with a verb, and so on. The interchanged ψ/a_i and φ/a_j parallel elements can be simple nouns, complex nominal structures, adjectives, verbs, or even propositions. Thus, the semantics S_2 is whatever proposition is identified by the relation $p_1(a_0, ..., a_{i-1}, a_j, a_{i+1}, ..., a_i, a_{j+1}, ..., a_n)$, which in turn is determined by interchanging two arguments of $p_1(a_0, ..., a_{i-1}, a_j, a_{i+1}, ..., a_i, a_{j+1}, ..., a_n)$. The latter is identified by S_1 in the canonical way. In sum, S_1 determines S_2 via p_1 and its interchanged variant. We can thus drop the mnemonic relation $\bowtie$ and more explicitly state how the interchange is computed in (43).

(43) Lexical entry of *vice versa* (final version)

$$
\begin{bmatrix}
\textit{word} \\
\text{PHON } \langle \textit{ vice versa } \rangle \\
\text{SYN} \begin{bmatrix} \text{CAT} \begin{bmatrix} \textit{verbal} \\ \text{SEL} \left\langle \left(\begin{bmatrix} \text{SYN} \begin{bmatrix} \text{CAT } \textit{verbal} \\ \text{VAL } \boxed{2} \end{bmatrix} \\ \text{SEM} \mid \text{INDEX } \boxed{s} \end{bmatrix} \right) \right\rangle \end{bmatrix} \\ \text{VAL } \boxed{2} \langle \text{ (NP) } \rangle \end{bmatrix} \\
\text{SEM} \begin{bmatrix} \text{INDEX } \boxed{s} \\ \text{FRAMES} \left\langle \begin{bmatrix} \textit{anaph-fr} \\ \text{ARG1 } \boxed{S_1} \\ \text{ARG2 ...} \end{bmatrix}, \boxed{S_2} \begin{bmatrix} \textit{frame} \\ \text{SIT } \boxed{s} \end{bmatrix} \right\rangle \end{bmatrix} \\
\text{CTX} \left\langle \textit{res-coher}\left(\boxed{S_1}, \boxed{S_2}, p_1(..., a_i, ..., a_j, ...), p_1(..., a_j, ..., a_i, ...) \right) \right\rangle
\end{bmatrix}
$$

Depending on which two a_i and a_j are singled out from the antecedent, we may get a variety of different patterns. Again, their choice hinges on pragmatics and parallelism rather than syntactic or semantic structure. For example, adnominal modifiers usually 'follow' the interchange, as show in (44). Here, *vice versa* does not mean *a black dog chased a black cat*.

(44) A white dog chased a black cat, and vice versa.

However, in the preferential interpretation of (45a) the interchange does not extend to the adjunct *armed with a gun*. The interchange only applies to *Hatfield* and *McCoy*. This contrasts with the data point in (45b), arguably because restrictive relative clauses are not appropriate for pronouns.

(45) a. Any Hatfield who owns a gun will shoot at a McCoy, and vice versa.
     (= any McCoy who owns a gun will shoot at an Hatfield)

   b. Any Hatfield who carries a gun will shoot at me, and vice versa.
     (= I will shoot at any Hatfield who carries a gun)

More examples are given in (46). In sentence (46a) the interchange applies to the adjectives *black* and *white*, whereas in (47) it applies only to the nouns *bishops* and *pieces*. This evidence is consistent with my analysis.

(46) a. In chess, any black pawn can capture any white piece, and vice versa.
     (= any white pawn can capture any black piece)

   b. The black bishops were surrounded by white pieces, and vice versa.
     (= the white bishops were surrounded by black pieces)

Usually, the entire NP denotation is interchanged, as shown in (47). These cases are in stark contrast with (46). I believe the difference stems from discourse coherence. If the first conjunct describes a specific black cat and a specific white dog, then it is not coherent to continue the discourse by making reference to a specific white cat and a specific black dog.

(47) a. One black cat chased that white dog, and vice versa.
     (= that white dog chased one black cat)
     ($\neq$ one black dog chased that white cat)

   b. A black cat chased a white dog, and vice versa.
     (= a white dog chased a black cat)
     ($\neq$ a black dog chased a white cat)

In (48) I provide another example of partial interchange, this time involving the NP embedded in the specifier of the subject, and the PP-embedded complement NP.

(48) About 20% of men's underwear is bought by women, and vice versa.
     (= about 20% of women's underwear is bought by men)

My account is general enough to obtain the indented result for all of the above. For example, (47) boils down to interchanging the individuals denoted by the subject NP with the individuals denoted by the object NP, and (46) is obtained by interchanging part of the denotation of the adjectives. Following standard accounts of the semantics of adjectives, I represent *black* as a state-denoting function $black(P, C, x)$ where C is a comparison class and P is a variable that picks out the

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part of x that the property represented by black is applied to in order to assess truth[6]. In (46), the obtained $p_1(..., a_i, ..., a_j, ...)$ and $p_1(..., a_j, ..., a_i, ...)$ correspond to the semantic representations in (49), where a_i and a_j are the states denoted by the adjectives. When the semantics of *vice versa* is computed from $p_1(..., a_j, ..., a_i, ...)$, the correct adjectives are paired with the denotations a_i/a_j.

(49) $\exists x(bishops(x) \wedge \exists z\, color(z) \wedge \exists s_1\, black(s_1, x) \wedge$
$\qquad \exists y(pieces(y) \wedge \exists s_2\, white(s_2, y) \wedge \exists e\, surround(e, y, x))$

$\quad \exists x(bishops(x) \wedge \exists s_1\, \mathbf{white(s_1, y)} \wedge$
$\qquad \exists y(pieces(y) \wedge \exists s_2\, \mathbf{black(s_2, x)} \wedge \exists e\, surround(e, y, x)))$

We can also in principle deal with puzzling cases noted by Fraser (1970,277) and McCawley (1970,279). where the quantifiers do not seem to follow the interchanged nouns. In (50) the *there*-existential is incompatible with the universally quantified NP *every buyer*. My account can account for this because the narrow scope reading of the indefinite denotes more than one seller. Thus, we can interchange the sellers and buyers denoted by the universally quantified subject.

(50) For every buyer there must be a seller and vice versa.
$\qquad$ (= for every seller there must be a buyer).

Let us now consider (51). Here, the bears/men described in the first conjunct do no have to be the same ones that are described in the second conjunct. However, the key to dealing with such cases lies in the semantics of these quantifiers.

(51) Many men killed many bears, and vice versa.

Kamp and Reyle (1993, 391), Nouwen (2003), and many others provide good evidence that quantifiers like *many* introduce discourse referents for for the maximal set as well as for the reference set. The maximal set is anaphorically recoverable by *they* as shown in (52). The examples in (52c,d) are mine, and show that the same is true of *most* and *no*. Since the maximal sets for men and bears are available in the semantic representation of *many men killed many bears*, then these can be targeted for interchange. Thus, the *many* quantifiers in either conjunct of (50) are free to select similar or different subsets of men/bears.

(52) a. Few women from this village came to the feminist rally. No wonder. They dont like political rallies very much.
$\qquad$ (*they = all women*)

$\quad$ b. Few MPs attended the meeting. They stayed home instead.
$\qquad$ (*they = all MPs*)

---

[6]The contextual factor is motivated by examples like *Anna is tall* (*for a woman*), the mereological argument is motivated by *you said that the apple was completely red, but it's red only on the outside, not on the inside*, and the state is motivated by degree/comparative constructions like *not as black as*.

c. I think most diplomats are probably corrupt. They are (all) legally untouchable because of their diplomatic immunity.
(*they = all diplomats*)

d. No student came to the party. They were too busy with exams.
(*they = all students*)

The same analysis extends to (53). The determiner *no* also introduces a maximal set as (52d) shows, which is therefore available for the interchange phenomena.

(53) a. No philosopher can trust any linguist, and vice versa.
(= no linguist can trust any philosopher).

b. No student can sit where teachers sit and vice versa.
(= no teacher(s) can sit where students sit)

c. No student can sit where these teachers sit and vice versa.
(= these teachers cannot sit where students sit)

Finally, we can also handle cases that exhibit scope ambiguities. Several native speakers report that *vice versa* has two possible readings in (54). The paraphrases (54a) and (54b) appear to mirror the scope resolution of the antecedent (arguably because of our coherence conditions, which cause conjoined sentences to have parallel scopings). This is compatible with our analysis, since we can interchange nominal denotations. If the indefinite *a bear* gets a narrow scope reading in the antecedent, then we can interchange the hunters and various bears, as in (54a). Conversely, if the indefinite gets a wide scope reading in the antecedent, then we can interchange the hunters and a unique bear, as in (54b).

(54) Every hunter saw a bear and vice versa.

a. (= every bear saw a hunter)

b. (= a bear saw every hunter)

3.2.2 Lexical decomposition

McCawley (1970) noted puzzling examples like (55), which are for many speakers better than (33). McCawley also noted exceptions, such as (56).

(55) a. Many Frenchmen have learned Italian and vice versa.
(= Many Italians have learned French)

b. Westerners are fascinated by the Orient, and vice versa.
(= Orientals are fascinated by the West)

c. Few philosophers take biology courses, and vice versa.
(= Few biologists take philosophy courses)

(56) *Many Frenchman have learned Sanskrit, and vice versa.
($\neq$ Many Sanskrit speakers have learned French)

The data can be captured if we adopt a decompositional analysis of morphologically complex nouns. For example, if *Westerners* breaks down as 'people from the West', then we can obtain the intended interpretation by interchanging *Orient* and *West*: *people from the Orient are fascinated by the West*. Similarly, if *Italian* means the language 'that speakers from Italy speak' and *Frenchmen* means (at least) 'people from France' then we can obtain the intended interpretation by interchanging *Italy* and *France*, thus obtaining the representations in (57).

(57) $\exists x(France(x) \land \mathsf{Many}_y(people(y) \land of(y, x) \land$
$\qquad \exists z(Italy(z) \land \exists k(language(k) \land of(k, z) \land learn(s, y, k))))$

$\qquad \exists x(\mathbf{Italy}(x) \land \mathsf{Many}_y(people(y) \land of(y, x) \land$
$\qquad\quad \exists z(\mathbf{France}(z) \land \exists k(language(k) \land of(k, z) \land learn(s, y, k)))))$

The case of (56) is out because *Sanskrit* and *France* are not parallel elements: one is a language and the other is a country. Moreover, there is no English compound noun that can express the concept *person from Sanskrit*, since *Sanskrit* is not a geographical region.

There are other cases like (58) (David Miller, p.c.), that may require extra steps, although not all speakers accept this data point. In this example, we interchange background information evoked by the nouns *Mexicans* and *English*. Assuming a decompositional analysis that contains information-rich descriptions of lexical semantics and world knowledge, as in QUALIA roles of Pustejovsky (1995), the first conjunct of (58) means something like 'many people natively from Mexico (where language X is spoken), speak the English language (which is natively spoken in Y)'. Then, by interchanging *Mexico* (and its official language X) and *English* (and its dependent geographical location Y), we can obtain the converse: 'many people natively from Y (where the English language is spoken), speak the X language (which is natively spoken in Mexico)'.

(58) (?) Many Mexicans speak English, and vice versa.
($=$ Many English speakers speak Spanish)

4 Conclusion

This work makes various contributions to the syntactic and semantic analysis of *vice versa*. This expression is exceptional in that it can occur in a number of different syntactic environments, as an adverbial, a nominal, or a (finite/non-finite) verbal structure. Furthermore, *vice versa* can occur in coordinate and non-coordinate structures alike, although there are some limitations based on coherence factors. There is no limitation to what kind of preceding clause can serve as an antecedent,

as these can be located in a conjunct, and embedded phrase, the same clause as *vice versa*, or in different sentences altogether. All of these facts can be captured straightforwardly by a typed-underspecified mixed category analysis of the lexical entry. Matters are less clear in the realm of semantics. The main difficulty lies in identifying the relevant generalization that encompasses all of the possible patterns of interchange. The latter are fairly complex and exhibit various degrees of flexibility (nouns, verbs, adjectives, clauses or entire phrases can be interchanged). Moreover, certain examples are ambiguous, and in theory allow more interpretations for *vice versa* than speakers can detect. Arguably, simpler alternative interpretations, context, and pragmatic factors interfere to make these alternatives less accessible.

In this work I have argued that a pure contextual analysis and a pure logical form analysis are difficult to formulate. Rather, the phenomena are best dealt with by logical form constraints stated at the pragmatic coherence level, drawing from work by Hobbs (1990) and Kehler (2002). In essence, the semantics of *vice versa* corresponds to a proposition that corresponds to a relation that coheres with the relation associated with the antecedent's semantics. The relations are argued to be the same with the exception of the interchanged denotata. Various cases involving quantifiers like *many* and *few* involve the interchange of maximal sets, which has independent support from anaphora phenomena (Kamp and Reyle 1993,391). Other cases still, are argued to hinge on a lexical decomposition analysis of lexical semantics that may include information-rich descriptions along the lines of Pustejovsky (1995).

The account proposed in this paper crucially relies on aspects of pragmatics and coherences which have been argued to be central in explaining certain aspects of a number of other phenomena (Kehler 2002). However, it must be noted that the computation of such coherence relations is less than clear, and necessitates further research. Until this is accomplished, the current account of the interchange phenomena triggered by *vice versa* is difficult to make more explicit, and consequently, test in a more objective manner.

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