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The Problem of Unintelligibility in OT Semantics

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When does an utterance make sense?¹ In order to be able to answer this question it might be helpful to study utterances that do not make sense. Surely, there are many different types of utterances that do not make sense. In this squib I will examine one particular type, namely when a syntactically well-formed expression does not obtain a felicitous interpretation. I will call this the problem of *unintelligibility*, the natural counterpart of the problem of *ineffability*, well-known in Optimality Theory.

1. Ineffability

Ineffability refers to the problem when a semantic input does not yield a well-formed syntactic expression as its output. It is considered a problem since in Optimality Theory (henceforth, *OT*), each input should give rise to at least one optimal output (Prince and Smolensky 1993, 1997).

Crucially, in OT, an output can never be rejected because the constraints it violates are too numerous or too strong. An output can be rejected for one reason only: there is a better alternative in the set of possible outputs. Given the theorem of Harmony maximization (Smolensky 1986), each input is assigned an output with maximal Harmony and this output can be considered the optimal parse according to the relevant set of constraints. When therefore an input does not give rise to an optimal output, this is a problem either for the theory in general, or for the particular analysis of the input-output mapping under consideration. An example of an input that does not yield a grammatical output can be found in Jelinek (1993). She refers to the excluded sentence type (1d) in Lummi (a Straits Salish language) as a “paradigm gap”:

(1)	a.	xč̥i-t-oŋəs=sən	‘I know you.’	NOM ACC
	b.	xč̥i-t-∅=sən	‘I know him.’	NOM ABS
	c.	xč̥i-t-s=∅	‘He knows him.’	ERG ABS
	d.	*	‘He knows me.’	*ERG ABS
	e.	xč̥i-t-ŋ=sən	‘I am known.’	NOM

There is no transitive sentence corresponding to (1d) where a third person agent bearing ergative case acts upon a first person patient marked with absolutive case. Thus, there is no syntactically well-formed output corresponding to an input meaning ‘He knows me’ in this language. Instead, a passive construction such as in (1e) can be employed.

Clearly, the problem of ineffability as illustrated by the paradigm in (1) is a problem for the general theory of OT which predicts each input to be assigned an output after evalua-

¹ I presented this squib at the conference *Making Sense* that was organized in November 2000 in Groningen, the Netherlands, in honour of Werner Abraham on the occasion of his retirement. The squib was written when I was a visiting professor at the university of Potsdam, Germany, October – December 2000. I would like to thank the Interdisciplinary Center for Cognitive Science and the General Linguistics Department in Potsdam for inviting me, and for creating such a pleasant and stimulating atmosphere. I greatly benefited from Reinhard Blutner’s insightful comments on an earlier version of this squib.

tion against a ranked set of constraints. The problem only arises, however, in the context of a limited set of candidate outputs. Once one allows for the passive construction in (1e) to become part of the candidate set of syntactic outputs, there would be an optimal output for (1d), namely (1e). More in general, one could argue that any semantic object a speaker at a certain time in a given discourse would want to express, should find an optimal output of some kind, which in a rather extreme case may even be a non-linguistic one.

2. Unintelligibility

The topic of this squib is the problem of unintelligibility, which may be viewed as the natural counterpart of ineffability within OT semantics. Whereas in OT syntax the process of optimization maps a semantic input onto its optimal syntactic structure, in OT semantics, a syntactic input is assigned an optimal interpretation (see Hendriks and De Hoop 1997, to appear, for a first elaboration of this approach). The problem arises when there does not seem to be an optimal interpretation in the candidate set of interpretation outputs for a certain input. Of course, like the problem of ineffability, briefly discussed above, whether the problem of unintelligibility is considered to be a real problem for the theory, highly depends on whether or not one wishes to restrict the candidate set of outputs. I will argue in this paper that the problem of unintelligibility is partly solved when one allows for an infelicitous interpretation to be the optimal one for a certain syntactic input.

In the following example, *every German* can be interpreted as *every German who owns a car*, the presupposition triggered by the object *his car* (cf. Geurts and Van der Sandt 1999):

- (2) Every German is proud of his car.

However, as Beaver (1994) notes, *every team member* in (3) cannot be interpreted as *every team member who owns a car*, despite the fact that an object *his car* is present that should trigger the presupposition, as was possible in (2).²

- (3) #Few of the team members can drive, but every team member will come to the match in his car.

Geurts and Van der Sandt (1999) argue that the second determiner *every* preferably lives on the whole set of team members instead of on the set of team members that can drive. This would give rise to the infelicitous interpretation, since how can people come to the match in their (own) cars if they cannot drive? I think that Geurts and Van der Sandt are correct in that this is indeed the infelicitous interpretation obtained for sentence (3). The question remains to be answered why this interpretation is the only possible one. Or, why does (3) not allow for a reading as the one that is naturally assigned to the utterance in (4):

² Blutner (to appear) argues that sentence (4) actually indicates that the interpretation given for (3) is not the right one and that the right interpretation would be „Every German has a car and is proud of it“ instead of „Every German who has a car is proud of it.“ Blutner claims that this explains the infelicity of (4), since that should be interpreted as „Few of the team members can drive, but every team member has a car and will come to the match in his car.“ I do not think Blutner’s judgements can be maintained, however. I would claim, in accordance with Geurts and Van der Sandt, that „Every German is proud of his children“ means „Every German who has children is proud of them“ rather than „Every German has children and is proud of them.“

- (4) Few of the team members can drive, but every team member that can will come to the match in his car.

As far as I understand their analysis correctly, Geurts and Van der Sandt do not provide a satisfactory answer to that question. They point out that in (3) the hearer must identify a suitable set of team members. There are two sets available in the linguistic context, the whole set of team members and the set of team members that can drive, and they note that “the hearer will decide to bind the presupposition triggered by *every team member*” to the first set, the set of all team members. But they do not explain why the hearer decides to do so.

Unlike suggested by the account of Geurts and Van der Sandt, it is not in general the case that a second determiner in a discourse quantifies over the same set as the first determiner (set A) rather than over the intersection of the sets related by the first determiner ($A \cap B$). In Hendriks and De Hoop (to appear) two conflicting constraints are formulated that account for the interpretations obtained in (5) in (6) (cf. Nerbonne, Iida & Ladusaw 1990):

- (5) Most students attended the meeting. Some spoke.
 (6) Most deliveries were on time. Some weren't.

In (5) the preferred domain of quantification for the second determiner, *some*, is the set of students that attended the meeting (that is, the intersection of the sets A and B related by the first determiner, *most*). In (6), however, the domain of quantification for the second determiner, *some*, is not the set of deliveries that were on time, but the whole set of deliveries (set A of the first determiner, *most*). Intuitively, it is clear why. If *some* were to quantify over the set of deliveries that were on time, we would get a contradictory interpretation, viz. that some deliveries that were on time weren't on time. In Hendriks and De Hoop (to appear) the contrast between the preferred readings of (5) and (6) is explained with the help of four conflicting constraints, viz., Avoid Contradiction, Topicality, Forward Directionality, and Parallelism:

- (7) *Avoid Contradiction*.
 (8) *Topicality*: As the antecedent of an anaphoric expression, choose a topic.
 (9) *Forward Directionality*: The original topic range induced by the domain of quantification of a determiner is reduced to the topic range induced by the intersection of the two argument sets of that determiner.
 (10) *Parallelism*: As the antecedent of an anaphoric expression, choose a parallel element from the preceding clause.

Forward Directionality (adapted from a notion of Van Kuppevelt 1996) favours the interpretation obtained in (5). In (6) Forward Directionality is violated. On the other hand, Avoid Contradiction and Parallelism favour the interpretation that is obtained in (6). As the reader may verify, the ranking in (11) accounts for these interpretations:

- (11) *Avoid Contradiction* >> *Topicality* >> *Forward Directionality* >> *Parallelism*

This ranking also predicts the right interpretations for the following examples (boldface is mine):

- (12) **These Thracians** are peasants. **They** fight two or three times a year, in a cattleraid or a brawl. **Most of them** are stupid, **none of them** are trained.

(*Fire from heaven* by Mary Renault, 1984, p.150)

- (13) At the town gates, horses and helpers were waiting by arrangement, and Pausanias seemed certain to escape. Only a few strides more and he would have been among them, but he overreached in his haste to jump astride; tripping, he fell, for his boot had caught in the trailing stem of a vine. At once **three of his pursuers** were on him, **all of them** highland nobles, **one** from his own kingdom. But familiarity meant nothing and **they** killed him, **some** said then and there; **others** claimed more plausibly that they dragged him back to the theatre where he could be questioned for accomplices and then condemned to death.

(*Alexander the Great* by Robin Lane Fox, 1973, p.21)

In (12) *these Thracians* is the topic of the discourse. The pronoun *they* is anaphorically related to this topic and so are the two instances of *them*. Therefore, Topicality is satisfied when the determiners *most* and *none* are both interpreted as quantifiers over the topic set. In (13) the determiner *three* relates the set of pursuers and the set of individuals being “on him”. The intersection of these two sets functions as the domain of quantification of *all*, in accordance with Forward Directionality. Thus, Parallelism is violated in order to satisfy the higher ranked constraint Forward Directionality, which accounts for the fact that the topic range is narrowed from the set of pursuers to the set of pursuers that were on him. The next determiner *one* takes again the intersection of the sets related by the previous determiner, in this case the set of pursuers that were on him that were highland nobles. Here of course, since all of the pursuers that were on him were highland nobles, we cannot distinguish the interpretation that is obtained when Forward Directionality is satisfied, from the interpretation that is obtained when Parallelism is satisfied. In the next sentence, *they*, because it is plural, cannot refer to the one highland noble from his own kingdom, and therefore it has to refer to the domain of quantification of *one*, once again the set of pursuers that were on him. *They* killed Pausanias and of course, *they* should know when and where they did it. Therefore, the next quantifier *some* cannot quantify over this set of killers, as it would yield some kind of incoherent (not really contradictory, though) interpretation. The reader has to determine the domain of quantification of *some* herself, so let’s take it to be the set of Alexander’s historians. Now, *others* inherently cannot quantify over the historians that “said then and there” (i.e., *others* by definition excludes coreference with respect to *some*). Apart from that, quantifying over the historians that “said then and there” would involve a violation of Avoid Contradiction. That is, Forward Directionality has to be violated in order to satisfy Avoid Contradiction. And by this necessary violation of Forward Directionality, we witness the emergence of a parallel interpretation, in accordance with the weaker constraint Parallelism. The optimal interpretation that satisfies Avoid Contradiction and Parallelism is obtained when the domain of quantification of *others* is the same as that of *some*, i.e., the set of Alexander’s historians. For reasons of space, I do not provide the relevant tableaux. The reader is kindly invited to evaluate the candidate interpretations against the constraint ranking given above.

At this point, consider the interpretations that result from replacing one or all of the anaphors in the fragment above by fully descriptive nominal constituents.

- (14) a. At once **three of his pursuers** were on him, **all of his pursuers** highland nobles, **one** from his own kingdom. But familiarity meant nothing and **they** killed him, ...
- b. At once **three of his pursuers** were on him, **all of them** highland nobles, **one** from his own kingdom. But familiarity meant nothing and **his pursuers** killed him, ...
- c. At once **three of his pursuers** were on him, **all of his pursuers** highland nobles, **one of his pursuers** from his own kingdom. But familiarity meant nothing and **his pursuers** killed him, ...

Clearly, when a full descriptive noun phrase in (14a) is used, the resulting interpretation no longer satisfies Forward Directionality. Instead of going from A to $(A \cap B)$ (from the set of pursuers to the set of pursuers that were on him), it seems as if the use of a full expression has the effect of going from $(A \cap B)$ to the superset A (the whole set of pursuers) again. In the original fragment (13) that contained an anaphor, *all* was interpreted as quantifying over the set of pursuers that were on him. In the optimal interpretation of (14a), *all* quantifies over the whole set of pursuers, thus violating Forward Directionality. This has consequences for the rest of the discourse. Now, *they* also refers to the whole set of pursuers (who all happen to be highland nobles) and not to the restricted set of pursuers that were on him. In (14b) by the use of the full noun phrase *his pursuers* we get the interpretation that the killing was done by his pursuers, not necessarily by the restricted set of pursuers that were on him and that were highland nobles. In (14c), the lack of anaphoric expressions renders the fragment unnecessarily explicit and artificial, but the interpretation we get is that every predicate is evaluated with respect to the whole set of his pursuers and never to a subset.

Recall Beaver's problematic (unintelligible) example in (3) above. In (3), too, Forward Directionality seems to be violated. That is, the second determiner, *every*, cannot anaphorically pick up the intersection of the two argument sets related by the first determiner, *few*. Why not? I claim that the solution to this problem is in the explicit use of the NP *team member*. If an anaphor would have been used instead, Forward Directionality could have been satisfied, as in (15)

- (15) Few of the team members can drive, but every one of those will come to the match in his car.

In the next section I will provide an analysis of the problem of unintelligibility along these lines.

3. Towards solving the problem

One way to account for the infelicity of (3) above would be to have an additional well-known pragmatic constraint like *Be informative* to be ranked above *Avoid Contradiction* in our previous ranking:

- (16) *Be Informative:*
- a. Don't say less than necessary;
- b. Don't say more than necessary.

If we consider the two relevant interpretations for (3), one where *every* quantifies over the set of team members and another one where it quantifies over the set of team members who can

drive, then we may argue that the first interpretation violates Avoid Contradiction and Forward Directionality. It is still the optimal interpretation, however (hence, the only interpretation that we get), since it satisfies the higher ranked constraint Be Informative (the use of the full NP is necessary to get the superset interpretation again, as was showed in (14)). The other interpretation would be a violation of Be Informative. In fact, it violates either (16a) or (16b). One way to obtain the subset interpretation is by using an anaphor as was shown in (15). In that sense, the use of a full NP as in (3) would be a violation of (16b). There is another way to get the desired subset interpretation, and that is by making that reading fully explicit in a complex noun phrase, as was done in (4) above. Then the mere use of the NP *team member* would violate (16a). So, the expression *every team member* in (3) is either too much (violating (16b)) or too little (violating (16a)) for the intended interpretation *every team member that can drive*. Since there is an alternative interpretation around that does not violate Be Informative in one way or another, this is the optimal interpretation we get for (3). Yet, the optimal interpretation is a contradictory interpretation (few of the team members can drive, but the whole set of team members will come to the match in their cars), one that satisfies Be Informative yet violates Avoid Contradiction, as shown in the tableau in (17):

- (17) A is the set of team members; $A \cap B$ is the set of team members that can drive.

Input	Output	Be informative	Avoid Contradiction	Forward Directionality	Parallelism
every team member	$\{X: A \subseteq X\}$		*	*	
	$\{X: A \cap B \subseteq X\}$	*			*

In fact, it is not surprising that more or less contradictory interpretations can be optimal, since we do get these interpretations every now and then. Consider for example (18):

- (18) Most female professors are men with beards or glasses.

The only, hence optimal, yet contradictory, interpretation we get for (18) is that the number of female professors who are men with beards or glasses exceeds the number of female professors who are not men with beards or glasses.

Note, however, that intuitively there is a crucial difference between (18) and (3). In (18) the problem of unintelligibility does not seem to arise. That is, although the interpretation one gets in (18) is weird and contradictory, it is certainly the one and only interpretation, hence the optimal one, and we get it without any problems. Instead, in (3) we encountered the problem of unintelligibility, the feeling that no optimal interpretation can be assigned, not even a straightforwardly weird one. In the remainder of this squib, I will put forward a suggestion how to deal with this intuitive difference in optimality between (18) and (3).

In the explanation proposed above for the oddness of (3) the hearer finds the optimal interpretation by evaluating the candidate interpretations with respect to Be Informative. Obviously, Be Informative is a constraint that must have played a role in generating the optimal form (the speaker's perspective). Blutner's (to appear) framework goes one step further and takes the effects of the interaction of the speaker's and the hearer's perspective to a higher level of abstraction. Blutner integrates optimal interpretation and optimal production in a bi-directional OT. Within this approach, the notion of *super-optimality* is defined. Super-optimal pairs of meanings and forms are optimal in both directions of optimization.

Blutner distinguishes between a strong and a weak version of bidirectional OT. In the strong version, a form-meaning pair $\langle A, \tau \rangle$ is super-optimal if and only if there is no pair $\langle A', \tau' \rangle$ or $\langle A, \tau' \rangle$ such that $\langle A', \tau' \rangle$ or $\langle A, \tau' \rangle$ is more harmonic or more economical than $\langle A, \tau \rangle$. Hence, super-optimal pairs are those that are both optimal when the production perspective is taken and optimal when the comprehension perspective is taken. Strong bidirectional OT is strong in the sense that the two directions of optimization are independent of each other. A pair is super-optimal just in case the meaning is the optimal meaning for the form and the form is the optimal form for the meaning. Strong bidirectionality accounts for total blocking, but not for partial blocking. The general tendency associated with partial blocking seems to be the pragmatic generalization that marked forms tend to be used for marked interpretations. This is accounted for by Blutner's weak version of bidirectional OT. In weak bidirectional OT, the structures that compete in one perspective of optimization are constrained by the outcomes of the other perspective and *vice versa*. In the weak version, not only $\langle A, \tau \rangle$ is super-optimal, but also $\langle A', \tau' \rangle$. That is, the form-meaning pair that consists of an unmarked form and an unmarked meaning is strongly super-optimal (in the strong version of bidirectional OT it is the only super-optimal pair). But the form-meaning pair that consists of a marked form and a marked meaning is also super-optimal, albeit in a weaker sense (it is only super-optimal in a weak version of bidirectionality). In our example (3), we obtain a marked (infelicitous) interpretation for a marked (non-anaphoric) form, hence a weakly super-optimal pair.

Crucially, it is in this respect that the optimal weird interpretation in (3) might differ from the optimal weird interpretation we get in (18). The optimal interpretation that we get for (3) is part of a weakly super-optimal pair. There is an alternative strongly super-optimal pair, consisting of an unmarked form and an unmarked interpretation, the one we encounter in (15). Of course, this strongly super-optimal pair is not a true alternative for the weakly super-optimal one, since optimization takes place in one direction only. The unmarked form would not yield the marked interpretation and the marked interpretation would not arise for the unmarked form. In (18), however, although the interpretation we get is contradictory, it is part of a strongly super-optimal pair. This suggests that unintelligibility only arises when inconsistent meanings are part of weakly super-optimal form-meaning pairs.

4. Conclusion

I hope to have shown in this squib that the problem of unintelligibility in OT is not a real problem for the theory, once we recognize that sometimes infelicitous interpretations might be optimal and hence should be part of the candidate set of interpretations. Unintelligibility is more than optimal infelicity, however. That is, unintelligibility arises when infelicitous meanings are part of optimal form-meaning pairs that are only weakly super-optimal in the sense of Blutner (to appear).

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