

Discourse, Diversity and Free Choice*

Wolfgang Schwarz

Draft, 3 March 2017

This paper has two aims. The first is to add new support to a proposal made in Klinedinst 2007: that free choice effects are a special kind of scalar implicature akin to the one triggered by *the best hammers are steel or fibreglass*, which suggests that some of the best hammers are steel and others fibreglass. Second, I offer a new explanation of how these “diversity implicatures” might arise. Instead of invoking lexicalized or grammaticalized implicatures (like Klinedinst), my explanation is essentially Gricean, although it requires a slight extension of standard neo-Gricean ideas. I argue that the extension is independently motivated.

1 Introduction

Georg Henrik von Wright observed a now famous “perplexity” [1967: 137] about disjunctive permission. (1a) seems to entail (1b) and (1c).

- (1) a. You may have beer or wine.
- b. You may have beer.
- c. You may have wine.

This is odd, because *having beer* entails *having beer or wine*: any possible act of having beer is also an act of having beer or wine. One might have expected – in line with standard deontic logic – that if a certain type of act *A* is permitted, and performing *A* entails performing *B*, then *B* must also be permitted. (In other words, permission contexts should be monotonic.) So the permissibility of having beer should entail the permissibility of having beer or wine: (1b) should entail (1a). But then (1a) can’t entail (1c), for (1b) certainly does not entail (1c).

Following [Wright 1968], this puzzle has come to be known as the *paradox of free choice permission*, because the disjunctive permission allows you to “freely choose” between beer and wine.

I will defend a suggestion made in [Klinedinst 2007] according to which the apparent implication from (1a) to (1b) and (1c) is really a scalar implicature akin to the one triggered by (2a), which seems to imply (2b) and (2c).

* This paper slowly grew out of a blog post from 2007: <http://www.umsu.de/wo/2007/468>. Thanks to Paolo Santorio for very helpful discussion and for pointing me at [Klinedinst 2007].

- (2) a. The best hammers are made of steel or fibreglass.
- b. Some of the best hammers are made of steel.
- c. Some of the best hammers are made of fibreglass.

In general, if a range of properties (like, *being made of steel or fibreglass*) is predicated of a collection (*the best hammers*), a “diversity implicature” [Klinedinst 2007] is triggered suggesting that different members of the collection instantiate different properties from the range. Now, arguably (1a) also predicates a range of properties to a collection: it describes the permissible worlds as worlds where you have beer or wine. Hence a diversity implicature arises that some of the permissible worlds are beer worlds and some are wine worlds – in other words, that you may have beer and you may have wine.

Unfortunately, while standard (neo-Gricean) accounts of scalar implicatures straightforwardly predict the diversity implicature in (2), they seem to fail for (1). Klinedinst suggests that the effect in (1) is due to a non-Gricean mechanism of embedded implicatures (see also [Fox 2007] and [Alonso-Ovalle 2008]). I will offer an alternative explanation that is closer to orthodox Gricean lines but also draws on some basic insights from dynamic semantics.

Extant accounts of free choice are often tailored to disjunctions in deontic contexts. On the present approach, the underlying phenomenon is a lot wider. Indeed, it has often been observed that parallel puzzles arise for other modalities. Thus *Carol might bring beer or wine* seems to imply that Carol might bring beer and that she might bring wine, clashing with the attractive idea that if *A* is epistemically possible, and *A* entails *B*, then *B* should also be possible. Similarly, *Carol could have brought beer or wine* seems to imply that she could have brought beer and she could have brought wine; *I can bring beer or wine* seems to imply that I can bring beer and I can bring wine.

More tellingly, free choice effects arise not only from disjunctions. If a variety of cookies is on display, then *you may have a cookie* suggests that you can choose any type of cookie. Similarly, *you may have wine* suggests that you may have red wine and you may have white wine, provided both are available. *Carol might be in one of the bars on campus* suggests that various bars are possible locations. *The generator can produce sine waves between 5 and 500 Hz* suggests that the generator can produce wavelengths from across the entire interval. Like free choice effects involving *or*, these apparent entailments clash with the plausible assumption that the relevant contexts are monotonic.

Roughly speaking, free choice effects arise whenever a possibility statement (involving *may*, *might*, *could*, *can* etc.) is in a certain sense “unspecific”, in which case it seems to entail various more specific possibility statements. The disjunction *having beer or wine* is unspecific, encompassing the more specific possibilities *having beer* and *having wine*. But *having wine* is still unspecific with respect to whether the wine is white wine or red wine.

Moving beyond disjunctions brings to light some further desiderata for a theory of free

choice, and further reasons in favour of a treatment as (scalar) diversity implicatures. Thus we need to explain what makes a statement “unspecific” and what counts as a resolution of the unspecificity. *Having white wine* is a more specific way of *having wine*, but so is *having wine while burning down the house*. Yet we don’t normally take a permission to have wine to cover this particular way of having wine. In other words, *having white wine* is a legitimate “specification” of *having wine*, while *having wine while burning down the house* is not. For a less artificial example, *electrical items may be carried in hand luggage* suggests that computers, cameras, and phones are allowed, although probably not tasers. Let’s call this the “problem of specifications”.¹

Note also that unspecific possibility claims that aren’t disjunctions don’t always imply that such-and-such more specific possibilities are true. Sometimes the diversity implication is merely existential.

(3) Third-year students may take an extra module.

An utterance of (3), for example, normally suggests that the students can choose from a range of modules: the unspecific *take an extra module* implies that various specific modules may be chosen. But neither speaker nor hearer may know which modules fall in this range – either because they don’t know what modules are taught in the first place or because they don’t know which of these modules are eligible as extra modules for third-year students. Similarly, *Carol might have lost something* suggests that there are various things Carol might have lost, but there needn’t be any particular thing (her keys, her phone) of which it suggests that she might have lost *it*. Let’s call this kind of phenomenon “existential free choice”.

Of course, one could argue that despite the superficial similarities, the free choice effect in (1) is unrelated to the effects arising for other modalities and for sentences that don’t involve disjunction. But I think it is fair to say that it counts in favour of the proposal I will outline that it uniformly explains all the cases I have mentioned.

Before I present the proposal, let me review some arguments for thinking that free choice effects are scalar implicatures, even though they don’t seem to fit the standard neo-Gricean analysis.

2 Free choice as a scalar implicature?

Why not simply treat the apparent entailment from (1a) to (1b) and (1c) as a genuine semantic entailment? One reason not to do that is the puzzle with which we began. In somewhat more detail, the puzzle rests on the following two assumptions about deontic modals.

1. *S may do A* is true iff *S* is not forbidden to do *A*.

¹ The problem is related to Lewis’s [1979] “problem about permission”.

2. Doing something that entails doing something forbidden *is* doing something forbidden.

Assuming that *having beer* entails *having beer or wine*, these assumptions guarantee that (1b) *you may have beer* entails (1a) *you may have beer or wine*. And then the latter had better not entail (1c) *you may have wine*, since (1b) patently doesn't entail (1c).

It may be worth going through another example to illustrate that tinkering with *or* (as proposed e.g. in [Zimmermann 2000], [Simons 2005], and [Alonso-Ovalle 2008]) is of limited help.

- (4) a. You may have wine.
b. You may have red wine.
c. You may have white wine.

In many contexts, (4a) seems to imply both (4b) and (4c). Uncontroversially, *having red wine* entails *having wine*. Moreover, if having wine is forbidden then plausibly having red wine is also forbidden (an instance of assumption 2). By assumption 1, (4b) therefore entails (4a). And then (4a) can't entail (4c), as otherwise (4b) would entail (4c), which it doesn't.

A related argument against a naive semantic treatment of free choice starts from the assumption that permission contexts are insensitive to logical form, meaning that if *S may do A* is true, and *A* is logically equivalent to *B*, then *S may do B* is true as well. After all, if *A* and *B* are logically equivalent, then it is logically impossible to do one without the other, so it makes little sense to permit *A* but not *B*. Given the equivalence between *A* and $[A \wedge B] \vee [A \wedge \neg B]$, the validity of free choice would allow us to reason from *you may do A* via *you may do [A and B] or [A and not-B]* to *you may do A and B*. From *you may have a cookie* we could infer *you may have a cookie and burn down the house*.

Another, potentially more revealing observation (going back to [Kratzer and Shimoyama 2002]) is that the contraposition of the inference from (1a) to (1b) and (1c) looks clearly invalid. If (1a) entailed (1b), then the negation of (1b) should entail the negation of (1a): *you may not have wine* should entail *you may not have beer or wine*. (Similarly, *you may not have white wine* should entail *you may not have wine*; *I can't bring white wine* should entail *I can't bring wine*, and so on.) But these inferences don't look good at all. *You may not have beer or wine* seems to say that beer and wine are both forbidden, which doesn't follow from the mere fact that wine is forbidden.

So free choice effects seem to disappear under negation. They also disappear in other downward entailing environments. For example, *no student may have beer or wine* – no student is an *S* such that *S* may have beer or wine – seems to state that both beer and wine are forbidden for each student. It does not merely state that either beer or wine is forbidden for student, as the validity of free choice would imply.

This interaction with downward entailing environments is a hallmark of scalar implicatures. Compare the textbook example of scalar implicatures, the inference from (5a) to (5b).

- (5) a. Some students passed.
- b. Not all students passed.

Arguably, this inference is not licensed by the truth-conditional content of (5a). On the (neo-)Gricean model of implicatures, it rather relies on further assumptions about the conversational context. The implication can be derived by an argument of the following form.

1. The speaker uttered *S* (*some students passed*) rather than the stronger alternative *S'* (*all students passed*).
2. As a cooperative informant, the speaker would have uttered *S'* rather than *S* if she had known *S'* to be true.
3. So the speaker doesn't know that *S'* is true.
4. But the speaker is well-informed about the subject matter.
5. So *S'* (*all students passed*) is false while *S* (*some students passed*) is true.

The Gricean hypothesis is not that people explicitly go through this line of reasoning whenever they encounter a statement like (5a). The hypothesis is rather that the computation of compositional semantic values is accompanied by a context-sensitive pragmatic process that can be rationalized as an inference along the above lines. The process itself may well be unconscious and semi-automatic; see e.g. [Saul 2002], [Bach 2006].

The Gricean account is attractive not only because it allows us to preserve traditional (and simple) views about the meaning of *some* and *all*, but also because it correctly predicts that the apparent entailment depends on the contextual background assumptions 2 and 4, and that it reverses in downward entailing environments, because what is more informative on its own becomes less informative in downward entailing environments. Thus *not all students passed* normally conveys that at least some students passed, and *I doubt that some/any students passed* normally conveys a suspicion that no student passed, rather than a suspicion that either no or all students passed.

We can also witness reversal in the case of free choice. Consider the free choice inference from (4a) to (4c). When the conclusion is negated – *you may not have white wine* – we would not infer that we may not have wine; on the contrary, we would infer that we're *allowed* to have wine, just not white wine.

Arguably, free choice effects also depend on assumptions 2 and 4 about the conversational context. Suppose I utter (6) while explaining a board game.

- (6) At the beginning of round two, you may draw a red card or a green card, depending on how many of these you already have.

This does not suggest that both types of card are permissible options. Or suppose I say (7), indicating that I don't know which options are permissible.

- (7) I'm not sure what happens at the beginning of round two. I think you may draw a red card or a green card.

Again, this does not suggest that you are free to choose between a red card and a green card. Similarly, one could say *you may have beer or wine, I forgot which*, or *you may have beer or wine, I won't tell you which*. Neither of these would make sense if *you may have beer or wine* already settled that you may have beer and you may have wine. Even direct cancellations of free choice effects are often possible: *you may have wine, but no red wine* might be slightly odd, but it is not a contradiction. (It is not as bad as *you may have red wine, but no wine*.)²

The hypothesis that free choice effects are scalar implicatures also has the promise to handle existential free choice and answer the problem of specifications. That's because any credible theory of scalar implicatures must postulate restrictions on the alternatives S' to an uttered sentence S that can enter into the algorithm for computing implicatures. Return to the case where we are told that *some students passed*. On the Gricean account outlined above, we can infer that not all students passed because the speaker didn't choose the stronger alternative *all students passed*. But there are countless other alternatives that could in principle be considered, including *some but not all students passed* and *some students passed and I don't want a cookie*. With these alternatives in place of S' , the Gricean argument would lead, respectively, to the conclusions that all students passed and that the speaker wants a cookie. Without substantive restrictions on the alternatives S' , the Gricean story therefore predicts not only implicatures that actually arise but also a plethora of implicatures that do not arise.

So what should count as an alternative S' to a given sentence S for the purpose of computing scalar implicatures? A popular strategy is to define a base class of *formal alternatives* which is then restricted (and perhaps extended) by conversational relevance and a condition of *innocent excludability*, which ensures that one can consistently deny all the alternatives while accepting the original sentence S (see [Fox 2007]). The precise characterization of formal alternatives is an open problem. According to [Katzir 2007], the formal alternatives to a sentence S are defined syntactically by (roughly) substituting constituents of S with either an element of the lexicon or another sub-constituent of S

² With disjunctive possibility statements, direct cancellations are more problematic: *you may have beer or wine, but no wine* sounds very bad. But so does *Alice brought beer or wine, but she didn't bring beer*, in which the second sub-sentence also attempts to cancel a ("primary") implicature of the first. I will have more to say on primary implicatures and the connection to free choice below.

(see also [Fox and Katzir 2011]). For our purpose, the details are not really important. What’s important is that if free choice effects are scalar implicatures, then it is clear why only some “specifications” are legitimate: they are the ones that correspond to genuine alternatives for the computation of scalar implicatures.

An analysis of free choice as a scalar implicature further promises to explain why the effect is especially strong for disjunctions. Compare (8a) and (8b).

- (8) a. Bob might be in the UK.
- b. Bob might be in England or Scotland or Wales.

(8b) strongly suggests that each of England, Scotland, or Wales is a live possibility for Bob’s whereabouts. The implication is much weaker (and more dependent on context) in (8a). Roughly speaking, the explanation is that if, say, Scotland could be ruled out, then the speaker should really have used the simpler and more informative *England or Wales* instead of *England or Scotland or Wales*, but it could still have been OK to use *UK*, especially if the precise location is not important in the conversational context.

I will return to these issues in section 4. First we need to recapitulate why an account of free choice in terms of scalar implicatures is not as easy as one might have hoped.

Consider again our first example.

- (1) a. You may have beer or wine.
- b. You may have beer.
- c. You may have wine.

The most salient alternatives to (1a) are (1b) and (1c). Both are simpler and stronger than (1a), they naturally come to mind as alternative things the speaker could have said, and they qualify as formal alternatives by the rules of [Katzir 2007]. However, they are not innocently excludable: we can’t assume that (1b) and (1c) are both false while (1a) is true. In any case, this would be the opposite of what we want. We want to infer that (1b) and (1c) are true, not false! How is that supposed to work?

It is sometimes argued that although free choice may not fit the standard account of scalar implicatures, it is nevertheless easily explained along Gricean lines (see e.g. [Geurts 2010: ch.6]). The idea is that for a well-informed and cooperative speaker, (1b) would be the right thing to say if only beer is allowed, and (1c) if only wine is allowed. If the speaker chose neither of those sentences, we can infer that neither condition is met. This leaves two possibilities: either beer and wine are both allowed or both forbidden. The actual statement (1a) entails that they are not both forbidden. The only remaining possibility is that they are both allowed.

But this doesn’t explain why (1a) is a reasonable choice of words for expressing that both beer and wine are allowed, if its literal meaning is that either beer or wine is allowed.

Shouldn't we rather expect those words to be used in cases where the speaker is not fully informed (or secretive) about the relevant permissions? Compare bare disjunctions.

- (9) a. Alice gave her number to Bob or Carol.
- b. Alice gave her number to Bob.
- c. Alice gave her number to Carol.

Suppose someone utters (9a). There are two obvious alternatives, (9b) and (9c). For a well-informed and cooperative speaker, (9b) would be the right thing to say if Alice gave her number only to Bob, and (9c) if she gave it only to Carol. Since the speaker chose neither of those sentences, one might infer that Alice either gave her number to both Bob and Carol or to neither of them. The latter is incompatible with the literal content of (9a), so the only remaining possibility is that Alice gave her number to both Bob and Carol. — This is clearly not a sensible interpretation of the utterance. In ordinary situations, nobody would understand (9a) as asserting that Alice gave her number to both Bob and Carol. A much better explanation for why the speaker chose the comparatively weak and complex (9a) is that she wasn't in a position to assert (9b) and (9c): she doesn't know (or doesn't want to tell) whether Alice gave her number to Bob or Carol.

This reasoning, from the utterance of (9a) to the conclusion that the speaker doesn't know (or doesn't want to tell) which of (9b) and (9c) is true, fits the above Gricean schema, except that the reasoning stops at step 3. Such inferences are sometimes called *primary implicatures*, in contrast to a full (*secondary*) implicature that goes all the way to 5. Even if we had initially thought the speaker well-informed and cooperative (premise 4), the utterance of (9a) would convince us that she is not. The question is why this doesn't happen with (1a).

3 Beyond modality

The modal constructions ('may', 'might', 'can', etc.) that trigger free choice effects are often analyzed as existential quantifiers over accessible possibilities. A natural question is therefore whether similar effects occur with constructions that instead quantify over times or individuals. As Klinedinst [2007] observes, the answer is yes. Thus *sometimes Carol brought beer or wine* suggests that sometimes Carol brought beer and sometimes she brought wine; and *some guests brought beer or wine* suggests that some guests brought beer and others wine. These implications are just as puzzling as free choice effects for *may* or *might* or *can*.

Consider (10a), which (in a suitable context) seems to imply (10b) and (10c).

- (10) a. Some guests brought beer or wine.
- b. Some guests brought beer.

c. Some guests brought wine.

There are good reasons to think that *some guests did so-and-so* is monotonic: if some guests did *A*, and doing *A* entails doing *B*, then surely some guests did *B*. Thus (10b) should entail (10a). If the latter entails (10c), we could infer (10c) from (10b). But while that inference is often truth-preserving, it is clearly not semantically valid.

Let’s note in passing that here, too, the effect is not limited to disjunctions. *Some guests brought musical instruments* suggests that the guests who brought instruments didn’t all bring, say, tubas. *Some guests arrived between 5 and 7* suggests that the relevant guests didn’t all arrive at exactly 6.30.

Once again the effect displays characteristic features of scalar implicatures. For example, it is sensitive to conversational context, to assumptions about the speaker’s knowledge, and it can be cancelled: *some guests brought beer or wine, I forgot which*. Moreover, the effect goes away under negation: *no guest brought beer* does not at all seem to entail *no guest brought beer or wine*. But as before the effect is hard to explain along Gricean lines. What alternative to (10a) could we negate to infer (10b) and (10c)?³

In response, Klinedinst [2007] suggests dropping the (neo-)Gricean account of implicatures in favour of a lexicalized or grammaticalized account as defended e.g. in [Chierchia 2004], [Fox 2007], or [Chierchia et al. forthcoming] on which scalar implicatures are unfolded in the standard compositional computation of meaning. On one way of fleshing out this idea, the lexicon contains a tacit “exhaustification” operator $\text{Exh}(\cdot)$ which enriches the compositional semantic value of embedded sentences by the Gricean algorithm, so that $\text{Exh}(A)$ is equivalent to the conjunction of *A* with its innocently excludable alternatives. Crucially, $\text{Exh}(\cdot)$ can occur in embedded positions. In essence, Klinedinst’s proposal is now that the logical form of (10a) is something like (11).⁴

$$(11) \quad [\exists X : \text{Guests}(X)]\text{Exh}([\forall x \in X](\text{Brought-Beer}(x) \vee \text{Brought-Wine}(x))).$$

Relevant alternatives to the embedded clause (12a) are (12b) and (12c).

- (12) a. $[\forall x \in X](\text{Brought-Beer}(x) \vee \text{Brought-Wine}(x)).$
 b. $[\forall x \in X]\text{Brought-Beer}(x).$

³ Klinedinst points out that the free choice effect only seems to arise if the existential quantifier is plural. *Once she brought beer or wine* does not suggest that once she brought beer and once wine. *Some guest brought beer or wine* does not suggest that some guest brought beer and some guest wine. This provides an interesting test for theories of free choice: several proposals in the literature predict that it should make no difference to the generation of free choice effects whether the quantifier is singular or plural (see [Klinedinst 2007: sec.1.5]).

⁴ [Klinedinst 2007] doesn’t make use of a lexical exhaustification operator, but rather follows [Chierchia 2004] in assuming that other lexical items like ‘some’ automatically trigger the computation of implicatures; in (10a) and (1a) the relevant item is taken to be an unpronounced distributivity operator which I’ve rendered as $[\forall x \in X]$ and $[\forall w \in W]$ respectively. The differences are not important for the present discussion.

c. $[\forall x \in X] \text{Brought-Wine}(x)$.

Conjoining (12a) with the negations of (12b) and (12c) yields the compositional semantic value of $\text{Exh}((12a))$. The original sentence (10a) therefore gets interpreted as (13), which states that there is a collection of guests all of which brought beer or wine but some of which didn't bring beer and others didn't bring wine.

$$(13) \quad [\exists X : \text{Guests}(X)][\forall x \in X](\text{Brought-Beer}(x) \vee \text{Brought-Wine}(x)) \wedge \neg[\forall x \in X] \text{Brought-Beer}(x) \wedge \neg[\forall x \in X] \text{Brought-Wine}(x).$$

To adapt this explanation to modals, Klinedinst suggests that (1a), too, should be analyzed as a plural quantification (over deontically accessible worlds):

$$(14) \quad [\exists W : \text{Acc}_D(X)] \text{Exh}([\forall x \in X](\text{Beer}(x) \vee \text{Wine}(x))).$$

The analysis of (14) is then completely analogous to that of (11).

I have no decisive objection to this proposal, but it evidently rests on some controversial assumptions, notably the hypothesis of lexicalized or grammaticalized implicatures.⁵ To be sure, there is good evidence that implicatures can arise in what appear to be embedded positions, as in (15a). The same is true for free choice effects, as witness (15b).

- (15) a. Bob knows that some students passed.
b. Bob knows that Alice may have beer or wine.

However, neo-Griceans have put forward various suggestions to explain away these effects without postulating special compositional rules or novel syntactic operators for which there is little independent evidence (see e.g. [Russell 2006], [Russell 2012], [Simons 2014]).

I do not want to enter this debate. Instead I want to put forward an alternative analysis of free choice type effects that does not require grammaticalized or lexicalized implicatures.

Return to (10a), which seems to imply (10b) and (10c).

- (10) a. Some guests brought beer or wine.
b. Some guests brought beer.
c. Some guests brought wine.

To understand this effect it may help to look at superficially similar cases involving plural definites.

- (16) The guests brought beer or wine.

⁵ Further potentially controversial assumptions are the plural interpretation of modals and the postulation of a distributivity operator in all contexts that trigger free choice effects.

In a suitable context, (16), like (10a), suggests that some of the guests brought beer and others wine. Similarly, *the guests arrived between 5 and 7* suggests that some of the guests arrived not long after 5 and some not long before 7; *the children drew animals* suggests that the children didn't all draw the same kind of animal, say giraffes. In each case, the attribution of an unspecific property to the plurality triggers a diversity implicature to the effect that different more specific properties are instantiated among the plurality.

These diversity implicatures are easily explained as standard scalar implicatures. For example, relevant alternatives to (16) are (17a) and (17b).

- (17) a. The guests brought beer.
- b. The guests brought wine.

Each of (17a) and (17b) semantically entails (16). Why did the speaker utter (16) rather than the stronger (17a) or (17b)? Assuming she is knowledgeable and cooperative, a natural explanation is that (17a) and (17b) are not true. And if (16) is true while (17a) and (17b) are false, then some of the guests brought beer and others wine.

For another example, (18b) and (18c) are some relevant alternatives to (18a).

- (18) a. The guests arrived between 5 and 7.
- b. The guests arrived between 5 and 6.
- c. The guests arrived between 6 and 7.

The alternatives specify a more narrow range of arrival times. The negation of all such alternatives is compatible with the literal truth of (18a): they are innocently excludable. Consequently, (18a) suggests that the guests did not all arrive between 5 and 6, or between 6 and 7.

Why does this explanation not carry over to cases like (10a) involving indefinites? The problem is that if there is plurality *G* of guests some of which brought beer and others wine, then this renders the alternatives (10b) and (10c) true. These are verified not by the original plurality *G*, but by certain sub-pluralities of *G*. When we consider alternatives to (16), *the guests* always picks out the same fixed plurality. By contrast, when we consider alternatives to (10a), different alternatives can be made true by different pluralities. To derive the diversity implicature, we have to hold fixed the plurality.

Analogous problems can arise with singular indefinites. Consider (19).

- (19) A gambler lost some of his savings. Another lost all of his.

There is an implicature here that the first gambler, unlike the second, didn't lose all his savings. How does the implicature arise? To be sure, the speaker could have used the stronger (20b) instead of (20a).

- (20) a. A gambler lost some of his savings.
- b. A gambler lost all of his savings.

Since she chose the weaker (20a), we might infer that she wasn't in a position to assert (20b). Assuming she is well-informed, we might further infer that the alternative is false. But in the context of (19), this explanation makes no sense. For the second sentence in (19) entails that (20b) is in fact true: the speaker knows that some gambler lost all of his savings. So we can hardly assume that she wasn't in a position to assert (20b).

Nonetheless, there is an intuitive explanation of the implicature along broadly Gricean lines. Informally, the reasoning could go as follows. "The speaker said of some gambler that he lost some of his savings; it would have been more informative to say that he lost all his savings; so the speaker probably doesn't think this is true; since she is well-informed, the relevant gambler probably didn't lose all his savings."

The underlying point is that speakers generally don't just aim at saying something true, but also at conveying specific information about specific individuals and events. Take another example.

(21) One day, Bob met some of his colleagues at the pub.

A speaker who begins an anecdote with (21) wants to convey information about a specific day on which Bob met some (and not all) of his colleagues at the pub. There may have been other days on which Bob met all of his colleagues, but these aren't at issue. So the reason why the speaker didn't use the stronger *all of his colleagues* instead of *some of his colleagues* in (21) is arguably not that this would have rendered the utterance false, but that it would have changed the topic: the speaker doesn't want to talk about a day on which Bob met all of his colleagues.

To put flesh on these informal remarks, let me draw on some basic ideas from dynamic semantics. It is well-known that the classical bound-variable interpretation of indefinites runs into problems with cases where associated pronouns are not in the scope of the postulated quantifier, as in (22).

(22) A gambler lost some of his savings. He got upset.

On one popular approach to these phenomena, going back to [Heim 1982] and [Kamp 1981], indefinites like *a gambler* introduce a new "discourse referent" into the linguistic context, which we may represent as a free variable x . The assignment function that interprets x is then constrained by the various assertions about the gambler, which are analyzed as open sentences containing the new variable. The relevant logical form of *A gambler lost some of his savings* is therefore taken to be something like (23).

(23) $Gambler(x) \wedge Lost\text{-}some\text{-}of\text{-}his\text{-}savings(x)$.

The second sentence in (22) then simply re-uses the variable x . Existential closure only takes place on the level of discourse, in the sense that the sequence of sentences (22) is true only if there is some individual that satisfies all the constraints.

We can now explain the implicature in (19) if we assume that the formal alternatives to a given sentence may involve the same free variables. One alternative to (23) is then (24).

$$(24) \quad \textit{Gambler}(x) \wedge \textit{Lost-all-of-his-savings}(x).$$

Conjoining (23) with the negation of (24) yields the desired result:

$$(25) \quad \textit{Gambler}(x) \wedge \textit{Lost-some-of-his-savings}(x) \wedge \neg \textit{Lost-all-of-his-savings}(x).$$

This arguably captures the informal quasi-Gricean reasoning above, in which we hold fixed the individual when computing implicatures, asking why the speaker characterized *him* as having lost some of his savings rather than as having lost all.

In effect, the Gricean mechanism here applies locally in the scope of the existential quantification. But we don't need to postulate tacit exhaustification operators or lexicalized implicatures to achieve that result. From a dynamic semantics perspective, a truly global application of Gricean principles would have to wait until the end of the entire discourse, which is evidently not practical.

The analysis of (10a) is now straightforward. *Some guests* introduces a plural discourse referent X ; the relevant logical form of (10a) is something like (26).⁶

$$(26) \quad \textit{Guests}(X) \wedge (\textit{Brought-Beer}(X) \vee \textit{Brought-Wine}(X)).$$

The diversity implicature arises in just the way it did for (18a): salient alternatives to (26) are (27a) and (27b).

$$(27) \quad \begin{array}{ll} \text{a.} & \textit{Guests}(X) \wedge \textit{Brought-Beer}(X). \\ \text{b.} & \textit{Guests}(X) \wedge \textit{Brought-Wine}(X). \end{array}$$

By the cumulative meaning of *Brought-Beer*, the negation of (27a) entails that if the X s are guests, then some of them didn't bring beer.⁷ Likewise, the negation of (27b) entails that if the X s are guests, then some of them didn't bring wine. Conjoining $\neg(27a)$ and $\neg(27b)$ with (26), we can infer that the X s are guests all of which brought beer or wine but some of which didn't bring beer and others didn't bring wine.

4 Free choice explained

Now let's work back to modality, stopping briefly at the temporal case. We saw that (28a) can seem to imply (28b) and (28c).

$$(28) \quad \text{a.} \quad \text{Sometimes Alice brought beer or wine.}$$

⁶ As mentioned above, I remain neutral on whether (10a) involves a silent distribution operator.

⁷ A predicate F is *cumulative* if $F(a) \wedge F(b)$ entails $F(a \text{ and } b)$. In the present case, the assumption that all individuals in X brought beer entails that the X s brought beer. Conversely, if the X s didn't bring beer, then some of them individually didn't bring beer.

- b. Sometimes Alice brought beer.
- c. Sometimes Alice brought wine.

In (28a), *sometimes* arguably functions like a plural indefinite, introducing a discourse referent for a plurality X of times or events; *Alice brought beer or wine* then characterizes all those times as times when Alice brought beer or wine. The explanation of the implicature is therefore just as above: if all the times in X had been times when Alice brought beer, a well-informed and cooperative speaker should have used the simpler *Alice brought beer*; since she didn't, one can infer that at some of the X times Alice brought wine. Likewise, *mutatis mutandis*, for beer.

Temporal discourse referents are well-established in dynamic semantics, motivated by the fact that tense often has an anaphoric function that is hard to capture with a traditional operator approach (see e.g. [Partee 1984]). Plural discourse referents are a little less familiar in this context, but there are good reasons to think that *sometimes* is indeed plural (as its morphology suggests). Thus it would at least be odd to use (28a) to describe scenarios in which Alice brought beer or wine only once. Moreover, like plural indefinites in the nominal domain, *sometimes* gives rise to “maximal set anaphora”. For example, in (29a), *then* picks out all times when Alice brought beer or wine, just as *them* in (29b) picks out all Bill's sheep.⁸

- (29) a. Sometimes Alice brought beer or wine. Then Bob was happy.
- b. Bill owns some sheep. Harry vaccinated them.

Note also that the implicature in (28) does not arise if *sometimes* is replaced by the clearly singular *one time*.

Let's see if we can adapt this analysis to our original modal cases.

- (1) a. You may have beer or wine.
- b. You may have beer.
- c. You may have wine.

What we need to assume is that *may* introduces a plural discourse referent, presumably standing for a collection of deontically accessible worlds or situations or events. Let's stick with worlds for the sake of concreteness. (1a) characterizes these worlds as *beer or wine* worlds. Since it would have been simpler to characterize them as *beer* worlds or *wine* worlds, one can infer that some of them are *beer* worlds and others *wine* worlds.

⁸ The analysis of temporal and plural discourse referents is complicated; see e.g. [Kamp et al. 2011: sec. 3.5], [Nouwen 2014], [Brasoveanu 2011]. For our purposes, the details are fortunately not too important.

More concretely, suppose the logical form of (1a) is something like (30a). The relevant alternatives are then (30b) and (30c); conjoining their negation with (30a) yields the desired implicature.⁹

- (30) a. $\text{Acc}_D(W) \wedge (\text{Beer}(W) \vee \text{Wine}(W))$
b. $\text{Acc}_D(W) \wedge \text{Beer}(W)$
c. $\text{Acc}_D(W) \wedge \text{Wine}(W)$

However, the present approach is not really committed to analyzing (1a) as (30a). The crucial assumption is that somehow or other, (1a) introduces a discourse referent for a plurality of deontically accessible worlds (or situations or events or whatever) and then imposes the condition *you have beer or wine* on those.

That modals introduce discourse referents is familiar and well-supported by the anaphoric phenomenon of modal subordination, as in (31a) and (31b).

- (31) a. Alice might bring beer. Bob would be happy.
b. You may have a beer. I would have one, too.

Note that (31a) suggests not only that there are some epistemically accessible worlds at which Alice brings beer and Bob is happy; it rather suggests that Bob is happy at all epistemically accessible worlds where Alice brings beer. Thus *would* seems to get a “maximal set” interpretation, which indicates that the modality is plural.

Traditionally, possibility modals have been analysed in terms of singular existential quantification over worlds:

- (32) *Alice might bring beer* is true iff there is an epistemically accessible world where Alice brings beer.

Is the present account incompatible with that tradition? Not necessarily. To begin, there are good reasons to adopt a “weak” reading of plurals on which plural variables can refer to collections with just a single member. For example, *no students came to the party* is false if exactly one student came. So we can allow for possibility statements that are verified by a single world. There aren’t many of those, but *it could have been that everything is just as it actually is* may be an example. Indeed, on the weak reading of plurality, there is no truth-conditional difference at all between the singular and plural analysis of simple possibility sentences: necessarily, there is a world that satisfies *C* iff there are one or more worlds all of which satisfy *C*. So we do not have to reject (32).

What’s at issue from the present perspective are not the truth-conditions of possibility statements, nor their precise logical form, but whether they introduce plural or singular discourse referents. As I mentioned above, the anaphoric behaviour of modals has

⁹ Again, I remain neutral on whether predicating *Beer* and *Wine* of a collection of worlds requires an explicit distribution operator.

features that clearly point towards the plural hypothesis. The hypothesis might get further support from languages in which modals aren't marked for quantificational force ([Rullmann et al. 2008]), languages in which the same anaphoric elements are used in nominal, temporal and modal contexts ([Schlenker 2012]), and from the close ties between modals and *if*-clauses on the one hand and *if*-clauses and plural definite descriptions on the other ([Schlenker 2003]). Looking into these considerations would lead us too far afield. In any case, I am not aware of any reasons for assuming that modal discourse referents are singular. So even if the plural hypothesis had no independent support, the fact that it allows for a uniform explanation of free choice effects would arguably be enough to take it seriously.

Let's have a closer look at some predictions of the present proposal. If S_i are (innocently excludable) scalar alternatives to S , then on the present proposal, *may S* generally triggers each of *may S_i* as an implicature. (Similarly for *might/can/could/sometimes*.) If S is a disjunction, the individual disjuncts are relevant scalar alternatives. This is true no matter how many disjuncts are in the disjunction. For example, (33) implicates that Alice might be in any of the four bars.

(33) Alice might be in *bar 1* or *bar 2* or *bar 3* or *bar 4*.

The explanation is that if, say, *bar 4* could be ruled out, the speaker should have characterized the relevant possibilities more simply and strongly as *bar 1 or bar 2 or bar 3* possibilities.

The implicature is weaker in (34), where we only get what I called an "existential" free choice effect.

(34) Alice might be in one of the bars on campus.

Here it would have been simpler and more informative to characterize the relevant possibilities as *bar 1* possibilities, or as *bar 2* possibilities, etc. Hence we do get the implicature that there are at least two different bars where Alice might be. On the other hand, *being in bar 1 or bar 2 or bar 3* normally doesn't count as a salient scalar alternative to *being in one of the bars on campus*. This is why (34), unlike (33), doesn't obviously suggest that each bar is a possible location. The implicature is merely that there are several bars where Alice might be.

As foreshadowed in section 2, we can also explain why (35) normally suggests that you may have red wine, but not that you may have wine and burn down the house.

(35) You may have wine.

The reason is that *you have white wine* is a plausible scalar alternative to *you have wine*, but not *you may have wine and burn down the house*.

We can see the same effect with definite plurals in the nominal domain:

(36) The guests had wine.

In a suitable context, (36) can implicate that some of the guests had red wine and others white wine. By contrast, it would be very unusual for (36) to implicate that some of the guests had wine and burnt down the house. That the implicature from *wine* to *red wine* is typically stronger in (35) than in (36) also has a natural pragmatic explanation: in a context where someone utters (36), it will often not be important whether all the guests had the same kind of wine; by contrast, if someone utters (35), it typically matters whether the deontically accessible worlds include red wine worlds and white wine worlds – that is, whether red wine is allowed and whether white wine is allowed. In the context of (35), *you have white wine* is therefore a highly relevant alternative to *you have wine*, while *the guests had white wine* is often not a highly relevant alternative to *the guests had wine* in the context of (36). Note that the implicature is also generally weaker in (37) than in (35) even though both are modal: in the context of (37), it also often doesn't matter whether the speaker can rule out white wine or red wine possibilities.

(37) Carol might have wine.

On the other hand, even in permission contexts, the relevant alternatives and therefore the “specifications” of the permission are tightly constrained. Recall another example from section 2.

(38) Electrical items may be carried in hand luggage.

A sign that says (38) suggests that a variety of electrical items, but not necessarily all electrical items, are allowed: if the permission were restricted to an easily describable sub-group *G* of electrical items, one would expect to see *G may be carried in hand luggage* instead of (38).

Here is another plausible prediction of the present proposal. I mentioned in passing that straight assertions of unspecific statements like (39) often trigger *primary* implicatures to the effect that the speaker is not in a position to assert the stronger alternatives.

(39) Alice brought beer or wine.

In the case of (39), the implicature is that the speaker doesn't know whether Alice brought beer or whether she brought wine. On the neo-Gricean account of implicatures, this effect is computed by the same rules as full (secondary) scalar implicatures, except that the computation ends in the middle: since *Alice brought beer* and *Alice brought wine* would have been simpler and stronger than (39), we can infer that the speaker isn't in a position to assert these alternatives. We can't further conclude that the speaker, being well-informed, actually knows that the alternatives are false, as that would contradict her actual assertion.

Now the present account predicts that the free choice inferences triggered by *might S* statements mirror the primary implicatures that would be triggered by corresponding

assertions of S , especially in contexts where *might* expresses epistemic possibility for the speaker. Again this prediction looks plausible. For instance, *Alice is in one of the bars on campus* typically suggests that the speaker doesn’t know in which bar Alice is, just as *Alice might be in one of the bars on campus* suggests that there are several bars where she might be. On the other hand, in a context where it wouldn’t be helpful to name a specific bar (because it would be irrelevant to the conversation, or because the addressee doesn’t know any bars on campus), both implicatures go away.

5 Conclusion

I have offered some new arguments for the hypothesis that free choice effects are scalar “diversity” implicatures. In particular, I have argued that this explains a variety of phenomena that do not involve disjunctions embedded under deontic modals: it solves the problem of specifications, allows for existential free choice, correctly predicts the context-sensitivity of the relevant effects, and explains why the primary implicatures triggered by direct assertions of unspecific sentences S generally match the free choice implications of corresponding *might* S assertions.

Most extant attempts to explain free choice as a scalar implicature postulate non-Gricean mechanisms of embedded exhaustification operators or lexicalized implicatures. The explanation I have outlined requires no such assumptions. It rather draws on the observation that when a speaker asserts a sentence S instead of a stronger alternative S' , the reason is not always that the alternative is false (or not known to be true); it can also be that the alternative would change the topic. I suggested that this can be captured in standard neo-Gricean accounts by assuming that the formal alternatives to a sentence hold fixed the discourse referents introduced by that sentence. Thus (40) (from [Klinedinst 2007]) suggests that some passengers got sick and others had trouble breathing because the relevant alternatives predicate of the very passengers introduced in (40) that they (all) got sick or that they (all) had trouble breathing.

(40) Some passengers got sick or had trouble breathing.

Extending this analysis to temporal and modal cases requires the assumption that the relevant operators (*sometimes*, *may*, *might*, etc.) also introduce plural discourse referents. I have argued that there is some independent evidence for this assumption, but further investigation may be warranted.

Another question for further research is whether the present account can explain other phenomena that are sometimes grouped with free choice, notably free-choice type effects in the antecedent of conditionals and with wide-scope ‘or’, as illustrated by (41) and (42) respectively.

(41) If Alice or Bob comes, it will be fun.

(42) You may have beer or you may have wine.

Adapting the account I have outlined to these cases would arguably require a closer look at the behaviour of plural discourse referents in general. Consider a nominal analogue of (42):

(43) Some passengers had to leave; they got sick or they had trouble breathing.

(43) is naturally understood as stating that some of the passengers who had to leave got sick and others had trouble breathing. It's as if *they* here picks out not all the passengers who had to leave but a random yet homogeneous subset. With respect to (41), observe that the present account already predicts the “simplification of disjunctive antecedents” effect if the conditional is broken into two speech acts (as it is in some languages that lack an *if-then* construction):

(44) Alice or Bob might come. Then it will be fun.

On the account I have outlined, the first sentence in (44) implicates that some of the epistemically possible worlds are Alice worlds and others are Bob worlds. Since *then* has its typical “maximal set” reading, the second sentence requires that all the worlds introduced by the first sentence are fun worlds.

These remarks are obviously no more than a tentative sketch. But they hopefully indicate that the account I have offered may have the potential to explain further phenomena that have not been the focus of the present study.

References

- Luis Alonso-Ovalle [2008]: “Innocent exclusion in an alternative semantics”. *Natural Language Semantics*, 16(2): 115–128
- Kent Bach [2006]: “The top 10 misconceptions about implicature”. *Drawing the boundaries of meaning: Neo-Gricean studies in pragmatics and semantics in honor of Laurence R. Horn*: 21–30
- Adrian Brasoveanu [2011]: “Plural Discourse Reference”. In J. van Benthem and A. ter Meulen (Eds.) *Handbook of Logic and Language*, London: Elsevier, 2nd edition, 1035–1058
- Gennaro Chierchia [2004]: “Scalar implicatures, polarity phenomena, and the syntax/pragmatics interface”. In A. Belletti (Ed.) *Structures and Beyond*, Oxford: Oxford University Press, 39–103
- Gennaro Chierchia, Benjamin Spector and Danny Fox [forthcoming]: “The grammatical view of scalar implicatures and the relationship between semantics and pragmatics.”

- In P. Portner, C. Maienborn and K. von Stechow (Eds.) *Handbook on Semantics*, Berlin: de Gruyter
- Danny Fox [2007]: “Free choice and the Theory of Scalar Implicatures”. In U. Sauerland and P. Stateva (Eds.) *Presupposition and Implicature in Compositional Semantics*, Basingstoke: Palgrave Macmillan, 71–120
- Danny Fox and Roni Katzir [2011]: “On the characterization of alternatives”. *Natural Language Semantics*, 19: 87–107
- Bart Geurts [2010]: *Quantity Implicatures*. Cambridge: Cambridge University Press
- Irene Heim [1982]: *The semantics of definite and indefinite noun phrases*. Doktorarbeit, University of Massachusetts Amherst
- Hans Kamp [1981]: “A theory of truth and semantic representation”. In J.A.G. Groenendijk, T.M.V. Janssen, and M.B.J. Stokhof (Eds.) *Formal Methods in the Study of Language*, Amsterdam: Mathematical Centre Tracts 135, 277–322
- Hans Kamp, Josef van Genabith and Uwe Reyle [2011]: “Discourse Representation Theory”. In Dov Gabbay and Franz Guenther (Eds.) *Handbook of Philosophical Logic, Volume 15*, Dordrecht: Springer, 2nd edition, 125–394
- Roni Katzir [2007]: “Structurally-defined alternatives”. *Linguistics and Philosophy*, 30: 669–390
- Nathan W. Klinedinst [2007]: “Plurality and Possibility”. Phd Dissertation, UCLA
- Angelika Kratzer and Junko Shimoyama [2002]: “Indeterminate pronouns: The view from Japanese”. In *Proceedings of the 3rd Tokyo conference on psycholinguistics*, Tokyo: Hituzi Syobo, 1–25
- David Lewis [1979]: “A Problem About Permission”. In E. Saarinen et al. (Ed.) *Essays in Honour of Jaakko Hintikka*, Reidel
- Rick Nouwen [2014]: “Plurality”. In M. Aloni and P. Decker (Eds.) *The Cambridge Handbook of Semantics*, Cambridge: Cambridge University Press
- Barbara H. Partee [1984]: “Nominal and temporal anaphora”. *Linguistics and Philosophy*, 7(3): 243–286. ISSN 1573-0549
- Alf Ross [1941]: “Imperatives and Logic”. *Theoria*
- Hotze Rullmann, Lisa Methewson and Henry Davis [2008]: “Modals as distributive indefinites”. *Natural Language Semantics*, 16: 317–357

- Ben Russell [2006]: “Against grammatical computation of scalar implicatures”. *Journal of Semantics*, 23: 361–382
- Benjamin Russell [2012]: *Probabilistic reasoning and the computation of scalar implicatures*. Doktorarbeit, Brown University
- Jennifer M Saul [2002]: “What is said and psychological reality; Grice’s project and relevance theorists’ criticisms”. *Linguistics and philosophy*, 25(3): 347–372
- Philippe Schlenker [2003]: “Conditionals as Definite Descriptions (A Referential Analysis)”. In R. Kempson and K. von Heusinger (Eds.) *Research on Language and Computation*, xxx
- [2012]: “Generalized Quantification and Anaphora Across Ontological Domains: Evidence from ASL”. *UCLA Working Papers in Linguistics, Theories of Everything*, 17: 382–388
- Mandy Simons [2005]: “Dividing things up: The semantics of or and the modal/or interaction”. *Natural Language Semantics*, 13(3): 271–316
- [2014]: “Local pragmatics and structured contents”. *Philosophical Studies*, 168(1): 21–33
- Georg H. von Wright [1967]: “Deontic Logics”. *American Philosophical Quarterly*, 4(2): 136–143
- [1968]: “An Essay in Deontic Logic and the General Theory of Action”. *Acta Philosophica Fennica*, 21: 110–133
- Thomas Ede Zimmermann [2000]: “Free choice disjunction and epistemic possibility”. *Natural language semantics*, 8(4): 255–290