Generically Free Choice*

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Abstract

This paper discusses free-choice like effects in generics. Just as *Jane may drink coffee or tea* can be used to convey *Jane may drink coffee and Jane may drink tea*, some generics with disjunctive predicates can be used to convey conjunctions of simpler generics: *elephants live in Africa or Asia* can be used to convey *elephants live in Africa and elephants live in Asia*. I propose an account on which this effect is a scalar implicature. Among other results, it can explain various aspects of this phenomenon, including why the effect is absent in the superficially similar *elephants have grey ears or white tusks*.

Keywords SEMANTICS · NATURAL LANGUAGE · GENERICS · PLURALS · FREE CHOICE · DISTRIBUTIVITY

1 Introduction

There are currently several powerful semantic theories for generics in the literature. Some of them, such as Cohen (1999a,b, 2001, 2004a,b) and Greenberg (2007) are optimistic about the possibility of capturing many aspects of genericity in an informative semantic theory. Others, such as Leslie (2007, 2008) and Liebesman (2010)—following the classic work of Carlson (1977, 2002) on this score—are more skeptical about this possibility. But all of them deal well with the basic cases of genericity. To decide between them, it is therefore useful to broaden the scope of our theorizing.

This paper concerns generic sentences with logically complex predicates. The paradigm is exhibited by (1) and (2).[1]

*[Acknowledgements suppressed for blind review].

[1]Some further examples of the same paradigm.

(1) Elephants live in Africa or Asia.

(2) Elephants have grey ears or white tusks.

(1) can be used to convey two different propositions, one genuinely disjunctive, the other conjunctive. Each can be brought out by considering a possible continuation (where ⇝ indicates that a proposition is conveyed).

(3) . . . , but I don't know which it is.
⇝ Elephants live in Africa *or* elephants live in Asia.

(4) . . . , either is equally natural.
⇝ Elephants live in Africa *and* elephants live in Asia.

By contrast, (2) can only be used to convey a genuinely disjunctive proposition, as the parallel continuations, and especially the unacceptability of (5b), show.

(5) a. Elephants have grey ears or white tusks, I don't know which it is.
b. # Elephants have grey ears or white tusks, either one is equally natural.

This paper aims to explain these data.

That sentences with disjunctions can sometimes be used to convey conjunctive propositions has been widely observed, beginning with Kamp (1973) for the case of permissions. Thus, (6) can be used to convey either (6a) or (6b), and the corresponding continuations serve to force each possibility.

(6) Jane may drink coffee or tea.

a. . . . but I don't know which.
⇝ Jane may drink coffee or Jane may drink tea.

b. . . . either one is fine.
⇝ Jane may drink coffee and Jane may drink tea.

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(1) a. Cactus flowers are red, white, or yellow.
b. Cactus flowers are red or fragrant.

(2) a. EE cats (i.e., cats with a certain genetic marker) are black or tabby.
b. EE cats are black or four-legged.

(1a) is taken from Britannica-online (http://www.britannica.com/EBchecked/topic/333776/leaf-cactus). (40b) comes from Little (1958, 121).

More recently, Fox (2007) and Klinedinst (2007) have observed a similar effect in existentially quantified sentences as in the examples (7).

(7) a. (The train was very stuffy.) Some passengers had trouble breathing or felt nauseous.

b. (This course is very hard.) Some students take three semesters to complete it or do not finish it at all.

However, no corresponding phenomenon is attested for universally quantified generalizations.

(8) All passengers had trouble breathing or felt nauseous.
$\not\rightsquigarrow$ All passengers had trouble breathing and all passengers felt nauseous.

To the extent that generics like (1) and (2), as well as the more humdrum *ravens are black* or *tigers have stripes*, are more closely akin to universally than existentially quantified sentences, it is surprising to see the free-choice phenomenon attested there. The burden of the paper is to show that we can account for the pattern of data using some specific claims about the semantics of generics that can be motivated independently of the need to account for these data, along with a general account of how free-choice understandings come about in non-generic sentences. If the account succeeds, it will serve to provide evidence for the tools used. And speaking more broadly, it is an illustration of the fruitfulness of trying to capture significant aspects of genericity within the framework of a formal and informative semantics.

A preliminary point: one might think that really nothing needs to be explained about the behavior of (1). Suppose for the sake of argument that generics are interpreted as roughly universal claims (perhaps suitably restricted, perhaps about a suitably constrained domain). Generally, universally quantified sentence with disjunctive predicates give rise to an implicature that each of the predicates forming the disjunction is satisfied by something in the domain. Thus, (9) suggests both (9a) and (9b) in many ordinary contexts.

(9) All of the students are girls or boys (none are adults).

a. $\rightsquigarrow$ Some students are girls.

b. $\rightsquigarrow$ Some students are boys.

Likewise, one might maintain that (1) suggests that both (10a) and (10b) are true.

(10) a. There are elephants in Africa.

b. There are elephants in Asia.

Thus, the appearance of the free-choice like effect for (1) is really just an implication that two existential bare plural sentences are true, rather than two genuine generics.

There are two concerns about this rapid dismissal of the data. The first is that this sketch would predict corresponding implications for (2). But clearly, these implications aren't attested, so we are left without an account of the asymmetry. Second, the two implicated bare plural sentences (11a) and (11b) are genuine generics.

(11) a. Elephants live in Africa.

b. Elephants live in Asia.

These sentences are true even when the corresponding existential sentences are false—when, for example, there happen not to be any elephants in Africa because of some fluke. Moreover, these sentences aren't entailed by their corresponding existentials, as is shown by the fact that we don't want to add *elephants live in Europe* to this list on the strength of there being some elephants that live in European zoos. Thus, we need a more sophisticated account that both explains why (1) can convey a conjunction of genuine generics and why (2) cannot.

2 Existential Quantification over Ways of Being Normal

I want to motivate a particular semantics for generics by reverse-engineering them from the two generics that we want to predict are conveyed by (1).[2] It will turn out that the semantics also immediately go a long ways towards accounting for the free-choice like aspect of (1). Begin, then, with (11).

[2] The discussion here follows the more detailed arguments in Nickel (2008).

(11) a. Elephants live in Africa.

b. Elephants live in Asia.

That both of these can be true is already puzzling in itself. Assume that we paraphrase generics of the form *As are F* as restricted universal quantification over the normal members of the kind, i.e., as *all normal As are F*. In that case, (11a) and (11b) would be equivalent to (12a) and (12b), respectively, and these should jointly entail (12c).

(12) a. All normal elephants live in Africa.

b. All normal elephants live in Asia.

c. All normal elephants live in (both) Africa and Asia.

But (12c) is obviously false, and hence the paraphrase in terms of (12a) and (12b) must have been mistaken, as well, since the original (11a) and (11b) do not imply that any elephants live on more than one continent.

Now, it is well-known that flatfooted normality analyses of generics fail quite independently of examples like (11a) and (11b). Examples such as (13a) have been familiar in the literature at least since Carlson (1977).

(13) a. Chickens lay eggs.

b. All normal chickens lay eggs.

c. Necessarily, all chickens that lay eggs are hens.

d. All normal chickens are hens.

e. Chickens are hens.

The flatfooted analysis interprets (13a) as (13b), which together with (13c) entails (13d). But that is just what we'd expect the analysis of (13e) to be, so that the simple normality-analysis is committed to treating (13a) as entailing (13e).

This is a problem for all quantificational accounts of generics, accounts that want to give an informative analysis of *As are F* in terms of the distribution of the property of being an *F* among the actual and possible *A*s. And the most common way of resolving this problem is by restricting the quantifier as a function of the predicate at issue in the generic. In the framework of quantification over normal members of a kind, we might capture this idea by considering not the members of the kind that are normal, *simpliciter*, but those that are normal *in a certain respect*, where that respect is determined by the predicate. In that case, the two generics (13a) and (13e) could be analyzed as in (14) and (15), respectively.

(14) a. Chickens lay eggs.

b. All chickens that are normal with respect to how chickens extrude offspring lay eggs.

c. All chickens that are normal with respect to how chickens extrude offspring are hens.

(15) a. Chickens are hens.

b. All chickens that are normal with respect to the sex of chickens are hens.

These analyses effectively block the inference from (13a) to (13e). Even with the additional premise (13c), all we are entitled to conclude is (14c), which is indeed true, but which does not entail (15b). Moreover, (15b) is false, so that we can predict the attested truth-value judgment for (15a).[3]

But this way of resolving the problem posed by chickens and their mode of reproduction cannot be extended to deal with the fact that (11a) and (11b) can both be true without entailing that there are any elephants that live in both Africa and Asia because plausibly, the same respect of normality is determined by both of the predicates involved—being normal with respect to habitat.

Following the argument in Nickel (2008), I want to suggest that we interpret (11a) and (11b) in terms of ways of being normal. A way into this idea is to sketch a bit of an analysis of normality. Assume that we interpret generics basically in terms of causal mechanisms. The reason that *ravens are black* is true is that there is a stable causal mechanism of the right kind that causes blackness in ravens. The reason that *ravens are white* is false is that, although there are some white ravens and it may even be a stable fact that there are white ravens, there is no causal mechanism of the right kind that causes whiteness in ravens. In the case of ravens and their coloration, being a mechanism of

[3]Ariel Cohen has implemented a similar strategy in terms of different details. On his view, the generic quantifier is restricted by a set of alternatives provided by the predicate (see Cohen, 1999a,b, 2004b).

the right kind may be a matter of natural selection.[4] For many kinds and features, there is only one feature that has such an appropriate causal process to underwrite a generic. But in principle, there could be more than one. In the case of biological kinds, that phenomenon is called polymorphism: several alternatives are equally characteristic or natural. This could be a matter of different habitats, colorations, it could be a matter of sexual dimorphism, or what have you.

The semantics reflect the possibility of there being multiple equally eligible causal mechanism by quantifying over ways of being normal, where each way corresponds to such a causal mechanism. Since it's sufficient for a simple generic such as *ravens are black* to be true that there be some eligible causal mechanism connecting the property of being a raven and the property of being black, the semantics quantify *existentially* over ways of being normal. For the specific examples of (11a) and (11b)—repeated here as (16a) and (17a)—we thus obtain the following interpretations.

(16) a. Elephants live in Africa.

b. There is a way of being an elephant that is normal with respect to its habitat, and all elephants that are normal in that way live in Africa.

(17) a. Elephants live in Asia.

b. There is a way of being an elephant that is normal with respect to its habitat, and all elephants that are normal in that way live in Asia.

These semantics immediately make the prediction that (11a) and (11b) can both be true without implying that there are any individual elephants that have multiple habitats. To put this proposal more formally, I'll assume the preliminary representation of a generic sentence with bare plural subject *A* and predicate *F* in (18). (19) gives an example.

(18) *Gen(As; F)*

(19) a. Ravens are black.

[4] For a more general theory of what makes a causal mechanism a causal mechanism *of the right kind*, see Nickel (2010a,c).

b. *Gen(Ravens; black)*

This proposal doesn't yet say anything about the logical form (LF) of generics, specifically about where the generic operator originates and whether it is an adverb of quantification, a nominal determiner, or something else (I'll return to this point in §5.1). (18) is simply a bit of regimentation to ease exposition. The general semantic proposal is this.

[Semantics for Generics]

(20) *Gen(As; F)* is true iff
$[\exists N\colon \text{Way.Of.Being.F-normal.A}(N)][\forall x\colon A(x) \wedge N(x)](F(x))$.

In this proposal, I'm abbreviating the notion of being normal with respect to a feature determined by the predicate *F* as simply *F-normal*. In words, (20) says that *As are F* is true iff there is a way of being an *F*-normal *A*, and all *A*s that are normal in this way are *F*.

This proposal has the great benefit of going some way towards explaining why there is a free-choice like effect for generics. We saw in §1 that free-choice like effects are attested for existentially but not universally quantified claims, and at least *prima facie*, we don't expect generics to be existentially quantified. The present proposal gives us a way of analyzing generics as basically existentially quantified, after all.

But even in the best case scenario, that only accounts for half of what wants to be explained, since we have no story to tell about why (2) cannot be used to convey a conjunctive proposition. In the next section, I'll introduce a proposal due to Fox (2007) that aims to explain free-choice phenomena in non-generic sentences. The purpose of introducing this account is two-fold. First, although the semantics for generics I've proposed so far do not slot seamlessly into the algorithm, we can supplement them with some further, independently plausible hypotheses. Thus supplemented they make the right predictions about (1). Second, Fox's account gives us some of the resources needed to explain the asymmetry between (1) and (2).

3 Fox's Theory

Theories of free-choice like effects, what I'll call conjunctive strengthening, come in basically two flavors. On some, a sentence such as (6) *Jane may drink coffee or tea* is semantically ambiguous between a disjunctive and a non-disjunctive reading.[5] Alternatively, such a sentence may be semantically univocal, and the stronger non-disjunctive construal is due to an implicature. For two reasons, I will adopt an implicature-based theory.

As has been pointed out by Alonso-Ovalle (2005), the conjunctive strengthening is absent when the disjunction appears in environments in which scalar implicatures quite generally are suspended. That suggests that the same mechanism accounts for both. Second, proposals on which a sentence like (10) is ambiguous usually derive both readings from the interaction of disjunction with a modal.[6] However, the examples I am interested in at least *prima facie* do not contain any modal operators, and hence lack one of the ingredients required to a derive a non-disjunctive reading.[7]

There are two recent implicature-based theories of conjunctive strengthening: Fox (2007) and Klinedinst (2007). I will work with Fox's treatment because Klinedinst's applies only awkwardly to my data. Fox's proposal is cast in terms of a framework within which scalar implicatures are computed compositionally along-side truth-conditional content.[8] Thus, given a sentence as input, semantic interpretation yields two outputs: the proposition asserted by a use of that sentence and one or more propositions that are implicated by that use. This contrasts with the more widely adopted view that scalar implicatures are computed not in the course of semantic interpretation, but as part of a more general and global Gricean mechanism, based on the classic work of Grice (1991) and Horn (1972).

The key idea Fox pursues is that a scalar implicature is computed roughly along these lines. The sentence is contrasted with a suitable set of alternatives. The implicated content is that the sentence is the strongest true member of that set. Hence, it is implicated that the stronger alternatives are all false. For

[5] See, e.g., Simons (2005) and Zimmerman (2000).

[6] See in particular Simons (2005).

[7] This point applies less forcefully to Zimmerman's account, on which disjunctions are understood as epistemic alternatives, so that they behave as if they were always in the scope of a modal operator.

[8] This approach is due to the work of Chierchia (2002).

example, an assertion of (21a) will implicate (21b), which in turn entails (21c), the standardly predicted implicature.

(21) a. John talked to Bill or Sue.

b. John only talked to Bill *or* Sue.

c. John did not talk to Bill and Sue.

By way of implementation, Fox suggests that under certain conditions, an exhaustivity operator EXH is applied to an asserted sentence together with a set of alternatives to that sentence, and that this operator then generates the relevant implicatures.[9] The meaning of the operator is given by Fox as (22).

[SEMANTICS FOR EXH]

(22) $[\![\text{EXH}]\!]\,(\text{ALT}_{[\![S]\!]})([\![S]\!]\,(w)) \Leftrightarrow$
$[\![S]\!]\,(w) = 1$ and $[\forall p\colon\ p \in \text{ALT}_{[\![S]\!]} \wedge p \succeq [\![S]\!]](p \approxeq \text{ALT}_{[\![S]\!]} \rightarrow p(w) = 0)$

Here, $p \succeq [\![S]\!]$ should be read as *p is not weaker than* $[\![S]\!]$, and $p \approxeq \text{ALT}_{[\![S]\!]}$ as *p is innocently excludable given* $\text{ALT}_{[\![S]\!]}$. In words, (22) says that applying the EXH operator to a sentence is equivalent to the conjunction of that sentence together with the negation of all of those members of the set of alternatives that are both no weaker than the sentence and can be innocently excluded. The notion of innocent exclusion is defined thus.

[INNOCENT EXCLUSION]

(23) $p \approxeq \text{ALT}_{[\![S]\!]}$ **if** $(\neg\exists q : q \in \text{ALT}_{[\![S]\!]} \wedge q \succeq [\![S]\!]]([\![S]\!] \wedge \neg p \vdash q)$

This definition formalizes the following idea: suppose that we are given a set of alternatives. Suppose further that the potential implicature that one of these alternatives does not obtain would entail that another alternative does. In that case, we might have an undesired strengthening of the original assertion. For example, suppose that the alternatives for a disjunction $p \vee q$ are each of the disjuncts and their conjunction, i.e., $\{p, q, p \wedge q\}$.[10] Clearly, each of the disjuncts is not weaker than the original sentence. But we do not want to

[9] For further motivation of the exhaustivity operator, see also Chierchia et al. (2010).
[10] For reasons to think that these are the right alternatives, see Fox (2007) and Sauerland (2004).

predict that an assertion of $p \vee q$ implicates that, say, p is false, since that would immediately implicate that q is true, so that the whole utterance is predicted to convey q, rather than the attested $(p \vee q) \wedge \neg(p \wedge q)$. The appeal to innocent exclusion does this job for us.

Here is the final piece of Fox's system, and this is why he argues that scalar implicatures are computed compositionally rather than globally: the EXH operator can be applied more than once. In fact, this possibility will be crucially exploited in order to generate the conjunctive strengthening. By contrast, on a theory of scalar implicatures on which they are derived via Gricean reasoning, it does not make sense to compute the implicature multiple times; or if it makes sense, it will trivially be the case that each successive computation yields the same result.[11]

3.1 A Worked Example

To see how Fox's system works, here is the derivation of the conjunctive strengthening for the schematic representation $(\exists x)(Fx \vee Gx)$.

Assertion: $[\![S]\!] = (\exists x)(Fx \vee Gx)$

First Application of $[\![\text{EXH}]\!]$
Doing so generates the formula

$$[\![\text{EXH}]\!]\,(\text{ALT}_{[\![S]\!]})\big((\exists x)(Fx \vee Gx)\big)$$

The alternatives $\text{ALT}_{[\![S]\!]}$ are

(a) $(\exists x)(Fx)$

(b) $(\exists x)(Gx)$

(c) $(\exists x)(Fx \wedge Gx)$

[11] An additional reason to adopt a theory of conjunctive strengthening on which scalar implicatures are computed compositionally, rather than as part of a global Gricean process is that we can see the conjunctive strengthening effect in unasserted environments, such as in the antecedents of conditionals. See Alonso-Ovalle (2005) and Kamp (1978).

Computation of $[\![\textsc{exh}]\!]\,(\textsc{alt}_{[\![S]\!]})\,[\![S]\!]$

Can (a) be innocently excluded?—No, because $[\![S]\!] \wedge \neg(\exists x)(Fx)$ entails $(\exists x)(Gx)$, which is a member of the alternatives in $\textsc{alt}_{[\![S]\!]}$, and which isn't weaker than $[\![S]\!]$. By parallel reasoning, (b) cannot be innocently excluded. (c), however, can be innocently excluded. Therefore,

$$[\![\textsc{exh}]\!]\,(\textsc{alt}_{[\![S]\!]})\,[\![S]\!] = (\exists x)(Fx \vee Gx) \wedge \neg(\exists x)(Fx \wedge Gx)$$

Second Application of $[\![\textsc{exh}]\!]$

Doing so generates the formula

$$[\![\textsc{exh}]\!]\,\big(\textsc{alt}_{[\![\textsc{exh}]\!](\textsc{alt}_{[\![S]\!]})[\![S]\!]}\big)\,\big(\,[\![\textsc{exh}]\!]\,(\textsc{alt}_{[\![S]\!]})\,[\![S]\!]\,\big)$$

The alternatives $\textsc{alt}_{[\![\textsc{exh}]\!](\textsc{alt}_{[\![S]\!]})[\![S]\!]}$ are:

(a) $[\![\textsc{exh}]\!]\,\big(\textsc{alt}_{[\![S]\!]}\big)\big((\exists x)(Fx)\big)$.

(b) $[\![\textsc{exh}]\!]\,\big(\textsc{alt}_{[\![S]\!]}\big)\big((\exists x)(Gx)\big)$.

(c) $[\![\textsc{exh}]\!]\,\big(\textsc{alt}_{[\![S]\!]}\big)\big((\exists x)(Fx \wedge Gx)\big)$.

Computation of the Alternatives (a)-(c)

Begin with (a), $[\![\textsc{exh}]\!]\,\big(\textsc{alt}_{[\![S]\!]}\big)\big((\exists x)(Fx)\big)$ The non-weaker alternatives to $(\exists x)(Fx)$ in $\textsc{alt}_{[\![S]\!]}$ are:

(d) $*$. $(\exists x)(Gx)$

$\dagger$. $(\exists x)(Fx \wedge Gx)$

(d$*$) can be innocently excluded. (d$\dagger$) can be innocently excluded, too, but doing so adds no extra information, since (d$\dagger$) has already been excluded in the initial application of $[\![\textsc{exh}]\!]$. Thus,

$$[\![\textsc{exh}]\!]\,\big(\textsc{alt}_{[\![S]\!]}\big)\big((\exists x)(Fx)\big) = (\exists x)(Fx) \wedge \neg(\exists x)(Gx)$$

By parallel reasoning, we can compute the value of (b) as

$$[\![\textsc{exh}]\!]\,\big(\textsc{alt}_{[\![S]\!]}\big)\big((\exists x)(Gx)\big) = (\exists x)(Gx) \wedge \neg(\exists x)(Fx)$$

Computing (c) is trivial, since there are no non-weaker alternatives to it in $\textsc{alt}_{[\![S]\!]}$. Thus,

$$[\![\textsc{exh}]\!]\left(\textsc{alt}_{[\![S]\!]}\right)\big((\exists x)(Fx \wedge Gx)\big) = (\exists x)(Fx \wedge Gx)$$

Return to the Computation of

$$[\![\textsc{exh}]\!]\left(\textsc{alt}_{[\![\textsc{exh}]\!](\textsc{alt}_{[\![S]\!]})[\![S]\!]}\right)\left(\,[\![\textsc{exh}]\!]\left(\textsc{alt}_{[\![S]\!]}\right)[\![S]\!]\,\right)$$

Can (a) be innocently excluded? That is, does the conjunction

$$(\exists x)(Fx \vee Gx) \wedge \neg(\exists x)(Fx \wedge Gx) \wedge \neg\big((\exists x)(Fx) \wedge \neg(\exists x)(Gx)\big)$$

entail either (b) or (c)? It entails neither. Hence, (a) is innocently excludable. By parallel reasoning, (b) is innocently excludable. (c) is also innocently excludable, but since it has already been excluded in the first application of $[\![\textsc{exh}]\!]$, excluding it again has no effect. Hence, the second application of $[\![\textsc{exh}]\!]$ yields.

$$\begin{aligned}[\![\textsc{exh}]\!]\left(\textsc{alt}_{[\![S]\!]}\right)[\![S]\!] =& (\exists x)(Fx \vee Gx) \wedge \neg(\exists x)(Fx \wedge Gx) \wedge \\ & \neg\big((\exists x)(Fx) \wedge \neg(\exists x)(Gx)\big) \wedge \\ & \neg\big((\exists x)(Gx) \wedge \neg(\exists x)(Fx)\big)\end{aligned}$$

Notice now that the last two conjuncts of this expression are equivalent to

$$\big((\exists x)(Fx)\big) \equiv \big((\exists x)(Gx)\big)$$

Together with the first conjunct of this expression, this equivalence entails

$$\big((\exists x)(Fx)\big) \wedge \big((\exists x)(Gx)\big)$$

which is exactly the conjunctive strengthening we wanted to predict.

3.2 *Application to Generics*

Consider the schematic case of a generic (24a).

(24) a. *A*s are *G* or *H*.

b. *Gen(As; G or H)*

c. $[\exists N\colon \text{Way.Of.Being.G-or-H-normal.A}(N)][\forall x\colon A(x) \wedge N(x)](G(x) \vee H(x))$.

d. $[\exists N][\forall x\colon Nx](Gx \vee Hx)$.

The regimentation of (24a) is given by (24b), which translates into the semantic proposal (24c). For reasons of legibility, I'll abbreviate (24c) as (24d). The more complex restrictors of the quantifiers play no role and could be expanded throughout the derivation to follow.

Assertion: $[\![S]\!] = [\exists N][\forall x : Nx](Gx \vee Hx)$

First Application of $[\![\text{EXH}]\!]$

Doing so generates the formula

$$[\![\text{EXH}]\!]\,(\text{ALT}_{[\![S]\!]})\big([\exists N][\forall x : Nx](Gx \vee Hx)\big)$$

The alternatives $\text{ALT}_{[\![S]\!]}$ are

(a) $[\exists N][\forall x\colon Nx](Gx)$

(b) $[\exists N][\forall x\colon Nx](Hx)$

(c) $[\exists N][\forall x\colon Nx](Gx \wedge Hx)$

Computation of $[\![\text{EXH}]\!]\,(\text{ALT}_{[\![S]\!]})\,[\![S]\!]$

Can (a) be innocently excluded?—Yes, because

$$[\exists N][\forall x\colon Nx](Gx \vee Hx) \wedge \neg[\exists N][\forall x\colon Nx](Gx)$$

does not entail either (b) or (c). To see this, it might help to remember that the predicate I'm abbreviating as Nx is just a predicate of objects in the domain. (a) says that there is some suitable way of restricting the domain of the quantifier (some property of the right kind picked out by N) so that only things that are either G or H are in that domain. (b) says that there is no suitable way of restricting the domain in such a way that it only contains things that are G. From that it doesn't follow that there's a suitable way of restricting the domain in such a way that it only contains things that are H, because it's compatible with the truth of (a) and (b) that the only suitable way of restricting the domain (the only way of being relevantly normal) is one that includes both things that are G and things that are H in the domain.

For parallel reasons, (b) can be innocently excluded. (c) can also be innocently excluded. Therefore,

$$\begin{aligned}[\![\textsc{exh}]\!]\,(\textsc{alt}_{[\![S]\!]})\,[\![S]\!] = &[\exists n][\forall x\colon\ Nx](Gx \vee Hx)\wedge \\ &\neg[\exists N][\forall x\colon\ Nx](Gx)\wedge \\ &\neg[\exists N][\forall x\colon\ Nx](Hx)\wedge \\ &\neg[\exists N][\forall x\colon\ Nx](Gx \wedge Hx)\end{aligned}$$

At this point, we have excluded precisely the propositions that are attested as conjunctive strengthenings, namely $[\exists N][\forall x\colon\ Nx](Gx)$ and $[\exists N][\forall x\colon\ Nx](Hx)$. Hence, a direct application of Fox's system to characterizing sentences with disjunctive predicates fails to predict the attested conjunctive strengthening.

4 The Final Ingredient

To see how to solve this problem, compare the successful derivation for the simple existentially quantified disjunction with its generic counterpart. The problem was that we could innocently exclude $[\exists N][\forall x\colon\ Nx](Gx)$, even though that was one half of the conjunctively strengthened meanings we wanted to predict. And the reason that we could innocently exclude it is that, for all we have said so far, (25a) and (25b) don't jointly entail (25c). Quite apart from the needs of the derivation of conjunctive strengthening, that's a bad prediction since the corresponding entailment goes through for their natural language counterparts, as is illustrated in (26).

(25) a. $[\exists N][\forall x\colon\ Nx](Gx \vee Hx)$
  b. $\neg[\exists N][\forall x\colon\ Nx](Gx)$
  c. $[\exists N][\forall x\colon\ Nx](Hx)$

(26) a. Elephants live in Africa or Asia.

b. Elephants don't live in Africa.

c. Elephants live in Asia.

So it looks as if this is the aspect of our proposed semantics we should alter. A principle that does the job is what I'll call HOMOGENEITY. Put in terms of our formalism, $\neg[\exists N][\forall x\colon Fx \wedge Nx](Gx)$ is equivalent to $[\forall N]\neg[\forall x\colon Fx \wedge Nx](Gx)$, which is almost what we want. We just have to add the principle that from $[\forall N]\neg[\forall x : Fx \wedge Nx](Gx)$, we can infer $[\forall N][\forall x\colon Fx \wedge Nx](\neg Gx)$. Informally, the point of HOMOGENEITY is to exclude ways of being normal that are mixed with respect to the predicates at issue. The things that are normal in any particular way N are all the same insofar as being G or being H is concerned: if one of them is, all are. That says exactly what we want. For example, *Elephants don't live in Africa* is interpreted as saying that any way of being an elephant that is normal with respect to its habitat is such that no elephants that are normal in that way live in Africa. That is, there's no way for an elephant to be normal in that respect and live in Africa. And that is a reasonable paraphrase of (26b). Generally, HOMOGENEITY amounts to this.

[HOMOGENEITY] $[QN]\neg[\forall x\colon Fx \wedge Nx](Gx) \vdash [QN][\forall x\colon Fx \wedge Nx](\neg Gx)$, where Q is $\forall$ or $\exists$.

If we incorporate HOMOGENEITY into the semantics for characterizing sentences and apply them to the examples in (26), we get the results exhibited in (27), where (26a) and (26b) are rendered as (27a) and (27b), respectively.

(27) a. $[\exists N][\forall x\colon \text{Elephant}(x) \wedge N(x)]\big(\text{Live-In-Africa}(x) \vee \text{Live-In-Asia}(x)\big)$

b. $\neg[\exists N][\forall x\colon \text{Elephant}(x) \wedge N(x)]\big(\text{Live-In-Africa}(x)\big)$

c. $[\forall N][\forall x\colon \text{Elephant}(x) \wedge N(x)]\neg\big(\text{Live-In-Africa}(x)\big)$

d. $[\exists N][\forall x\colon \text{Elephant}(x) \wedge N(x)]\big(\text{Live-In-Asia}(x)\big)$

Given HOMOGENEITY, (27b) entails (27c), which together with (27a) *does* entail (27d). And (27d) is the representation of (26c), so that we can now predict the attested validity of the inference from (26a) and (26b) to (26c).

This also allows the derivation of the conjunctive strengthening to go through, since we can no longer innocently exclude either (26a) or (26b). The informal reason for the fact that the entailment goes through now is just that

HOMOGENEITY rules out the possibility of mixed ways of being normal, i.e., the possibility that there's a way of being a relevantly normal elephant such that some elephants that are normal that way live in Africa and some elephants that are normal in that way live in Asia. That's the possibility that defeated the original inference.

Thus, if HOMOGENEITY is true, we can explain why (1) can be conjunctively strengthened. But what grounds do we have for accepting that principle, short of a pious hope? That we should posit something like it has been suggested before. Fodor (1970) (cited also by von Fintel, 1997) suggests that HOMOGENEITY is a general feature of plurals, not just bare ones. For example, plural definite descriptions such as *the children* are supposed to come with an "all-or-nothing" presupposition, the presupposition that the predicate applies to all the things denoted by the description or to none.[12] This proposal receives *prima facie* support from the observation that saying that it is false that the children are asleep is usually tantamount to saying that none of them are. However, as Brisson (2003) has argued, many perfectly acceptable plurals seem to fail the proposed presupposition and are no worse for the wear. For example, it may be true that the students asked questions after class, even though only a minority of the students actually said anything.[13] Thus, we should see whether we can find another motivation for the HOMOGENEITY assumption.

I think that such a motivation specifically for generics can be derived from the following observation. Consider the sentence *ravens are black* once again. We know that this sentence isn't falsified by the existence of albino ravens. On the present approach on which we interpret generics as universal generalizations that are restricted to the normal members of the kind, that means that albino ravens do not count as normal, at least for the purposes of this generalization. Now try to imagine a normally colored raven that isn't black. I suspect that you cannot: any non-black raven you might conjure up will strike you as abnormal, as not what the generalization is about. Here is a diagnosis. Being a normally colored raven (at least in this world) is, in itself, sufficient for being black. The contingency of the sentence *ravens are black* is not due to the existence of a world in which there are ravens that are normally colored

[12]See von Fintel (1997, 33), citing Fodor (1970, 159-67).

[13]I'm not sure how compelling this argument is. It may be the case that *the students asked questions after class* exhibits a "team-credit" phenomenon, which is paradigmatically shown by *The Brazilians scored the prettiest goal of the tournament*, which may well be true even though only one Brazilian player actually put the ball in the net.

by the lights of our world but which fail to be black. Rather, the reason *ravens are black* is contingent is that there are worlds in which being normally colored entails being some color other than black.[14]

On this approach to the role of normality in the interpretation of generics, HOMOGENEITY comes for free. If there is a raven (say) that is normal and not black, that entails that being a normally colored raven is sufficient for being some color other than black, and hence that all normally colored ravens are some other color than black. Nothing essential changes once we add ways of being normal into the picture. If, given a way of being normal, something is normal in that way and fails to be black, then nothing that is normal in that way is black. And that is precisely the import of HOMOGENEITY as I formulated it above.

5 The Contrast with (2)

We thus have an account of how (1) can be conjunctively strengthened. But the account provided so far predicts that the very same reasoning is available for (2), so that it, too, should allow for conjunctive strengthening. Clearly, it does not, and so far, we don't have an explanation for this fact.

My account of why (2) doesn't allow for conjunctive strengthening has two parts. The first is a consequence of Fox's system. A sentence containing an existential quantifier and a disjunction gives rise to the conjunctively strengthened implicature only if the disjunction has narrow scope with respect to the existential quantifier. That is, applying Fox's EXH-operator to a sentence of the form $(\exists x)(Fx \vee Gx)$ yields a conjunctive strengthening, while applying it to $\big((\exists x)(Fx) \vee (\exists x)(Gx)\big)$ does not.[15]

I want to exploit this feature of Fox's system by arguing that generics with logically complex verb phrases (VPs) are ambiguous between a reading

[14] I defend this proposal more fully in my (2010a).

[15] An attempted derivation of a conjunctively strengthened meaning for $\big((\exists x)(Fx) \vee (\exists x)(Gx)\big)$ crashes at the end. The first application of EXH yields the result $\big((\exists x)(Fx) \vee (\exists x)(Gx)\big) \wedge \neg\big((\exists x)(Fx) \wedge (\exists x)(Gx)\big)$. When we apply the EXH operator again, we have to compute the alternatives that correspond to (a)-(c) on p. 12. The alternatives that correspond to (a) and (b) are the same in this case, but while we *could* innocently exclude (a) in the earlier derivation, we cannot innocently exclude it in this one. That's because to innocently exclude it, the result of the strengthened meaning, together with the negation of (a), would have to not entail (b). But it does: $\big((\exists x)(Fx) \vee (\exists x)(Gx)\big) \wedge \neg\big((\exists x)(Fx) \wedge (\exists x)(Gx)\big)$ together with $\neg\big((\exists x)(Fx) \wedge \neg(\exists x)(Gx)\big)$ does entail (b), $\big(\neg(\exists x)(Fx) \wedge (\exists x)(Gx)\big)$.

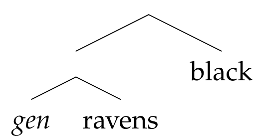
on which the generic operator takes scope over the logical operators in the VP and a reading on which it is within the scope of the logical operators. However, the semantics of the generic operator don't always allow both scope possibilities. In the case of (2), for example, we cannot interpret the generic operator as having scope over the disjunction in the VP, and hence we predict that (2) cannot be conjunctively strengthened in Fox's system.

5.1 The LF of Generics

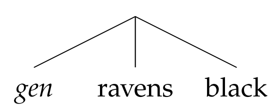
In §2 I regimented generics in terms of a generic operator, but I did not commit myself to any particular LF for generics. I now need to be more explicit on this issue. The most common analyses of generics treat the generic operator as either a nominal determiner or as an adverb of quantification.[16] So to a good first approximation, the LF of (28) is either (28a) or (28b).[17]

(28) Ravens are black.

a.



b.



One reason to be dissatisfied with either of these options stems from the well-formedness of sentences such as those in (29).[18]

(29) a. Diamonds are rare and valuable.

b. Pandas are black and white and endangered.

On either analysis, these sentences should be incoherent because they contain one predicate that needs to be analyzed by using the generic operator (*valuable* and *black and white*), and another predicate that cannot be so analyzed because it applies directly to the kind (*rare* and *endangered*). But on both analyses, either both predicates are in the scope of the generic operator or neither is.

[16]See Asher and Morreau (1995); Krifka et al. (1995)) for the determiner analysis and Cohen (1999a,b); Wilkinson (1991) for the adverbial analysis.

[17]I'm assuming a ternary branching structure of adverbs of quantification, following Heim (1982).

[18]See, e.g., Schubert and Pelletier (1989) for discussion.

I suggest that we reconceive the LF of generics by modeling it very closely on the LF of non-generic plurals, focusing particularly on the difference between collective and distributive readings of plurals. The basic contrast is exhibited by the pair in (30).

(30) a. The children woke up at eight.

b. The children gathered in the yard.

(30a) licenses the inference that each child woke up at eight, making it distributive. (30b) does not license the corresponding inference that each child gathered in the yard, making it collective. In fact, an individual child cannot gather. The predicate applies to the children as a whole. The standard treatment of the collective/distributive contrast posits a distributive quantifier in the LF of distributively read sentences, so that at the level of LF, (30a) is analyzed roughly as (31).

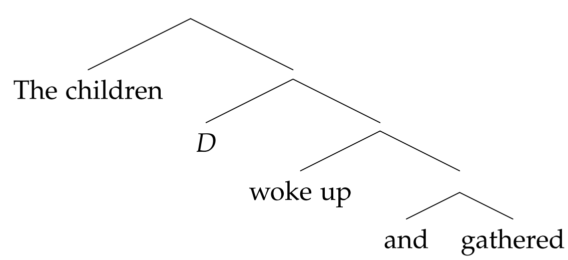
(31) The children are such that for each child among them, it gathered in the yard.

Just as in the case of generics, there are alternative proposals regarding where in the LF the distributive quantifier originates. Here, the options are to analyze it as part of the plural NP or to analyze it as part of the VP.[19] Many theorists prefer the VP-analysis because of examples like (32).

(32) The children woke up at eight and gathered in the yard.

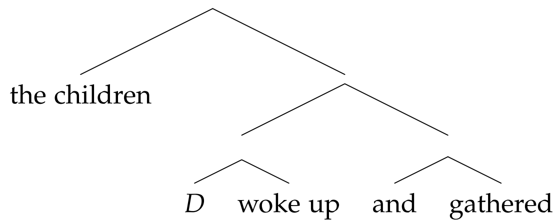
If we treated the distributive operator as part of the NP, we'd predict that (32) meant that the children are such that each one among them woke up at eight and gathered in the yard, which is incoherent. However, if we analyze the distributive operator as part of the VP, we have two options, sketched in (33).

(33) a.



[19]See, e.g., Gillon (1987, 1990, 1992); Lakoff (1972) for the NP-analysis, Beck and Sauerland (2000); Landmann (2000); Lasersohn (1995); McKay (2006); Pietroski (2005); Schein (1993); Schwarzschild (1996); Winter (2000) for the VP-analysis.

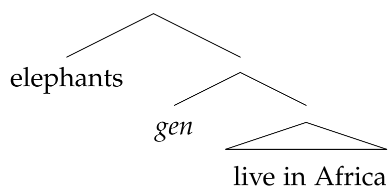
b.



(33a) corresponds to the incoherent reading, while (33b) is coherent. It says that the children are such that for each one among them, it woke up, and they gathered in the yard.[20]

I suggest that we take the parallel between generics and non-generic plurals seriously and analyze the generic operator as part of the VP, precisely in the way that the distributive operator *D* is analyzed as part of the VP. Thus, the basic generic *elephants live in Africa* is assigned the LF in (34).

(34)



Exploiting the parallel between distributive operators in non-generic plurals and generics derives support from another oft-noted fact.[21] Consider the examples in (35).

(35) a. Killer bees are dangerous.

b. Buffalos form protective circles.

If we treat these examples as involving a simple generic quantifier, we almost certainly run into problems. The basic idea of the generic quantifier is to state the truth-conditions of the generic sentence in terms of some condition that a suitable set of members of the kind have to satisfy individually. But (35a) is a true claim about *swarms* of bees, rather than individual bees which aren't lethal at all. Likewise, (35b) is a true claim about *herds* of buffalo, since an individual buffalo cannot form a protective circle. Informally, we'd like to paraphrase (35a) and (35b) as (36a) and (36b), respectively.

[20]In a class on plurals, Irene Heim has suggested that this argument for a VP-analysis of distributivity can be resisted if we posit a duplication of the NP in (32).

[21]See, for example, Cohen (1999b); Krifka et al. (1995).

(36) a. Killer bees are such that swarms of them are dangerous.

b. Buffalos are such that herds of them form protective circles.

That is to say, (35a) and (35b) neither make a claim about the kind as a whole, nor about properties had by their members individually. Rather, they are claims about collections that are intermediate between the individual and the kind.

A precisely parallel phenomenon can be observed in non-generic plurals. Consider a situation in which a shopkeeper has just received a large shipment of vegetables packed in crates. She has two scales, an industrial scale that can be used for very heavy weights, and a retail scale than can only be used for very light weights. In this context, she might truly say (37).

(37) The vegetables are too heavy for the small scale but too light for the big one.

If we analyze (37) without a distributive operator, the sentence is false because all the vegetables together aren't too light for the big scale. If we analyze (37) with a distributive operator, the sentence is false because each of the vegetables by itself isn't too heavy for the small scale—each could easily be weighed by itself. The true reading of the sentence results if we think of the vegetables partitioned into crates, i.e., as having the truth-conditions in (38).

(38) The vegetables are such that each crate among them is too heavy for the small scale but too light for the big one.

As in the case of the generic, we observe distribution of the predicates to some collections that are intermediate between the whole denoted by the plural phrase (*the vegetables*) and the individuals making up that whole. The parallel between the generic and non-generic cases is captured directly if we treat both in terms of a distributive quantifier.[22], [23]The difference between a simple distributive quantifier and the generic quantifier lies in their specific

[22]Cohen (1999b) treats examples such as (35a) and (35b) along similar lines insofar as he, too, analyzes them as involving generically quantifying over collections that are intermediate between the individual and the kind. He calls a specification of such an intermediate collection a *coordinate*. However, he simply stipulates the generics need to be analyzed in terms of such coordinates. My proposal about the LF of generics—that the generic operator is a kind of distributive operator—can explain why we see the possibility of such intermediate distribution.

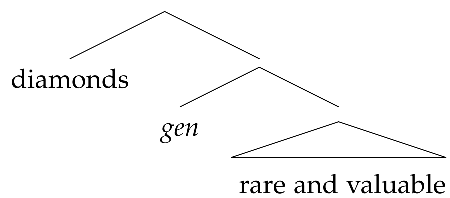
[23]For another argument for this analysis, based on the fact that it can predict various phenomena about the interaction of genericity and comparatives, see Nickel (2010b).

semantics: the former is a simple universal, the latter a complexly restricted one with modal import.

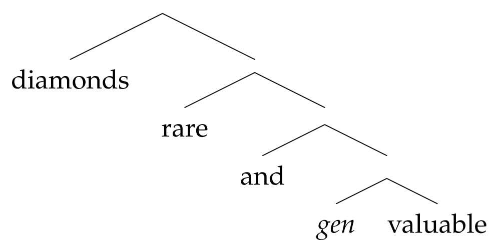
Once we have logically complex predicates, we have several options. The generic operator can attach high in the complex VP or to each predicate making up that VP.

(39) Diamonds are rare and valuable.

a.



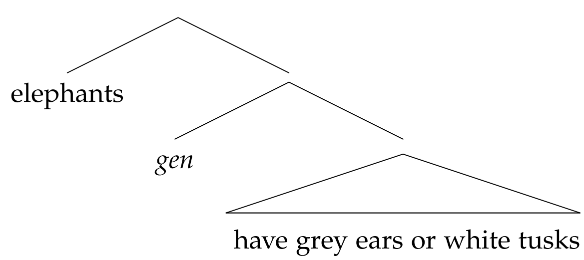
b.



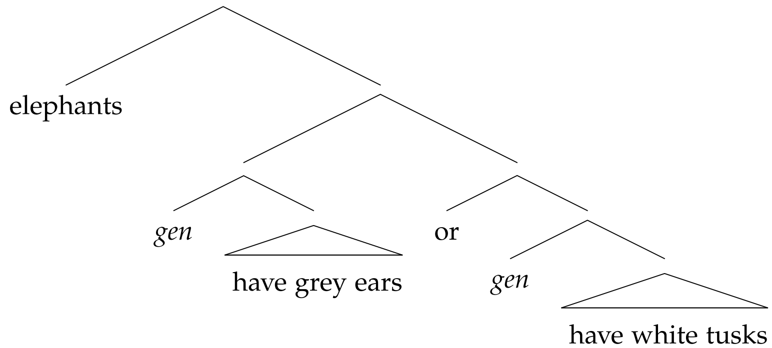
Given this analysis, we also have two possible LFs for the sentence (2), repeated here as (40).

(40) Elephants have grey ears or white tusks.

a.



b.



(40a) gives rise to an interpretation of (40) on which the generic operator has wide scope with respect to the whole predicate. On this interpretation, Fox's system predicts that (40) can be conjunctively strengthened. (40b) gives rise to an interpretation with two generic operators, neither of which has wide scope with respect to the disjunction—it's equivalent to the sentential disjunction *elephants have grey ears or elephants have white tusks*. That interpretation does not allow for conjunctive strengthening.

5.2 *Respects of Normality*

The fact that there are two possible LFs for (2) shows that it's possible for an assertion of (2) to not be conjunctively strengthened. But that's not enough to account for the data, since I have yet to explain why (2) *cannot* be so strengthened. In other words, I need an explanation for why the LF (40a) is ruled out as a possible LF of (2).

The reason turns on how the generic operator is interpreted. Recall that in interpreting a generic, we always have to restrict the domain of the quantifier to members of the kind at issue that are normal in a certain respect. This respect, in turn, is determined by the predicate: if (for instance) we predicate being black, then the respect of normality is color. But a disjunction may not always determine such a respect of normality. One reason for such a failure is that each of the disjuncts determines a different respect of normality, in which case these two respects cannot be amalgamated. That is precisely what happens when we interpret (2). If we wanted to assign truth-conditions based on the LF (40a)—with the disjunction taking narrow scope under *gen*—we would have to find a respect of normality of which having grey ears and having white tusks are both instances. But there is no such respect, and hence that LF is not interpretable. Only the wide-scope disjunction LF remains. By contrast, the two disjuncts in (1) determine the same respect of normality, being normal with respect to habitat, which is why the LF that assigns the disjunction narrow scope is interpretable and conjunctive strengthening is available.

6 Conclusion

In this paper, I've observed that some generics with disjunctive predicates can be used to convey conjunctions of simpler generics while other similarly complex generics don't allow this. I've argued that we can account for the possibility of conjunctive strengthening in the case of the former generics, as well as the impossibility of the strengthening in the case of the latter, using five basic ideas: we interpret generics in terms of a sophisticated notion of normality that (1) makes reference to respects of normality and (2) recognizes ways of being normal in a given respect. The generic quantifier (3) occupies the same position as a distributive quantifier in non-generic plurals and (4) obeys HOMOGENEITY. Finally, I've assumed (5) Fox's account of conjunctive strengthening in non-generic free-choice cases.

Each of these five building blocks can be motivated on grounds that are independent of the specific phenomena discussed here. The fact that they also account for free-choice like phenomena in generics adds credibility to their applications in other contexts. Within the contrast between theories that are optimistic about the possibility of giving systematic and informative theories of generics and theories that are skeptical on this score, the present discussion suggests that optimism should be the order of the day.

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