

The Dynamics of Generics

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Abstract

It is a familiar point that we can use generic sentences to express generalisations that are tolerant to exceptions and then go on to state those exceptions explicitly. It is a less familiar point that switching the order of the generics has deleterious effects on their felicity. For example, the sequences ‘Ravens are black, but albino ravens aren’t’ is perfectly felicitous and judged to be true, whereas its reverse ‘Albino ravens aren’t black, but ravens are’ is infelicitous and contradictory-sounding. This paper argues that such sequences pose a problem for extant theories of generics: while they have no trouble predicting the felicity of the first sequence of generics, they are unable to explain why reversing the order results in infelicity. I propose to account for these observations by adopting a dynamic semantic theory of generic sentences.

1 A PROBLEM

It is a familiar point that we can use generic sentences to express generalisations that are tolerant to exceptions and then go on to state those exceptions explicitly.¹ Consider, for example, the following sentences:

- (1) a. Ravens are black; but albino ravens aren’t.
- b. Birds fly; but birds with broken wings don’t.
- c. The duck lays eggs; but the male duck doesn’t.
- d. A lion has a mane; but a female lion doesn’t.

Call such pairs of sentences *generic Sobel sequences*.² The sentences in (1) are perfectly felicitous and judged to be true, even though they each involve a true generic generalisation together with a sentence that expresses its exceptions.

1 This point was made at least as far back as Heim (1984, 103), Delgrande (1987, 106), and Pelletier and Asher (1997, 1144).

2 The label ‘Sobel sequence’ is appropriated from the literature on counterfactuals, where it denotes analogous chains of counterfactuals, such as ‘If Sophie had gone to the parade, she would have seen Pedro dance; but if Sophie had gone to the parade and been stuck behind someone tall, she would not have seen Pedro dance’. David Lewis (1973, 10) credits J. Howard Sobel with having first noticed such combinations of counterfactuals; see Sobel (1970).

It is a less familiar point that switching the order of the conjuncts in (1) has deleterious effects for the felicity of the respective sequences.³ Observe the striking asymmetry between the acceptability of the sentences in (1) and their reverse counterparts in (2):⁴

- (2) a. #Albino ravens aren't black; but ravens are.
 b. #Birds with broken wings don't fly; but birds do.
 c. #The male duck doesn't lay eggs; but the duck does.
 d. #A female lion doesn't have a mane; but a lion does.

Call such pairs of sentences *reverse generic Sobel sequences*.⁵ While utterances of the sentences in (1) are felicitous, the sentences in (2) sound infelicitous. This is somewhat unexpected since the sentences in (2) should arguably convey just the same information as those in (1), albeit presented in a different order.

These observations raise a novel challenge for extant theories of generics: to capture the intuitive consistency of Sobel sequences, while simultaneously accommodating the asymmetry between the felicity of Sobel sequences and reverse Sobel sequences. Any empirically adequate theory of generics should resolve this apparent tension.

This paper proposes a solution to this puzzle by developing a new theory of generics. More specifically, I develop a dynamic theory of generics in terms of quantification over normal individuals and worlds that builds in the potential for expanding this domain of quantification by bringing open but hitherto ignored possibilities into view. Section 2 adduces a variety of new data in more detail. Section 3 argues that the phenomena pose a problem for many, if not all, extant theories of generics. Section 4 explores in detail one way of accommodating these facts about generics. I propose a version of the normality-based theory of generics with a dynamic spin, which handles both generic Sobel sequences and their reversals with grace. Section 5 illustrates how the resulting theory handles the phenomena in question. Section 6 concludes. A discussion of a previous dynamic treatment of generics can be found in Appendix 1.

3 To the best of my knowledge, this observation was first made in Kirkpatrick (2015, 2019).

4 '#' indicates infelicity.

5 The observation that the felicity of counterfactual Sobel sequences is sensitive to the order in which their conjuncts are presented was first observed by Irene Heim in a seminar presentation at MIT in 1994, as reported by von Stechow (2001), although they are occasionally also attributed to Frank (1997). Consequently, reverse Sobel sequences of counterfactuals are sometimes called 'Heim sequences' in homage. Historically speaking, reverse Sobel sequences have been taken to pose a problem for Lewis's variably strict semantics for counterfactuals, which was designed in part to account for ordinary Sobel sequences. Two general approaches to the problem have been developed: a semantic one and a pragmatic one. Proponents of the semantic approach, such as von Stechow (2001) and Gillies (2007), a.o., handle the problem by developing a strict conditional analysis of counterfactuals in the setting of dynamic semantics. Proponents of the pragmatic approach, such as Moss (2012) and Lewis (2018), a.o., propose a pragmatic solution to the problem. The theory of generic sequences developed in this paper is aligned with the semantic approach. For further discussion of Sobel sequences and their reversals, as well as discussion of similar phenomena arising for indicative conditionals, definite descriptions, and 'loose talk', see Carter (2021); Holst (2013); Ippolito (2020); Klecha (2018, 2022); Schlenker (2004); Willer (2017); Williams (2008).

2 GENERIC SEQUENCES

It has long been recognised that generics tolerate legitimate exceptions, individuals or cases which are abnormal or non-standard in some respect. In this section, I will present the empirical phenomena concerning sequences of generics and develop a working hypothesis about its nature, which is then to be implemented in a theory. In doing so, I will pay particular attention to when it is acceptable to express exceptions to generic generalisations.

2.1 *The basic phenomenon*

As the examples above illustrate, the contrast between the acceptability of Sobel and reverse Sobel sequences of generics is quite general and does not depend on any particular grammatical or linguistic feature. First, the contrast does not seem to depend on the kind of predicate in question. Generic sequences are felicitous and their reversals are infelicitous regardless of whether they involve an adjective or stative predicate like *are black*, as in (1a) and (2a), a habitual verb like *fly*, as in (1b) and (2b), or a predicative noun phrase like *have a mane*, as in (1d) and (2d).

Second, the contrast does not depend on singular–plural morphology nor on the definite–indefinite distinction. Generic sequences involving bare plurals, such as (1a) and (2a), pattern in the same way as sequences of definite singular generics, such as (1c) and (2c), and indefinite singular generics, such as (1d) and (2d).^{6,7}

Third, the contrast does not depend on how the subject noun phrase is modified to evoke the exceptions in question. For example, reverse Sobel sequences are infelicitous regardless of whether the exceptions are indicated using subsecutive adjectival modification, as in (3) and (4), or restrictive relative clauses, as in (5):⁸

- 6 Note there is some difficulty in formulating felicitous Sobel sequences of *definite* singular generics, where their bare plural and indefinite singular counterparts are perfectly fine. Witness the awkwardness of the generic reading of *The bird flies, but the bird with broken wings doesn't*. This may be explained if not just any nominal constituent can form a kind-referring definite DP, as some theorists have argued (Carlson, 1977; Dahl, 1975).
- 7 It is less clear whether an order effect shows up with habituais. Consider the following sentences:

- (i) Elizabeth smokes after dinner, but she doesn't smoke cigars after dinner.
- (ii) ?Elizabeth doesn't smoke cigars after dinner, but she smokes after dinner.

While my informants report an order effect with these sentences, an anonymous referee reports that they don't find (ii) particularly bad. It should also be noted that the felicity of (ii) improves with contrastive focus or emphatic *do*, as witnessed below:

- (iii) Elizabeth doesn't smoke [cigars]_f after dinner, but she [smokes]_f after dinner.
- (iv) Elizabeth doesn't smoke cigars after dinner, but she [does]_f smoke after dinner.

Insofar as habituais should be treated in a similar vein to generics, which is admittedly a contentious issue, the theory that I will developed in this paper will apply equally to habituais.

- 8 Interestingly, non-subsecutive adjectival modification does not result in the same kind of infelicity, as illustrated by the following sentences:

- (i) a. Ducks lay eggs, but rubber ducks don't.
- b. Rubber ducks don't lay eggs, but ducks do.

Presumably, this is because the denotation of *rubber ducks* is neither a subset nor overlaps with the denotation of *ducks*, and so such sentences are not true Sobel sequences.

- (3) a. Ravens are black; but albino ravens aren't.
 b. #Albino ravens aren't black; but ravens are.
- (4) a. Teachers care for their students; but bad teachers don't.
 b. #Bad teachers don't care for their students; but teachers do.
- (5) a. Ravens are black; but ravens with albinism aren't.
 b. #Ravens with albinism aren't black; but ravens are.

Each of the a-sentences in (3)-(5) sound fine and each of the b-sentences in (3)-(5) sound terrible, even though they use different linguistic mechanisms to demarcate the exceptions to their respective generalisations. Similarly, Sobel and reverse Sobel sequences of generics can occur with a mixture of definite singular, indefinite singular, and bare plural generic sentences.

Fourth, the phenomenon occurs when the exceptions are introduced by a single observation, rather than a full-blown generic, as in (6) and (7):

- (6) a. Ravens are black, although Nevermore the albino raven isn't.
 b. ?Nevermore the albino raven isn't black, although ravens are.
- (7) a. Birds fly, but this one [pointing at an ostrich] doesn't.
 b. #This bird doesn't fly, but birds do.

The upshot is that the phenomenon under question is perfectly general. Tentatively, it seems that placing any sentence *S* before a generic sentence *G* that entails that *G* has exceptions will result in infelicity. Any empirically adequate explanation of the phenomenon should explain the full range of data presented here.

2.2 *The nature of exceptions*

Despite the general admissibility of generic Sobel sequences, it is not straightforwardly possible to express a generic generalisation and then go on to explicitly state that some members of the noun denotation do not have the property in question. Consider, for example, the following sentences:

- (8) #Ravens are black, but not all ravens are.
 (9) #Ravens are black, but some ravens aren't.
 (10) a. Ravens are black.
 b. #That's true, but not all ravens/some ravens aren't.

Contrastingly, it is sometimes possible to admit exceptions in reverse generic Sobel sequences, but only by making explicit reference to the amount of the kind that satisfies the initial generalisation. For example, the infelicity of (2b) immediately sounds better with the addition in the second generic of an explicit quantificational adverb, as in (11a), a quantificational determiner, as in (11b), a weak ability modal, as in (11c), or emphatic assertion, as in (11d).

- (11) a. Birds with broken wings don't fly; but birds generally/usually/typically/normally fly.
 b. Birds with broken wings don't fly; but most/some birds fly.
 c. Birds with broken wings don't fly; but birds can fly.
 d. Birds with broken wings don't fly; but birds [do]_f fly.⁹

9 '[.]_f' indicates focal stress around the bracketed constituent.

These observations have some interesting upshots for the semantics of generics. More specifically, the fact that (2b) can be made felicitous by adding a quantificational adverb, as in (11a), or an explicit quantificational determiner, as in (11b), draws doubt on the idea that the meaning of any covert generic operator is identical in meaning to any such explicit quantificational adverb or determiner. That is, the fact that such mechanisms remove the infelicity of reverse Sobel sequences is evidence that covert forms of such quantificational adverbs or determiners are not present in bare instances of those sentences. This fact demonstrates that the sentence ‘Birds fly’ cannot have the same truth-conditions as ‘Birds generally fly’, or else (2a) and (11a) would be truth-conditionally equivalent and hence equally felicitous. In a similar vein, the felicity of (11c) draws doubt on the idea that generics univocally express something like an existential or capability modal. And if the emphatic-*do* assertion in (11d) expresses something like ‘At least some birds fly’ or ‘There is a normal way of being a bird and all birds normal in that way fly’, then we should be sceptical that bare generics express quantificationally weak existential generalisations.

It is also possible to construct felicitous sequences of generics that only *indirectly* make exceptions to their respective generalisations salient, such as:

(12) Lions have manes and lions give birth to live young.

This sequence is perfectly acceptable even though only male lions have manes and only female lions birth live young. Since these generics symmetrically voice exceptions to their conjunction-mate’s generalisation, we would have expected such sequences to be infelicitous, but they are not. Consequently, any explanation of the (in)felicity of generic (reverse) Sobel sequences must not overgeneralise to prohibit such sequences.

Lastly, I want to dwell a little further on the phenomenon exhibited in (11d), namely, that the felicity of reverse sequences is sometimes improved with differing focus (especially emphatic-*do*) in a way that contended contrasts aren’t observed.¹⁰ Consider the following examples:

(13) A: Albino ravens aren’t black.
B: #That’s true, but ravens are black.

(14) A: Albino ravens aren’t black.
B: That’s true, but ravens [are]_f black.

While the reverse Sobel sequence in (13) is infelicitous, its emphatic counterpart in (14) sounds fine. Such uses of generics are examples of what Cohen (2004) calls ‘existential generics’, generics that seem to have quasi-existential truth-conditions. Such uses are further exemplified by the contrast between B’s statement in (15) and its non-emphatic counterpart (16):

(15) A: Nobody in India eats beef.
B: That’s not true! Indians [do]_f eat beef! (Cohen, 2004, 139)

(16) Indians eat beef.

10 Thanks to two anonymous referees for encouraging me to discuss this fact. Another way to improve the felicity of reverse sequences is to introduce explicit adjectival material that excludes the exceptional individuals, as in the following:

- (i) A: Albino ravens aren’t black
- (i) B: That’s true, but ordinary ravens are.

For B's statement in (15) to be true, it is sufficient that *some* Indians eat beef, while the generic in (16) gets its regular quasi-universal generic interpretation that is true just in case, roughly speaking, Indians generally eat beef.

The felicity of emphatic reverse Sobel sequences, like in (11d) and (14), can be explained by appealing to Cohen's (2004) theory of existential generics. In brief, it is well-known that generics are generally evaluated with respect to a set of alternatives. For example, the generic 'Ducks lay eggs' is evaluated with respect to alternative ways of procreating, such as birthing live young, laying eggs, reproducing via mitosis, and so on. So, when evaluating 'Ducks lay eggs', only ducks that satisfy one of those alternatives are taken into account, and since those ducks normally lay eggs, the generic is true.

However, Cohen (2004) argues that, unlike their quasi-universal counterparts, generics with emphatic, contrastive focus, such as B's statements in (14) and (15), do not introduce any set of alternatives. Instead, they are evaluated with respect to a singleton set.¹¹ In (14), this is the singleton set containing the property of being black, and in (15), it is the singleton set containing the property of eating beef.¹² When a generic is evaluated with respect to a singleton set of alternatives, it is true, roughly speaking, just in case some member of the kind instantiates the property in question. After all, if the generic $\lceil \text{Gen } x[\phi(x)][\psi(x)] \rceil$ is true iff, in general, if $\phi(x) \wedge \bigvee A(x)$, then $\psi(x)$, where $\bigvee A$ is the disjunction of the set of alternatives to ψ ; and so, when the truth-conditions of the generic are evaluated relative to a singleton set of alternatives (e.g., $\bigvee A(x) = \psi(x)$), the generic would be true in the following case: in general, if $\phi(x) \wedge \psi(x)$, then $\psi(x)$, which is trivially true just in case some individual assigned to x satisfies $\phi(x) \wedge \psi(x)$. For example, when evaluated against a singleton set of alternatives, the generic 'Ravens [are]_f black' is true iff some raven is black, and so the discourse in (14) is equivalent to the following:

- (17) A: Albino ravens aren't black.
 B: That's true, but some ravens are black.

This sequence is clearly felicitous, as remarked upon in my discussion of (11b). In turn, this explains why differing focus sometimes improves the felicity of reverse generic sequences, such as in (14). For the remainder of this paper, I will focus primarily on generic sequences on their quasi-universal interpretations.

2.3 Interim summary

The working hypothesis that I would like to develop from this discussion is as follows. Generics normally allow us to properly exclude certain individuals from the domain of the generalisation, so long as they are contextually irrelevant and/or abnormal for the purposes of conversation. For example, generic Sobel sequences are felicitous because the cases that make the second generic true are somehow excluded as non-salient or outside the domain of the generalisation for the purposes of judging whether the first generic is true. But reverse

11 Arguably, other ways of introducing singleton sets of alternatives is by using contrastive *even though* or the adjective *abnormal*, as in the following:

- (i) Albino ravens aren't black, even though ravens are.
 (ii) Abnormal ravens aren't black, but ravens are.

12 More generally, assuming that generics involve a phonologically null quantifier *Gen* and have the logical form $\lceil \text{Gen}[\phi][\psi] \rceil$, existential generics are evaluated with respect to the singleton set $\{\psi\}$.

Sobel sequences of generics are infelicitous because the *first* generic makes salient certain individuals that render the second generic false, and so, for the purposes of conversation, they must be considered even though they are not normal by the lights of the second generic. This not only explains why explicitly mentioning a specific exception to a generic before then uttering that generic is infelicitous, it also explains why sentences like (12) are acceptable: even though both generics make salient the exceptions to each other's generalisations, such sequences of generics arguably have more than one conversational purpose, namely, whether lions have manes and whether lions birth live young. As such, the individuals that make one generic true can be properly excluded as exceptions to the other generic.

In Section 4, I propose a theory of generics that works exactly in the manner just described. But before doing so, in the following section, I will argue that, although many extant theories of generics are built to accommodate exactly the exception-permitting behaviour of Sobel sequences, no extant theory is designed to accommodate the infelicity of reverse Sobel sequences.

3 PREDICTIONS OF PROMINENT THEORIES

Many semantic theories of generics posit a certain amount of context-sensitivity in their interpretation, usually through some mechanism of domain restriction. Given that these theories make the interpretation of generics dependent on the context, is there conceptual space for thinking that the difference between generic Sobel sequences and their reversals are due the context-sensitive elements of generics?

In this section, I survey a range of prominent theories of generics to see whether they can accommodate the data about sequences of generics. I begin by considering two prominent and well-worked-out theories that build in a certain amount of context-sensitivity into their semantics for generics, namely, Ariel Cohen's (1997; 1999a) probabilistic view (§3.1) and Yael Greenberg's (2003; 2007) normality-based theory (§3.2). I then look at a more radically context-sensitive approach, namely, Rachel Sterken's (2015) indexical approach (§3.3).

3.1 Probability-based approaches

Probability-based accounts hold that generics have probabilistic truth-conditions defined over suitable smoothed out admissible temporal segments of possible worlds that extrapolate from the current history so far. For example, Cohen (1996, 1997, 1999a,b) proposes that a generic of the form 'Fs are G' is true iff, roughly speaking, the probability of being a G conditional on being an F that satisfies some alternative to being a G is greater than 0.5. Let us tentatively represent the schematic logical form of generic sentences as 'Gen[ϕ][ψ]', where 'Gen' is a covert generic quantifier that syntactically relates a *restrictor* clause, ϕ , with a *matrix* clause, ψ . Then, more formally, Cohen (1999a, 37) proposes the following truth-conditions:¹³

(18) Let 'Gen[ϕ][ψ]' be a sentence, where ϕ and ψ are properties.

Let $A = \text{ALT}(\psi)$, the set of alternatives to ψ . Then

'Gen[ϕ][ψ]' is true iff $P(\psi|\phi \wedge \bigvee A) > 0.5$

13 Actually, Cohen proposes a slightly complicated truth-conditions to accommodate what he calls 'relative generics'. We focus on a simplified version of his view, since nothing that I have to say here is impacted by relative generics.

where P is a frequentist probability function. These relative probability judgments are interpreted in a Branching Time framework (Thomason, 1984), where we consider not only the sequence of events that we have actually observed, but also possible continuations of that sequence into the future. Given frequentism, this amounts to the claim that the frequency of ψ s in a suitable reference class of ϕ s that also satisfy one of the alternatives associated with ψ is greater than 0.5.

What does Cohen's theory predict about the data surveyed above? First, observe that Cohen's theory predicts that generic conjunctions like 'Lions have manes and lions give birth to live young' are felicitous. This is because each generic is assessed relative to a different set of alternatives as determined by their respective predicates. More specifically, the first generic is assessed relative to those individuals that satisfy some alternative for having a mane (i.e., having some other male sexually selected trait), while the second generic is assessed relative to those individuals that satisfies some alternative to giving birth (i.e., laying eggs, reproducing via fusion, etc.). As such, the predicate of each generic evokes a different set of alternatives that excludes the individuals relevant to the assessment of the other generic. Consequently, (12) is true on Cohen's theory iff the probability of having a mane conditional being a lion that satisfies some alternative for having a mane is greater than 0.5, and the probability of birthing live young conditional on being a lion that satisfies some alternative to giving birth is greater than 0.5. Since both these conditions are true, (12) is true.

Furthermore, Cohen's theory accounts for the felicity of generic Sobel sequences, like (1a). According to the probabilistic account, the first conjunct in (1a) is true because, given the propensity of the colour amongst actual ravens, the conditional probability that an arbitrary individual is black, given that it is a raven, is greater than 0.5. Furthermore, the second conjunct in (1a) is also true because, given the propensity of the colour amongst actual albino ravens, the conditional probability that an arbitrary individual is not black, given that it is an albino raven, is greater than 0.5. Consequently, the probabilistic approach accommodates the felicity of generic Sobel sequences.

However, for exactly this reason, Cohen's account doesn't accommodate the infelicity of reverse Sobel sequences. Since Cohen's account predicts that both 'Albino ravens aren't black' and 'Ravens are black' are true, his theory predicts that 'Albino ravens aren't black, but ravens are' is true.

3.2 Normality-based approaches

Normality-based accounts typically deploy (restricted) universal quantification over normal individuals or normal worlds. For example, Yael Greenberg (2003; 2007) argues that generics of the form $\ulcorner FsareG \urcorner$ are true at a world w iff, roughly speaking, in all appropriately accessible worlds, every contextually relevant and normal F-individual has the G-property in those worlds.¹⁴ More formally, Greenberg proposes that generics of the form $\ulcorner FsareG \urcorner$ have the following truth-conditions:¹⁵

14 For present purposes, I will focus on Greenberg's theory, but what I have to say generalises to other versions of the view. For other proponents of the normality-based approach, see, e.g., Asher and Morreau (1991, 1995); Asher and Pelletier (2013); Eckardt (2000); Kirkpatrick (2023); Krifka *et al.* (1995); Pelletier and Asher (1997).

15 Greenberg (2007) develops a more sophisticated version of her semantics by replacing her informal 'cont.norm' restriction with the kind of exceptions-tolerance mechanism for generics suggested by

(19) $\forall w'(w' \text{ is appropriately accessible from } w_0 \rightarrow \forall x[P^{\text{cont.norm}}(x, w') \rightarrow Q(x, w')])$,

where ' w_0 ' is the actual world, ' P ' and ' Q ' are the subject and VP properties, respectively, and the superscript 'cont.norm' is a restriction on P to the contextually relevant and normal P -individuals.

Just as with Cohen's probability-based approach, Greenberg's normality-based approach accommodates the felicity of Sobel sequences. For the first conjunct in (1a) is true, since in all the appropriately accessible worlds from w_0 , all contextually relevant and normal ravens are black. And the view also predicts that the second conjunct in (1a) is true, since in all the appropriately accessible worlds from w_0 , all contextually relevant and normal albino ravens are not black. Similar remarks apply to the other sentences in (1).

However, Greenberg's account is unable to accommodate the infelicity of reverse Sobel sequences. For given that the first conjunct of (2a) is the same sentence as the second conjunct of (1a), following our previous reasoning, the normality-based account predicts that it is true. Similarly, since the second conjunct of (2a) is the same sentence as the first conjunct of (1a), the account predicts that it is true as well. Could the normality-based view say that, after albino ravens have been made contextually salient by an utterance of (2a), they cannot be properly excluded when assessing the second generic in (2a)? Not obviously: after all, the domain of the generalisation is restricted to all the contextually relevant *and normal* ravens, and so even if albino ravens remain contextually salient, they would nevertheless be excluded from the domain of the second generic's generalisation on the grounds that they are decidedly abnormal ravens. And it doesn't help to weaken Greenberg's truth-conditions by restricting the domain of the generalisation to *either* the contextually relevant *or* normal ravens, since this weakens Greenberg's semantics too much.¹⁶ For example, the modified semantics predicts that 'Ravens are white' can be true in a context where only white ravens are contextually relevant.

For this reason, I tentatively suggest that, while Greenberg's account is one of the most worked out normality-based theories of generics, it does not obviously accommodate the data concerning sequences of generics.

3.3 Indexical approaches

Lastly, let us consider a much more radically context-sensitive theory of generics due to Rachel Sterken (2015).¹⁷ Sterken takes the truth-conditional variability of generics to be evidence that what is conveyed by generics varies massively across contexts. In turn, she takes this to be evidence that the generic operator *Gen* expresses different generalisations across contexts and that there is no content which is distinctively generic.

One way to make Sterken's theory precise is to treat the generic operator *Gen* as an indexical in the Kaplanian sense. That is, the semantic *character* of *Gen* is a function from contexts to the kinds of denotations of quantificational adverbs, and the semantic *content* of *Gen*, that is, which quantificational adverb denotation gets picked out at a context,

Kadmon and Landman (1993). As far as I can see, nothing in my discussion will turn on this, and so I will focus on the simpler version.

¹⁶ Thanks to an anonymous referee for encouraging me to consider this modification.

¹⁷ My exposition of Sterken's view is simplified in a number of ways. Note also that there are other ways of implementing Sterken's idea, including adopting a variable semantic typing for the semantic content of *Gen* and adopting a different metasemantic theory.

varies from context to context as determined by a suitable metasemantic story, such as the following:

The semantic value of a use of *Gen* in a context *c* is the generalisation *g* that meets the following two conditions:

- 1) the speaker intends *g* to be the value of *Gen* in *c*; and
- 2) a competent, attentive, reasonable hearer who knows the common ground of the conversation at the time of utterance would know that the speaker intends *g* to be the value of *Gen* in *c*. (Sterken, 2015, 21)

So if a speaker utters the sentence ‘Ravens are black’ in a context *c*, intending something like *normally* to be the value of *Gen* in *c*, and a competent, attentive, reasonable hearer who knows the common ground of the conversation at the time of utterance would know that the speaker intends *normally* to be the value of *Gen* in *c*, then the speaker’s utterance is true in *c* iff normally, ravens are black.

It is difficult to make concrete statements about what Sterken’s theory predicts about generic Sobel and reverse Sobel sequences, since it is phrased in broad, general terms. But as far as I can see, Sterken’s theory seems to run into difficulty. According to Sterken’s theory, the semantic content of *Gen* varies across contexts, and its semantic value at a context will be that of a specific quantificational adverb, as determined by the metasemantic story above. So, for generic Sobel sequences like (1a), there will be two (possibly identical) quantificational adverbs *g, g'*, such that the corresponding generalisations ‘*g* ravens are black’ and ‘*g'* albino ravens aren’t black’ are both true. For everything that’s been said, nothing in Sterken’s semantic or metasemantic theory rules this out. But if these generalisations are truth-conditionally compatible, then their commutation should also be true and acceptable. That is, there should be nothing preventing a speaker from uttering ‘Albino ravens aren’t black, but ravens are’, intending the generalisation *g* of the first sentence to range over all normal albino ravens, while simultaneously intending the generalisation *g'* of the second sentence to range over all normal ravens, and for a competent, attentive, reasonable hearer who knows the common ground of the conversation at the time of utterance to know these facts. Indeed, given the felicity of sentences like in (11), such conjunctions of generalisations with explicit quantificational adverbs are completely fine. But, as the data involving reverse Sobel sequences shows, such sequences are not acceptable. Sterken’s theory leaves such facts unexplained.

That being said, there may be a more complex metasemantic story to tell about how the meaning of *Gen* is fixed in context, that explains the infelicity of generic reverse Sobel sequences. But, without further details, it is hard to determine what such an account will predict about these cases. Tentatively, then, I submit that Sterken’s theory has problems accommodating generic reverse Sobel sequences.¹⁸

18 What about other semantic theories of generics? One notable alternative to theories considered above takes the truth-conditions of generics to be existentially weak, such that a generic of the form ‘ $\square F$ s are G ’ is true just in case there is a contextually salient way of being a normal *F* with respect to *G*, such that all *F*s that are normal in this way are *G* (Nickel, 2009, 2016). Another notable alternative posits a primitive capacity for forming default generalisations to which the truth-conditions of generics are sensitive (Leslie, 2007, 2008). As far as I can see, the same problem applies to these views. A totally different way of treating generics takes the subject terms of generic

3.4 *Interim summary*

This section has argued that several prominent theories of generics ignore the felicity contrasts between Sobel and reverse Sobel sequences of generics described above, assigning to each them equivalent truth-conditions. The crucial commitment that allows these theories to predict the felicity of Sobel sequences is that their semantics are essentially non-monotonic. But it is due to this commitment that these theories fail to predict the infelicity of reverse Sobel sequences.

This failure is perfectly general as none of these semantics are explicitly sensitive to the dynamics of discourse, and, in particular, the order in which generic sentences are uttered. Consequently, they cannot explain why changing the order of Sobel sequences makes previously felicitous utterances infelicitous, and this failure counts against them. What we need, then, is an additional theory which attempts to formally capture both the felicity of generic Sobel sequences and the infelicity of reverse generic Sobel sequences. In the next section, I propose a theory of generics that achieves exactly this.

4 DYNAMIC GENERICITY

This section aims to tell a semantic story about generics that accounts for the felicity differences between generic Sobel sequences and their reversals, as well as the other data surveyed earlier. I begin by outlining the intuitive idea behind my informal theory (§4.1). I then provide a formal implementation of this informal theory (§4.2). The next section will demonstrate how the resulting framework handles the data concerning generic sequences presented earlier.

4.1 *The basic idea*

How can we explain the felicity differences between generic Sobel sequences and their reversals? One simple explanation would be that reverse Sobel sequences are contradictions, whereas Sobel sequences are not. This immediately explains the infelicity of the former and the felicity of the latter, since contradictions are generally infelicitous, whereas non-contradictions are often fine. This reaction might seem extremely surprising given that exactly the same sentences are involved in Sobel and reverse Sobel sequences, and, on any classical conception of consistency, the order in which sentences are presented should not affect their felicity. But I argue that this is exactly what must be rejected; the order in which generic sentences are uttered affects their interpretation.

The central idea of my theory is that generics express generalisations that are sensitive to individuals who have already been made salient in the conversation and that the domain

sentences refer to kinds and such sentences are true iff the kind denoted by the subject term satisfies the property denoted by the predicate. On one prominent version of this kind-predication approach, a kind satisfies an individual-level property if it inherits that property from its members, given a suitable notion of property inheritance (Liebesman, 2011; Liebesman and Magidor, 2017, 2023). According to this view, then, 'Ravens are black' is true because *Corvus*-kind is black (it inherits the property from its members), while 'Albino ravens aren't black' is true because *Albus-Corvus*-kind (whatever that might be) isn't black (it fails to inherit the property of being black from *its* members). As far as I can see, nothing in the kind-predication theory indicates that property inheritance is a context-sensitive matter nor that kind predications are sensitive to utterance order, so it is doubtful that kind-predication theories can account for the infelicity of reverse Sobel sequences.

of salient individuals can expand as the conversation progresses. On this view, generic Sobel sequences are consistent because the domain of quantification that the first generic is evaluated against properly excludes exceptional individuals or possibilities, but is then later expanded when evaluating the second generic to include such individuals. For example, when evaluating the first generic in the sequence ‘Ravens are black, but albino ravens aren’t’, we consider whether normally coloured ravens are black, and in doing so, we exclude albino ravens. Since all normally coloured ravens are black, the first generic is true. Then when we come to evaluate the second generic, we must expand the domain of quantification to include albino ravens and consider whether they are black. Since all normally coloured albino ravens are white, the second generic is also true. Thus generic Sobel sequences are predicted to be consistent.

Contrastingly, while the very same mechanism is in play when evaluating reverse Sobel sequences, once the first generic expands the domain of quantification to include individuals or possibilities that the second generic would otherwise have properly excluded, those individuals or possibilities cannot then be ignored when evaluating that second generic. For example, when evaluating the first generic in the sequence ‘Albino ravens aren’t black, but ravens are’, we consider whether normally coloured albino ravens are black. Since they aren’t, the first generic is true. But when we come to evaluate the second generic, those albino ravens are salient and cannot be properly ignored. Thus, since not all ravens in the domain are black, the second sentence is false and the reverse Sobel sequence is inconsistent.

There are a few ways I could imagine formally implementing the ideas developed above. In the rest of this section, I develop a dynamic implementation of the informal theory, one that treats the meaning of sentences in terms of their effects on a context or body of information, as well as their truth-conditions.¹⁹ The resulting framework is not intended to be a fully worked out theory of the dynamics of generics nor do I suggest it is the only possible implementation of the above idea. Rather, I develop this framework to demonstrate how the informal theory can be developed in concrete terms and to illuminate how the informal theory provided here predicts the phenomena surveyed above. To this end, I make use of a particular combination of syntactic and semantic assumptions that I feel are best suited to supplement my hypothesis. However, they do not present the only way to cast the theory I develop and the success of my basic argument is compatible with many other alternative implementations.

4.2 *The dynamic theory*

My theory, which I call the *dynamic theory*, is comprised of two parts. The first part concerns the truth-conditional content of generic sentences and it builds on a version of the normality-based approach to generic sentences introduced earlier. But it augments these normality-based truth-conditions with a dynamic story about how generics expand the context to make and keep certain possibilities salient. In particular, I propose that generics presuppose that the contextually supplied domain of generalisation contains some ‘restrictor-satisfying’ individuals. Whenever there is presupposition failure, the context is adjusted by expanding the domain of generalisation just enough to encompass the normal restrictor-satisfying

19 For the *loci classici* for dynamic approaches to meaning, see Heim (1982); Kamp (1981). Also see Karttunen (1969); Stalnaker (1974, 1975, 1978), for important theoretical precursors.

individuals. Consequently, rather than being evaluated with respect to disjoint domains, sequences of generics are evaluated with respect to a single dynamically evolving domain.

Let me begin by outlining the version of the normality-based approach upon which I build my own theory. Following the vast literature on generics, I will assume that generics have a tripartite structure involving a restrictor and a matrix clause coordinated by a phonologically null generic operator called ‘Gen’ (e.g., [Krifka et al., 1995](#)). Furthermore, I will treat *Gen* as an unselective quantifier in the style of [Lewis \(1975\)](#) in the sense that it binds any free variables in its scope.²⁰ For example, the generic (20) will be analysed as (20a):²¹

(20) Ravens are black.

a. Gen x, w [raven(x, w) \wedge C(x, w)][black(x, w)]

Such structures will be understood as quantifying over a set of contextually specified cases determined by the value of the contextual variable C . The value of C is in principle determined by a number of contextual factors, such as the questions under discussion and the focus/prosodic structure of the sentence (cf. [Kadmon, 1990](#); [Krifka, 1995](#); [Rooth, 1985, 1995](#)). But, for concreteness, I follow [Cohen \(1999b\)](#) in assuming that C will denote the set of alternatives to the property denoted by the matrix clause. Consequently, in (20a), $C = \bigvee \text{ALT}(\lambda s. \lambda x. \text{black}(x)(s))$.

My theory builds on Regine Eckardt’s (2000) version of the normality-based view, according to which a sentence like (20a) is true at a world w iff in all worlds w' approximately like w with respect to causal and statistical dependencies and regularities, but perhaps differing from w in isolated accidental facts, all normal ravens that are coloured in some way are black.

There are two components in this theory that need further specification. The first is the accessibility relation over worlds. Let \approx be an accessibility relation between worlds, such that all those worlds w' that are \approx -accessible to w are those worlds that are like w with respect to with respect to all dispositions, causal and statistical dependencies and regularities, but may differ from w in isolated accidental facts. Then let $\text{DO}(w) = \{w' : w \approx w'\}$ be the dispositional orbit of w .

The second component is the notion of a normal individual. To distinguish between all the P s and the normal P s, we introduce a family of functors:

(21) $N_n : W \times (E)^n \mapsto W \times (E)^n$

Intuitively, these map all n -ary properties P on to their normal restrictions $N(P)$. So, for all worlds w , $N(P)(w)$ is the set of all tuples a_1, \dots, a_n that are the normal P s in w . Evidentially, for all w , $N(P)(w) \subseteq P(w)$.

20 There is also a situation-based approach to quantificational adverbs, pioneered by [Berman \(1987\)](#) and adopted by [Elbourne \(2005, 2013\)](#); [Heim \(1990\)](#); [von Stechow \(2004\)](#); for an application of this approach to generics, see [Kirkpatrick \(2023\)](#). I will work with the unselective binding approach here as it is more familiar in the literature.

21 For discussion of how the sentence material gets distributed between the restrictor and matrix clauses, as well as how this distribution is affected by focus structure and prosody, see, a.o., [Chierchia \(1995\)](#); [Cohen \(1999b\)](#); [Rooth \(1995\)](#).

With these components in mind, we can specify our static semantics for generic sentences (with a slight blurring of object- and meta-languages):²²

(22) *Static Semantics (to be revised)*

$$\llbracket \text{Gen } x_1, \dots, x_n, w[\phi][\psi] \rrbracket^{\mathcal{M},g} = \lambda w. \forall w' (w \approx w' \rightarrow \forall x_1, \dots, x_n (N_n(\lambda w. \lambda y_1, \dots, y_n \phi)(x_1, \dots, x_n)(w') \rightarrow \psi(w')))$$

Here ' $N_n(\lambda w. \lambda y_1, \dots, y_n \phi)$ ' is the result of using the n -ary property formed from ϕ as an argument of the N functor. It yields the normal ϕ s. The semantics then says that, for any world w' that is \approx -related to w , if all objects a_1, \dots, a_n that are normal ϕ in w' are also ψ in w' , then the generic statement is true.

To give an example of how this works, consider the following truth-conditions for (20a):

$$(23) \llbracket \text{Gen } x, w[\text{raven}(x, w) \wedge C(x, w)][\text{black}(x, w)] \rrbracket^{\mathcal{M},g} = 1 \text{ iff} \\ \forall w' (w \approx w' \rightarrow \forall x (N_1(\lambda s. \lambda y. \text{raven}(y)(s) \wedge g(C)(y)(s))(x)(w') \rightarrow \text{black}(x)(w')))$$

In English: (20a) is true at a world w relative to contextual variable assignment g iff, for all the worlds w' in the dispositional orbit of w , all the normally coloured ravens in w' are black. (To make things more readable, I have underlined the argument of N .)

My theory of generics builds on this version of the normality-based theory. But, rather than generalising over *normal* restrictor-satisfying individuals by default, my theory generalises over *salient* restrictor-satisfying individuals, and it augments the normality-based truth-conditions with a dynamic story about how generics expand the context to make and keep certain possibilities salient. In particular, I propose that generics presuppose that the contextually supplied domain of generalisation contains some 'restrictor-satisfying' individuals, and whenever there is presupposition failure, the context is adjusted by expanding the domain of generalisation just enough to encompass the normal restrictor-satisfying individuals.

To make this idea precise, let me introduce the notion of a *context change potential* (CCP). Typically, CCPs are thought of as updates on the *common ground* of a conversation, broadly construed as the set of worlds that represents the mutually accepted presuppositions of the participants of the discourse (Stalnaker, 1978). On this model, conversation determines a body of mutually shared information and declarative speech acts usually update this body by adding more information to it. Standardly, the common ground determines a set of open possibilities, those possibilities that are not excluded by what is presupposed by the conversational participants. Familiar forms of discourse effects include the progressive elimination of possibilities, the addition of discourse referents to the domain of entities that can be referred to anaphorically, and tests on the common ground to see whether certain conditions obtain. But since I am only concerned with modelling the expansive effect of generics on the common ground, the operative concept of an update in this paper will be more restricted.

22 $\llbracket \cdot \rrbracket^{\mathcal{M},g}$ denotes the semantic interpretation function of the model of the language. It maps well-formed expressions of the language relative to a contextual variable assignment function g and a model $\mathcal{M} = \langle E, W, I \rangle$, where E is the set of possible individuals, W is the set of possible worlds, and I is an interpretation function mapping lexical items to suitable denotations. I occasionally leave off superscripts for readability. I also switch freely back and forth between talk about sets and their characteristic functions, but officially I prefer functional talk.

More specifically, I propose that generics presuppose that, for each accessible world, there are some relevant restrictor-satisfying individuals on the modal horizon, and, in the case of presupposition failure, the context is expanded to include the normal restrictor-satisfying individuals.²³ Following von Fintel's (2001) evocative terminology for this kind of evolving contextual parameter, I call it the 'modal horizon'. I make the simplifying assumption that no other sentences have any effect on the context.

Formally, let $\sigma : W \mapsto \bigcup_{n \in \mathbb{N}} \wp(W \times (E)^n)$ be an *accessibility function* mapping worlds to sets of tuples of worlds and individuals (i.e., functions from worlds to properties). Intuitively, σ should be thought of as selecting the salient set of relevant world-individuals-tuples relative to w . Call the set of σ -salient tuples relative to w , σ_w , the *modal horizon* of w relative to σ . Then the context change potential of a sentence ϕ is an *update function* $[\cdot]^{\mathcal{M},g} : \mathcal{L} \mapsto ((W \mapsto \bigcup_{n \in \mathbb{N}} \wp(W \times (E)^n)) \mapsto (W \mapsto \bigcup_{n \in \mathbb{N}} \wp(W \times (E)^n)))$ that maps sentences to functions from modal horizons to modal horizons (relative to a model \mathcal{M} and contextual variable assignment g). Thus, $\sigma_w[\phi]^{\mathcal{M},g}$ is result of updating σ_w on ϕ (relative to a model \mathcal{M} and contextual variable assignment g).

The idea is that when an utterance of a generic is accepted as an assertion, we check the modal horizon to see whether, for each world w' in the dispositional orbit of w , there is some relevant restrictor-satisfying individuals. If the test is positive, then the input modal horizon simply falls through as output unchanged. But if the test is negative, then for each world w' where there are no relevant individuals in the modal horizon, we add the normal restrictor-satisfying ones from w' to it. The proposition expressed is then computed with respect to the contextually salient restrictor-satisfying individuals. Thus, without further ado, we can then give our revised truth-conditions for generics as follows:²⁴

(24) *Dynamic semantics for generics*

a. Context change potential

$$\sigma[\text{Gen } x_1, \dots, x_n, w[\phi][\psi]]^{\mathcal{M},g} = \lambda w. \sigma_w \cup \{(x_1, \dots, x_n, w') : w' \in \text{DO}(w) \text{ and } N_n(\lambda w. \lambda y_1, \dots, y_n \phi)(x_1, \dots, x_n)(w') \text{ and } \neg \exists y_1, \dots, y_n([\lambda w. \lambda z_1, \dots, z_n \phi](y_1, \dots, y_n)(w') \wedge \sigma_w(y_1, \dots, y_n)(w'))\}$$

b. Truth-conditions

$$\llbracket [\chi \text{ Gen } x_1 \dots, x_n, w[\phi][\psi]] \rrbracket^{\mathcal{M},g,\sigma} = \lambda w. \forall w' (w \approx w' \rightarrow \forall x_1, \dots, x_n (\sigma_w[\chi]^{\mathcal{M},g}(x_1, \dots, x_n)(w') \wedge [\lambda w. \lambda y_1, \dots, y_n \phi](x_1, \dots, x_n)(w') \rightarrow \psi(w')))$$

where $\sigma_w[\chi]^{\mathcal{M},g} = \sigma_w[\text{Gen } x_1, \dots, x_n, w[\phi][\psi]]^{\mathcal{M},g}$.

²³ This core idea adapts a central insight in von Fintel's (2001) and Gillies's (2007) dynamic semantics for counterfactuals, namely, the expansive update function on worlds, but adapts it to the present context by focusing on bringing in normal restrictor-satisfying individuals rather than closest antecedent-satisfying worlds.

²⁴ For present purposes, I focus only on the expansive effects of generics on the modal horizon of the context. While the question of whether the modal horizon can be shrunk or 'reset' once expanded is interesting, I do not have a general theory about how the modal horizon can be contracted by generics, nor how it can be expanded and contracted by expressions other than generics. For relevant discussion, see Lewis (1979, 1996).

5 THE DATA

With this exposition in hand, we can now explore what the dynamic theory of generics predicts about generic Sobel sequences and their variants. I begin by explaining how the dynamic theory pulls off the tricky task of predicting that Sobel sequences of generics are felicitous, while also predicting that their reversals are infelicitous. I then go on to consider mixed sequences and other forms.

5.1 *Generic Sobel sequences*

What predictions does this theory make about Sobel sequences of generics? The key idea is that, over a conversation, the context naturally evolves so as to expand the modal horizon, so that, as generics are sequentially entertained, the modal horizon is updated to include more individuals. Each subsequent generic is then evaluated with respect to the already salient individuals together with any individuals that it itself introduces.

Consider, for example, a generic Sobel sequence like (1a), repeated below.

(25) (= (1a)) Ravens are black; but albino ravens aren't.

To assess its truth at a world w with respect to σ_w , we begin by evaluating the first generic 'Ravens are black' at w with respect to σ_w ; then, we go on to evaluate the second generic 'Albino ravens aren't black' at w with respect to the modal horizon updated on the first generic. More carefully, we begin by updating σ_w with 'Ravens are black', by adding to it, for any world w' in the dispositional orbit of w for which there are no coloured ravens in σ_w , the normally coloured ravens in w' . If there are some coloured ravens in w' in σ_w , then no more individuals are added for that world. We then see whether, for each world w' in the dispositional orbit of w , all the individuals in the updated modal horizon that are coloured ravens in w' are black.

Formally:

$$(26) \quad \llbracket [\phi \text{ Gen } x, w [\text{raven}(x, w) \wedge C(x, w)] [\text{black}(x, w)]] \rrbracket^{w, \sigma} = 1 \text{ iff} \\ \forall w' (w \approx w' \rightarrow \forall x (\sigma_w[\phi](x)(w') \wedge \text{raven}(x)(w') \wedge C(x)(w') \rightarrow \text{black}(x)(w')))$$

where $\sigma_w[\phi] = \sigma_w[\text{Gen } x, w [\text{raven}(x, w) \wedge C(x, w)] [\text{black}(x, w)]]$. Assuming that discourse initial modal horizons are empty, a discourse initial utterance of 'Ravens are black' is truth-conditionally equivalent to (23).

Next, we evaluate 'Albino ravens aren't black' with respect to the updated modal horizon $\sigma_w[\phi]$. That is, we check whether there are any restrictor-satisfying individuals in the modal horizon, for each world w' in the dispositional orbit of w . But there are no albino ravens in the modal horizon, since it contains only normally coloured ravens. Consequently, we must expand the modal horizon by adding, for each world w' in the dispositional orbit of w , the normally coloured albino ravens in w' . We then evaluate the second generic with respect to the newly expanded modal horizon. Formally:

$$(27) \quad \llbracket [\phi' \text{ Gen } x, w [\text{albino.raven}(x, w) \wedge C(x, w)] [\text{not.black}(x, w)]] \rrbracket^{w, \sigma[\phi]} = 1 \text{ iff} \\ \forall w' (w \approx w' \rightarrow \forall x ((\sigma_w[\phi])[\phi'](x)(w') \wedge \text{albino.raven}(x)(w') \wedge C(x)(w') \rightarrow \neg \text{black}(x)(w')))$$

where $(\sigma_w[\phi])[\phi'] = (\sigma_w[\phi])[\text{Gen } x, w [\text{raven}(x, w) \wedge C(x, w)] [\text{black}(x, w)]]$. In English, for each world w' in the dispositional orbit of w , every contextually salient albino raven is not black. And since the only contextually salient albino ravens are the normal ones we've

just added, the sentence is true, as they are not black. Thus, as we can see, the dynamic theory cleanly predicts the consistency of generic Sobel sequences.

5.2 Reverse Sobel Sequences

How does the theory fare with reverse Sobel sequences of generics? Consider a discourse-initial utterance of (2a), repeated below as (28).

(28) (= (2a)) #Albino ravens aren't black, but ravens are.

As before, the first generic is evaluated at a world w relative to a modal horizon σ_w by expanding the modal horizon to include the normally coloured albino ravens in each world of the dispositional orbit of w . Since in all such worlds, no normally coloured albino ravens are black, the first generic is judged to be true.

But when evaluating the second generic, our check on the modal horizon reveals that, for every world w' in the dispositional orbit of w , there are already some ravens in w' in the modal horizon, namely, the albino ones added by the first generic. It doesn't matter that the albino ravens aren't normally coloured ravens; they are nevertheless salient for the evaluation of the second generic. Thus, we evaluate the second generic with respect to the individuals already in the modal horizon, and since they are albino ravens, the second conjunct is guaranteed to be false. Consequently, the whole conjunction is false.

Let us take a step back to appreciate how the dynamic theory solves the puzzle laid out in the introduction. On the one hand, 'Albino ravens are not black, but ravens are' should be consistent, since the original order is completely fine. But on the other hand, the sentence strikes us as blatantly inconsistent. The dynamic theory makes sense of these facts by predicting that 'Ravens are black' and 'Albino ravens are not black' are indeed consistent, but only when taken in that order. If we evaluate their conjunction in reverse Sobel sequence form, the result is a contradiction. And so, despite the joint consistency of the two conjuncts, when taken in a certain order, the conjunction ends up being a contradiction.

Importantly, this argument doesn't rely on anything special about the predicates in particular, except for the fact that the restrictor clause of the second generic in a generic Sobel sequence denotes a subset of restrictor clause of the first generic. Nor is my theory particular to bare plural generics: the dynamic theory of generics can be generalised to cover other forms of generics, including indefinite and definite singular generics, adapting the theory to handle the relevant specifics. Consequently, the reasoning generalises to show that any generic Sobel sequence is consistent and its reversal is inconsistent. Thus, I submit that the dynamic theory makes sense of the surprising behaviour of sequences of generics.

5.3 Mixed generics and other sequences

How does the present theory handle mixed generics and other sequences, such as (12) and (6) repeated below?

(29) (= 12) Lions have manes and lions give birth to live young.

(30) a. (= (6a)) Ravens are black, but Nevermore the albino raven isn't.

b. (= (6b)) #Nevermore the albino raven isn't black, but ravens are.

The problem with sequences like 'Lions have manes and lions give birth to live young' is that each generic seems like it should bring to salience counterexamples to the generalisation expressed by the other generic in the sequence, and so we might expect such sequences to be infelicitous. But such sequences are fine, and so those counterexamples must somehow end

up being properly excluded. How does our theory avoid overreaching and predicting that these sequences are infelicitous?

The key is that, while each generic makes salient individuals who don't have the properties expressed by the other, the truth of each generic is only evaluated with respect to those individuals in the modal horizon that satisfy its own restrictor. Consequently, since the generics are about different topics, the truth-conditions of the generics exclude the recalcitrant individuals.

More carefully, the first generic expands the modal horizon to include the normal lions that satisfy some alternative to having a mane (that is, having some sexually selected male trait or other). Informally, since all such normal lions have manes, the first generic in the sequence is true. But, since none of the previously considered individuals are lions that satisfy some alternative to birthing live young (that is, produce offspring in some way or other), the second generic also expands the modal horizon to include all the normal lions that produce offspring in some way or other. Thankfully, we do not get a contradiction because the second generic is true just in case all the lions in the updated modal horizon that produce offspring in some way or other (that is, the normal female ones) birth live young. Formally:

- (31) $\llbracket [\phi \text{ Gen}_x, w \llbracket \text{lion}(x, w) \wedge C(x, w) \rrbracket \llbracket \text{has.a.mane}(x, w) \rrbracket] \rrbracket^{w, \sigma} = 1$ iff
 $\forall w' (w \approx w' \rightarrow \forall x (\sigma_w[\phi](x)(w') \wedge \text{lion}(x)(w') \wedge g(C)(x)(w') \rightarrow \text{has.a.mane}(x)(w')))$
- (32) $\llbracket [\phi' \text{ Gen}_x, w \llbracket \text{lion}(x, w) \wedge C'(x, w) \rrbracket \llbracket \text{births.live.young}(x, w) \rrbracket] \rrbracket^{w, \sigma[\phi]} = 1$ iff
 $\forall w' (w \approx w' \rightarrow \forall x ((\sigma_w[\phi])[\phi'](x)(w') \wedge \text{lion}(x)(w') \wedge g(C')(x)(w') \rightarrow \text{births.live.young}(x)(w')))$

where $C = \bigvee_{\text{ALT}}(\lambda s. \lambda x. \text{has.a.mane}(x)(s))$, namely, the set of alternative ways of having some other male sexually selected trait, and $C' = \bigvee_{\text{ALT}}(\lambda s. \lambda x. \text{births.live.young}(x)(s))$, namely, the set of alternative ways of reproducing.

Consequently, even though there are male lions in the modal horizon against which the second generic gets evaluated, the truth-conditions of the generic properly excludes them from consideration as its only concerned with lions that satisfy some alternative to birthing live young, which those male lions don't do. This doesn't happen with pure generic Sobel sequences, as the contextual variable for both generics is the same, being specified by the predicate.

What about infelicitous sequences, like 'Nevermore the albino raven isn't black, but ravens are'? I propose to handle these sequences by following Chierchia (1995) and treating individual-level predicates, like *is black*, as inherent generics.²⁵ According to this view, a sentence like (33), receives the interpretation in (33a), to which my theory assigns the truth-conditions in (34):

- (33) Nevermore, the albino raven, is not black.
 a. $\text{Gen } s \llbracket C(\text{Nevermore}, s) \rrbracket \llbracket \text{not.black}(\text{Nevermore}, s) \rrbracket$

²⁵ An anonymous referee observes that it would be simpler and less controversial to handle these sentences by assuming that explicit reference to an individual makes them salient. I agree, but for present purposes, I focus on demonstrating how these sentences can be accommodated *in principle*, rather than developing a general semantic mechanism for how explicitly referring to something makes it salient.

$$(34) \quad \llbracket [\phi \text{ Gen } s [C(\text{Nevermore}, s)] [\text{black}(\text{Nevermore}, s)]] \rrbracket^{w, \sigma} = 1 \text{ iff} \\ \forall w'(w \approx w' \rightarrow (\sigma_w[\phi](n)(w') \wedge g(C)(n)(w') \rightarrow \neg \text{black}(n)(w')))$$

In English: the generic adds to the modal horizon, for each world w' in dispositional orbit of w , Nevermore as he is in those worlds, and is true just in case, for each such world, Nevermore is not black. And, indeed, since Nevermore is an albino raven, the generic is true: Nevermore is not black. So, when the second generic 'Ravens are black' is evaluated, it is against a modal horizon that includes Nevermore. Consequently, the conjunction comes out as false, since not all of the ravens in the modal horizon of the second generic are black.

6 CONCLUSION

Generic Sobel sequences present a challenge for standard ways of thinking about generic sentences. I have argued that there is good reason to suspect that generics evoke non-trivial changes to the context in which they are assessed, and so we should adopt a semantic analysis that reflects this dynamic behaviour. More specifically, I have argued that there is good reason to think that reverse Sobel sequences are contradictions and their conjuncts, when taken in that order, are inconsistent. This account of the fact is exactly what the dynamic theory provides. The interpretation of generics is constrained by contextual possibilities that have been raised in preceding discourse. The live salience of certain counterinstances makes certain generalisations conversationally inappropriate. And so the dynamic theory resolves the puzzle.

I do not pretend that the precise implementation I have chosen is the only account of the facts. For example, I have focused on retooling the normality-based approach to generics in a dynamic framework, and I have not shown that a similarly dynamic approach cannot be taken for the other theories of generics. Proponents of those views are welcome to make use of the framework that I have developed here and see how their theories fare. Furthermore, I have not argued that a compelling static alternative to the present theory could not be developed. A natural question is: what kind of non-dynamic revision to any of the standard static semantics for generics could resolve the problems above? This question is of interest if we want to understand the extent to which facts about Sobel sequences support an essentially dynamic approach to meaning more generally.

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Appendix

A. Comparisons with Veltman (1996)

Veltman (1996) presents a dynamic account of generics in his early work on update semantics, and so, it is worthwhile to compare our respective theories. Veltman's theory has a very different architecture to the one I have presented. For present purposes, I consider my approach to be preferable for the following reasons:

- (i) Veltman's theory treats generics as default rules, which are understood as placing constraints on the structure of information states, rather than as carrying factual information.
- (ii) The theory makes the same predications as mine about Sobel sequences of generics, but erroneously predicts that reverse Sobel sequences of generics are consistent.

To demonstrate these points, it is necessary to give a formal exposition of his theory.

Greatly simplified, the core idea of Veltman's approach is as follows. Generic sentences express default rules that update information states by making certain possibilities 'more preferred' than others. Consequently, an agent's information state not only encodes the factual information about what is consistent with her knowledge, it also encodes her *expectations* about what possibilities are 'default', that is, what possibilities are conceived of as more likely or more preferred than others.

To first see intuitively how Veltman's theory works, consider sentences of the form 'Normally ϕ ' and 'If ϕ , then normally ψ ', which are taken to be default rules and restricted default rules, respectively. The idea, then, is that an information state σ accepts a default rule of the form 'Normally ϕ ' only if ϕ -worlds are more preferred in σ than not- ϕ -worlds; updating σ with 'Normally ϕ ' updates the expectation pattern in σ to reflect that ϕ -worlds are more preferable than not- ϕ -worlds. Similarly, an information state σ accepts a restricted default rule of the form 'If ϕ , then normally ψ ' only if ϕ -and- ψ -worlds are more preferred in σ than ϕ -and-not- ϕ -worlds; σ is updated with 'If ϕ , then normally ψ ' by reflecting that ϕ -and- ψ -worlds are more preferable than ϕ -and-not- ϕ -worlds in σ .

I shall now make this informal exposition precise, drawing heavily on Veltman's (1996) definitions throughout. We begin by defining our formal language.

DEFINITION A.1. Let \mathcal{A} be a set consisting of finitely many *atomic sentences*. With \mathcal{A} we associate two languages, $\mathcal{L}_0^{\mathcal{A}}$ and $\mathcal{L}_1^{\mathcal{A}}$. Both have \mathcal{A} as its nonlogical vocabulary. $\mathcal{L}_0^{\mathcal{A}}$ has as its logical vocabulary one unary operator \neg , two binary operators \wedge and \vee , and two

parentheses) and (. The sentences of \mathcal{L}_0^A are just the ones you would expect for a language with that vocabulary. \mathcal{L}_1^A has as its logical vocabulary one additional binary operator \rightsquigarrow . A string of symbols ϕ is a sentence of \mathcal{L}_1^A iff there are sentences ψ and χ of \mathcal{L}_0^A such that $\phi = \psi$, or $\phi = \psi \rightsquigarrow \chi$.

Read $\lceil \phi \rightsquigarrow \psi \rceil$ as $\lceil \text{If } \phi, \text{ then normally } \psi \rceil$. Intuitively, this will encode $\lceil \phi\text{-objects normally are } \psi\text{-objects} \rceil$. A sentence of the form $\lceil \phi \rightsquigarrow \psi \rceil$ will express that the proposition $\llbracket \psi \rrbracket$ is a default in the domain of worlds given by ϕ . General default rules of the form $\lceil \text{Normally } \phi \rceil$ are defined as an abbreviation of $\lceil (\phi \vee \neg\phi) \rightsquigarrow \phi \rceil$.

To describe the impact of default rules and restricted rules on an agent’s statement of mind in a mathematical model, we need to describe an agent’s knowledge and an agent’s expectations in a manner that allows us to describe how an agent’s expectations evolve as her knowledge increases. One way to do this is to take an agent’s information state σ to be a pair $\langle \pi, s \rangle$, where s is a subset of the set of possible worlds, W , which intuitively represents the agent’s factual information, and π encodes the agent’s knowledge of the rules. We define this as follows:

DEFINITION A.2. Let W be the powerset of the set \mathcal{A} of atomic sentences and $d \subseteq W$.

- (i) An (expectation) frame on W is a function π assigning to every subset d of W a preorder (reflexive and transitive relation) πd on d .
- (ii) Let π be a frame on W and $d, e \subseteq W$. The proposition e is a default in πd iff $d \cap e \neq \emptyset$ and $\pi d \circ e = \pi d$.

(Here, $\pi d \circ e = \{ \langle v, w \rangle \in \pi d : \text{if } w \in e, \text{ then } v \in e \}$; we say that $\pi d \circ e$ is the refinement of πd with the proposition e .)

Let P be the set of propositions a certain agent considers to normally be the case in the domain of worlds given by $d \subseteq W$ and let πd be a preorder on d . Then, for all $w, v \in d$, $\langle w, v \rangle \in \pi d$ (write: ‘ $w \preceq_{\pi d} v$ ’) if every proposition in P that holds in v also holds in w . If $w \preceq_{\pi d} v$ and $v \preceq_{\pi d} w$, then $w \equiv_{\pi d} v$. Clearly, $\equiv_{\pi d}$ is an equivalence relation. If $w \preceq_{\pi d} v$ but not $v \preceq_{\pi d} w$, then we write ‘ $w \prec_{\pi d} v$ ’ and say that w is less exceptional than v .

Only coherent expectation frames are allowed to form information states.

DEFINITION A.3. Let π be a frame on W , and $d \subseteq W$.

- (i) w is a normal world in πd iff $w \in d$ and for every $d' \subseteq d$ such that $w \in d'$ it holds that $w' \preceq_{\pi d'} v$ for every $v \in d'$;
- (ii) $\mathbf{n}\pi d$ is the set of all normal worlds in πd ;
- (iii) π is coherent iff for every nonempty $d \subseteq W$, $\mathbf{n}\pi d \neq \emptyset$.

We can now officially define what an information state is:

DEFINITION A.4. Let W be as before.

- (i) σ is an information state iff $\sigma = \langle \pi, s \rangle$, and one of the following conditions is fulfilled:
 - a. π is a coherent frame on W , and s is a nonempty subset of W ;

- b. π is the frame $\langle \iota, \emptyset \rangle$, where $\iota d = \{\langle w, w \rangle : w \in d\}$ for every $d \subseteq W$.
- (ii) $\mathbf{0} = \langle \vartheta, W \rangle$, where $\vartheta d = d \times d$ for every $d \subseteq W$.
 $\mathbf{1} = \langle \iota, \emptyset \rangle$.
- (iii) Let $\sigma = \langle \pi, s \rangle$ and $\sigma' = \langle \pi', s' \rangle$ be states. Let π'' be the frame such that for every d , $\pi'' d = \pi d \cap \pi' d$. Then
 $\sigma + \sigma' = \langle \pi'', s \cap s' \rangle$, if $\langle \pi'', s \cap s' \rangle$ is coherent;
 $\sigma + \sigma' = \mathbf{1}$, otherwise.

Updating an information state with factual information is a matter of intersecting the factual component of an information state with the factual content of the sentence being updated upon. Updating an information state with a new rule is a matter of refinement. If an agent with an information state $\sigma = \langle \pi, s \rangle$ accepts a sentence of the form $\lceil \phi \rightsquigarrow \psi \rceil$, then the pattern $\pi \llbracket \phi \rrbracket$ will be refined with $\llbracket \psi \rrbracket$; but, of course, if the result of refining $\pi \llbracket \phi \rrbracket$ with ψ is incoherent, $\lceil \phi \rightsquigarrow \psi \rceil$ should not be accepted.

DEFINITION A.5.

- (i) Let π and π' be frames, both based on W . The frame π is a *refinement* of π' iff $\pi d \subseteq \pi' d$ for every $d \subseteq W$.
- (ii) Let π be a frame and $d, e \subseteq W$. π_{doe} is a refinement of π given by
- if $d' \neq d$, then $\pi_{doe} d' = \pi d'$;
 - $\pi_{doe} d = \pi d \circ e$.
- The frame π_{doe} is *the result of refining πd in π with e* .

DEFINITION A.6. Let $\sigma = \langle \pi, s \rangle$ be an information state. For every sentence ϕ of \mathcal{L}_1^A , $\sigma[\phi]$ is determined as follows:

- (i) if ϕ is a sentence of \mathcal{L}_0^A , then
- if $s \cap \llbracket \phi \rrbracket = \emptyset$, $\sigma[\phi] = \mathbf{1}$;
 - otherwise, $\sigma[\phi] = \langle \pi, s \cap \llbracket \phi \rrbracket \rangle$
- (ii) if $\phi = \psi \rightsquigarrow \chi$, then
- $\sigma[\psi \rightsquigarrow \chi] = \mathbf{1}$ if $\llbracket \psi \rrbracket \cap \llbracket \chi \rrbracket = \emptyset$ or $\pi d \subseteq \llbracket \psi \rrbracket \sim \llbracket \chi \rrbracket$ for some $d \supseteq \llbracket \psi \rrbracket$.
 - Otherwise, $\sigma[\psi \rightsquigarrow \chi] = \langle \pi_{\llbracket \psi \rrbracket \circ \llbracket \chi \rrbracket}, s \rangle$

To apply this framework to generic sentences, we should think of defaults in expectation frames as default properties of objects by interpreting atomic sentences as monadic predicates and reinterpreting the underlying model in terms of sets of possible types of objects rather than sets of possible worlds. Then, we can read restricted rules of the form $\lceil \phi \rightsquigarrow \psi \rceil$ as expressing claims of the form $\lceil \phi \text{-objects normally are } \psi \text{-objects} \rceil$ instead of $\lceil \phi \text{-worlds normally are } \psi \text{-worlds} \rceil$.

It should now be easy to see why my first point holds. Generics do not express propositions or carry factual information on Veltman's account. Instead, they place restrictions on the structure of an agent's expectations. For anyone who thinks that generic sentences are truth-evaluable, this approach is not the right way to go. Furthermore, it might be considered especially problematic given the existence of composite sentences that mix genericity with

Table 1 A toy model.

index	world
0	-
1	p
2	q
3	q, p
4	r
5	r, p
6	r, q
7	r, q, p

more genericity, as in (30), or generics embedded under propositional attitude reports, such as (31) (cf. Pelletier and Asher, 1997, 1152ff.):

- (30) a. People who work late nights do not wake up early.
- b. People who do not like to eat out, do not like to eat out.
- (31) a. John believes that cassowaries fly.
- b. John knows that Mary loves kissing him, and he would be unhappy if she were to like it less.

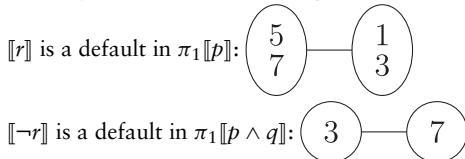
Indeed, given the definition of \mathcal{L}_1^A in Definition A.1, strings of the form $\lceil \phi \rightsquigarrow (\psi \rightsquigarrow \chi) \rceil$ and $\lceil (\phi \rightsquigarrow \psi) \rightsquigarrow \chi \rceil$ are illformed, since $\lceil \psi \rightsquigarrow \chi \rceil \lceil \phi \rightsquigarrow \psi \rceil$ are not sentences of \mathcal{L}_0^A . Consequently, it's not even clear how to formalise sentences like (30) in Veltman's theory.

Second, and more importantly for present purposes, we can now see why Veltman's theory predicts that both generic Sobel sequences and their reversals are consistent. Let us formalise 'Ravens are black' and 'Albino ravens are not black' as ' $p \rightsquigarrow r$ ' and ' $(p \wedge q) \rightsquigarrow \neg r$ ' respectively. Then, for each of the following states $\sigma_i = \langle \pi_i, s_i \rangle$, we can see that σ_i is consistent:

- (i) $\sigma_1 = 0[p \rightsquigarrow r][\lceil (p \wedge q) \rightsquigarrow \neg r \rceil] \neq 1$
- (ii) $\sigma_2 = 0[\lceil (p \wedge q) \rightsquigarrow \neg r \rceil][p \rightsquigarrow r] \neq 1$

For simplicity, suppose we are dealing with a set $W = \{w_0, \dots, w_7\}$ of eight possible types of objects, as described by Table 1, where the set $\llbracket p \rrbracket = \{w_1, w_3, w_5, w_7\}$ and the set $\llbracket p \wedge q \rrbracket = \{w_3, w_7\}$.

It is easy to see that the resulting frame π_1 looks like this:²⁶



And for $d \neq \{w_1, w_3, w_5, w_7\}$ or $d \neq \{w_3, w_7\}$, $\pi_1 d = d \times d$.

²⁶ Diagrammatically, if two types of objects belong in the same $\equiv_{\pi d}$ -equivalence class, they are placed within the same ellipse, and if $w \prec_{\pi d} v$, then the $\equiv_{\pi d}$ -equivalence class to which w belongs is placed to the left of the $\equiv_{\pi d}$ -equivalence class to which v belongs.

Since Veltman's semantics is not order-sensitive with respect to defaults, $\sigma_1 = \sigma_2$, since $\pi_1 = \pi_2$. Consequently, Veltman's theory treats reverse Sobel sequences as consistent. Furthermore, it is not obvious how to develop his theory to take into account order effects of generic sequences. For these reasons, I prefer my theory for the purposes of accounting for generic sequences.²⁷

27 Asher, Morreau, and Pelletier (in various combinations) propose an alternative theory for generic sentences that builds a dynamic 'epistemic semantics' on top of the truth-conditional core to capture defeasible reasoning patterns (Asher and Morreau, 1991, 1995; Pelletier and Asher, 1997). Their theory allows for arbitrarily deep nestings of generic sentences, and, as such, their theory overcomes the first problem with Veltman's theory. Crucially, however, their truth-conditional theory essentially exploits a Stalnaker–Lewis style semantics for a normality-based conditional and their dynamic semantics doesn't build in a one-way expansion mechanism like mine does. Consequently, just as the Stalnaker–Lewis semantics for counterfactuals erroneously predicts the consistency of reverse Sobel sequences of counterfactuals, Asher, Morreau, and Pelletier's theory predicts the consistency of reverse generic Sobel sequences.