Novelty and Familiarity for Free

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1 Introduction

In this paper we offer a novel resolution of a familiar tension, that between approaches in which the difference between definites and indefinites is based on uniqueness, and those in which it is based on novelty/familiarity. Advocates of uniqueness-based approaches such as Horn & Abbott (2013) and Coppock & Beaver (2015) have pointed out cases where the description is unique, but not familiar. For example, Coppock & Beaver (2015) use the following example:

(1) Jane didn't score the only goal. #It wasn't a bicycle kick, either.
(where *the only goal* serves as an antecedent for *it*)

The fact that the definite description cannot be an antecedent for a subsequent pronoun means that it cannot be picking up a familiar discourse referent; a familiar discourse referent would still be available for subsequent anaphora. On the other hand, proponents of a familiarity-based approach such as Heim (1982), Szabó (2000) and Ludlow & Segal (2004) can point to the fact that the descriptive content of an anaphoric definite description need not be unique in any obvious sense. Take the following example from Heim (1982):

(2) A glass$_i$ broke last night. The glass$_i$ had been very expensive.

This does not seem to imply that there is just one contextually-relevant glass. Ideally, a theory of definite descriptions should be able to explain both of these kinds of examples.

In this paper, we show that familiarity of (short) definites and novelty of indefinites can be derived from uniqueness and non-uniqueness respectively. Specifically, we show that if an ordinary dynamic semantics is defined to allow tracking of discourse referents, and an indexing mechanism is defined to allow identification of descriptions with referents, then both novelty of indefinites and familiarity of definites can be derived without stipulating lexically that the articles have these properties. The derivation relies entirely on principles that are commonly used (e.g. the uniqueness requirement for definites, and Heim's Maximize Presupposition principle). However, the derivation does not predict familiarity for all definites; in particular, familiarity for definites in case of semantic uniqueness will not be required. Furthermore, the uniqueness requirement will effectively drop away in case of familiarity.

We will explicate the proposal by first defining a dynamic system that embodies many of the insights in Heim's (1982,1983) seminal work on definites, and then showing how basic properties of her treatment can be derived and improved upon.

2 Partial File Logic

As a tool for representing dynamic meanings, we specify a logic that we call Partial File Logic (PFL). PFL has a basic type l for labels in addition to s, e, and t, and three truth values, as well as undefined entities $\#_\alpha$ for every type α, denoted by constants $\star_\alpha$ in the logic.

Type		Variables
e	:	x, y, z
s	:	w
l	:	i, j
$\langle l, e\rangle \quad (= \sigma)$	:	f, g, h
$\langle \sigma, \langle \sigma, t\rangle\rangle \quad (= \tau)$	:	$p,\ q$
$\langle e, t\rangle$	:	$P,\ Q$
$\langle e, \tau\rangle$	:	$\mathcal{P},\ \mathcal{Q}$

Table 1: Variables and their types in Partial File Logic

A dynamic system, which borrows from Heim (1982) and the Amsterdam tradition from Groenendijk & Stokhof (1989) on, is built on top of this static foundation. The Heimian notion of a *sequence* is implemented as a function of type $\langle l, e\rangle = \sigma$. A dynamic proposition relates two sequences, and is thus of type $\langle \sigma, \langle \sigma, t\rangle\rangle \ (= \tau)$. Dynamic properties are type $\langle e, \tau\rangle$.

The syntax of the language is mostly standard for typed lambda calculus. The variable naming conventions are given in Table 1. To denote the result of applying predicate π to argument α, we write $\pi(\alpha)$, except in the case of an expression of type τ, where τ is shorthand for $\langle \sigma, \langle \sigma, t\rangle\rangle$, effectively a relation between two sequences. In that case, instead of $\phi(f)(g)$, where ϕ is an expression of type τ, we write $f[\phi]g$, where f is the 'input' sequence and g is the 'output' sequence. We sometimes use a dot (.) to separate a binder (λ, $\forall$, or $\exists$) from its scope; the scope should in that case be interpreted as extending as far to the right as possible.

Expressions of PFL are interpreted with respect to a model, a world, and an assignment. The extension of an expression α with respect to model M, world w, and assignment a is written $[\![\alpha]\!]^{M,w,a}$; sometimes the model and the assignment parameters are suppressed. A model is a tuple $\langle D_e, D_t, D_l, W, I\rangle$ subject to the following constraints:

- The domain of individuals D_e contains at least one individual along with the undefined individual of type e, denoted by $\#_e$.
- The domain of truth values D_t contains three truth values: T, F, and $\#_t$. We use $\#$ as a shorthand for $\#_t$.
- The domain of labels D_l is the set of integers.
- W contains at least one possible world.
- I is an interpretation function, assigning an intension to all of the constants of the language. The intension of a constant of type τ is a function from W to D_τ.

An assignment a is a total function whose domain consists of the variables of the language such that if u is a variable of type τ then $a(u) \in D_\tau$. Note that these assignments are for interpreting variables of PFL; they should not be confused with *sequences*, which are objects in the model, functions from labels to individuals. PFL uses Weak Kleene connectives, and undefinedness of a functor or an argument yields undefinedness of an application: $[\![A_{\langle\beta,\alpha\rangle}(B_\beta)]\!]^{M,w,a} = \#_\alpha$ if $[\![A]\!]^{M,w,a} = \#_{\langle\beta,\alpha\rangle}$ or $[\![B]\!]^{M,w,a} = \#_\beta$, $[\![A]\!]^{M,w,a}([\![B]\!]^{M,w,a})$ otherwise.

Using these tools, we define dynamic connectives as follows:

Abbreviation 1. **And**$\equiv \lambda\phi\lambda\psi\lambda f\lambda g\,.\,\exists h\,.\, f[\phi]h \wedge h[\psi]g$

Abbreviation 2. **Not** $\equiv \lambda\phi\lambda f\lambda g\,.\, f = g \wedge \neg\exists h\,.\, f[\phi]h$

Abbreviation 3. ϕ **Implies** $\psi \equiv$ **Not**$[\phi$ **And Not** $\psi]$

Let ∂_s denote the static ∂-operator from Beaver & Krahmer 2001 (yielding undefinedness if its complement is not true); then the dynamic partial operator ∂_d may be defined as follows.

Abbreviation 4. $\partial_d\phi \equiv \lambda f\lambda g\,.\,\partial_s(f[\phi]g) \wedge f[\phi]g$

The PFL dynamic connectives yield standard dynamic presupposition projection behavior (cf. Beaver 2001).

3 Updating Heim

Heim's (1982) implementation does not use type theory, but we can loosely describe her analysis of definite and indefinite DPs as giving them the same type as VPs, with both being essentially propositional. However, Heimian propositions are not the propositions of old, but rather Context Change Potentials. That is, for Heim, both a DP and a VP can provide a way of updating contexts to produce new contexts, so that e.g. "a cat_i" provides a way of updating a context so that in the output context the referent i is established to be a cat, and a VP like "purrs" is taken to share the same index, becoming "i purrs", which, once again, can be used to update a context in the obvious way. Identity between the cat and the purrer in "a cat purrs" is established by sharing of indices (sequential updates with "a cat_i" and "i purrs"). Thus, for Heim, predicates apply directly to numeric labels, so that e.g. "7 smiles" could be part of an LF. While a familiar subscripted index should have a meaning given by the input context, a novel index has an unconstrained value, but has a side-effect of extending the context so that it is defined on the new index.

We also take a more Montagovian line in our version, using type theory and functional application as the primary means of composition. In our variant of her system, labels for referents have a distinct type from individuals, and (dynamic) predicates apply to individuals rather than applying to labels. The nominal that a definite or indefinite article may in principle be labeled (e.g. *glass*) or unlabeled (e.g. $\textit{glass}_i$). In other case, it denotes a dynamic property, i.e., a function from individuals (type e) to dynamic propositions (type τ).[1] Let us represent the static $\langle e, t\rangle$ property of being a glass with the non-logical constant **glass**. (The extension of this predicate at world w, $[\![\textbf{glass}]\!]^w$ will depend on w.) We will call the corresponding dynamic property **Glass**. The latter may be defined in terms of the former as follows.

Abbreviation 5. **Glass** $\equiv \lambda x\lambda f\lambda g\,.\, f = g \wedge \textbf{glass}(x)$

Analogous abbreviations will be made for the dynamic version of all basic static predicates. The unlabeled common noun *glass* translates as **Glass**:

Translation 1. *glass* $\rightsquigarrow$ **Glass**

Subscripting a noun with an index adds an additional constraint, which we capture using the constant **Labeled**. This constant is then used in the definition of how subscripted predicates $\mathcal{P}_i$ are to be interpreted, essentially forming a new dynamic property from the label property and the predicate property:

Translation 2. $\textit{glass}_i \rightsquigarrow \textbf{Glass}_i$

[1] In the case of a simple common noun like *glass*, no use is made of the dynamic nature of the property, but it becomes important in cases like *glass given to me by a friend*, where the noun phrase introduces a discourse referent.

Abbreviation 6. $\mathcal{P}_i \equiv \lambda x \,.\, \mathbf{Labeled}(i)(x)$ **And** $\mathcal{P}(x)$

So subscripting amounts to a dynamic version of intersection, i.e. intersection of the predicate property and the label property (cf. Heim and Kratzer's "Predicate Modification" rule).

The definition of **Labeled** is as follows, where $g \geq_i f$ can be read 'g extends f'.[2]

Abbreviation 7. $\mathbf{Labeled} \equiv \lambda i \lambda x \lambda f \lambda g \,.\, x = g(i) \wedge g \geq_i f$

Given these definitions, we have the following equivalence:

$$\begin{array}{lll}
\mathbf{Glass}_i & \equiv & \lambda x \,.\, \mathbf{Labeled}(i)(x) \ \mathbf{And} \ \ \mathbf{Glass}(x) \\
& \equiv & \lambda x \lambda f \lambda g \exists h \,.\, f[\mathbf{Labeled}(i)(x)]h \ \wedge \ h[\mathbf{Glass}(x)]g \\
& \equiv & \lambda x \lambda f \lambda g \exists h \,.\, [x = h(i) \wedge h \geq_i f] \ \wedge \ [h = g \wedge \ \mathbf{glass}(x)] \\
& \equiv & \lambda x \lambda f \lambda g \,.\, x = g(i) \wedge g \geq_i f \ \wedge \ \mathbf{glass}(x)
\end{array}$$

The definition in Abbreviation 7 implements the intuition that a label denotes a property, namely the property of being identical to the referent of the index. It also implements Heim's strategy of adding discourse referents to contexts on an as-needed basis. The studious reader may recall that Heim defines the semantics of predication in an unusual way, which can be understood in terms of two cases. First, suppose that a referent is familiar. In that case, predicating something of that referent will simply update the context so as to constrain the value of the referent in the appropriate way. But suppose instead that something is predicated of a referent that is not defined in the context. In that case, each sequence in the context is extended so as to provide values for the new referent, and these values are appropriately constrained. Thus in Heim's system, "i purrs" defines an update both for contexts in which i is familiar, and for contexts in which i is novel. Abbreviation 7 does something similar: **Labeled** maps from an index to the dynamic property of being identical to the value of that index, with the possible additional side-effect that the output sequence is defined on that index even if the input is not.

Given that linkage between DPs and VPs is established using variable binding, we introduce an operator to perform that binding. This operator, **Ex**, will play an important role in this paper. The intuition in the following definitions is that **Ex** takes a (dynamic) nominal property ($\mathcal{P}_1$) and a (dynamic) verbal property ($\mathcal{P}_2$), and then produces a dynamic proposition, which is a relation between assignments f and g. Specifically, the context f must be first updated using the nominal property, and then using the verbal property. But how can we establish that both properties hold of the same individual? To do that, we existentially quantify over an individual (using the variable x), and predicate both properties of that individual:

Abbreviation 8. $\mathbf{Ex} \equiv \lambda \mathcal{P}_1 \lambda \mathcal{P}_2 \lambda f \lambda g \,.\, \exists x \, f[\mathcal{P}_1(x)$ **And** $\mathcal{P}_2(x)]g$

Thus whereas in Heim's original system the LF for "The glass$_7$ broke" would be roughly *glass*(7) & *broke*(7), in our variant of Heim's system the at-issue part of the translation to PFL will (after reduction of the type theoretic expressions) amount to $\exists x \,.\, \mathbf{Labeled}(7)(x)$ **And** $\mathbf{Glass}(x)$ **And** $\mathbf{Broke}(x))$.

We are now ready to turn to Heim's use of Novelty and Familiarity, which, in the Heimian analysis of DPs, involves a constraint on the relationship between the determiner used and the index born by the DP. Specifically, an indefinite DP must bear a novel index, and a definite DP must bear a familiar index. We define novelty and familiarity to be (dynamic) properties of an index, in terms of whether the input context provides the index with a defined value, i.e one other than $\#_e$. Novelty and familiarity are defined as *tests* in the sense of Beaver (2001)

[2] $g \geq_i f$ means that g and f agree on all indices other than i, that if f is defined on i then g gives the same value, and that if not then g may map i to any entity. Formally, $g \geq_i f \ \equiv \ \forall j (j \neq i \rightarrow f(j) = g(j)) \wedge (i \in \textsc{dom}(f) \rightarrow f(i) = g(i)) \wedge i \in \textsc{dom}(g)$.

(who adapts the notion from Veltman (1996)), in that when the relevant condition holds, they have no effect on the context, but when the relevant condition fails, they yield undefinedness. Let us write $i \in \textsc{dom}(f)$ to mean $f(i) \neq \#_e$. Then:

Abbreviation 9. **novel** $\equiv \lambda i \lambda f \lambda g \,.\, \partial(i \notin \textsc{dom}(f))$

Abbreviation 10. **familiar** $\equiv \lambda i \lambda f \lambda g \,.\, \partial(i \in \textsc{dom}(f))$

We saw above that indices are to be treated as labels on the nominal complement of the determiner rather than on the determiner or the DP. This is important, because a core idea in our proposal is that indices in complex DPs provide properties, just like nouns and intersective adjectives. But in restating Heim's analysis, this analysis of indices creates a tension: the determiner needs access to the index, but the index is on a different constituent. As a result, in giving our reformulation of Heim's system, it will be convenient to introduce the articles syncategorematically. In the following definitions, both definite and indefinite DPs combine a condition on the status of the index (as novel or familiar) with a use of the **Ex** operator to link the nominal property to a lambda-abstracted property ($\mathcal{P}$), which can be thought of as the dynamic meaning of the verbal predicate:[3]

Translation 3. *a* $\mathrm{X}_i \rightsquigarrow \lambda\mathcal{P}.\ \mathbf{novel}(i)\ \mathbf{And}\ \mathbf{Ex}(X_i)(\mathcal{P})$, where $\mathrm{X}_i \rightsquigarrow X_i$

Translation 4. *the* $\mathrm{X}_i \rightsquigarrow \lambda\mathcal{P}.\ \mathbf{familiar}(i)\ \mathbf{And}\ \mathbf{Ex}(X_i)(\mathcal{P})$, where $\mathrm{X}_i \rightsquigarrow X_i$

We assume a rule of Function Application specifying that if $\alpha \rightsquigarrow \alpha'$ and $\beta \rightsquigarrow \beta'$ and α' denotes a function that can be applied to the denotation of β, then an English phrase consisting (only) of α and β translates as $\alpha'(\beta')$. We can now calculate the meaning of *The glass*$_7$ *broke*, for which the translation into PFL will be $\mathbf{familiar}(7)\ \mathbf{And}\ \mathbf{Ex}(\mathbf{Glass}_7)(\mathbf{Broke})$.

The glass$_7$ *broke*

$$\begin{array}{ll}
\rightsquigarrow & \mathbf{familiar}(7)\ \mathbf{And}\ \mathbf{Ex}(\mathbf{Glass}_7)(\mathbf{Broke}) \\
\equiv & \mathbf{familiar}(7)\ \mathbf{And}\ \mathbf{Ex}(\lambda x \,.\, \lambda f \lambda g \,.\, x = g(7) \wedge g \geq_7 f\ \wedge\ \mathbf{glass}(x))(\mathbf{Broke}) \\
\equiv & \mathbf{familiar}(7)\ \mathbf{And}\ \lambda f \lambda g \,.\, \exists x (x = g(7) \wedge g \geq_7 f\ \wedge\ \mathbf{glass}(x) \wedge \mathbf{broke}(x)) \\
\equiv & \lambda f \lambda g \,.\, \partial(7 \in \textsc{dom}(f)) \wedge \exists x (x = g(7) \wedge g \geq_7 f\ \wedge\ \mathbf{glass}(x) \wedge \mathbf{broke}(x)) \\
\equiv & \lambda f \lambda g \,.\, \partial(7 \in \textsc{dom}(f)) \wedge f = g \wedge \exists x (x = f(7)\ \wedge\ \mathbf{glass}(x) \wedge \mathbf{broke}(x)) \\
\equiv & \lambda f \lambda g \,.\, \partial(7 \in \textsc{dom}(f)) \wedge f = g \wedge\ \mathbf{glass}(f(7)) \wedge \mathbf{broke}(f(7))
\end{array}$$

Thus *The glass*$_7$ *broke* will be defined on any sequence that provides a value to the index 7. Relative to such a sequence, it returns the original sequence if 7 is mapped to a smiling glass, and returns no sequence otherwise.

Let a *file* be a set of pairs of worlds and sequences in which all sequences are defined on the same labels. Now in Heim's system, such files are used within the compositional semantics, so that the Heimian meaning of a sentence is a function from files to files. However, we have simplified the compositional semantics such that sentential meanings have an essentially lower type, the type of relations between sequences. Suppose that natural language sentence S has an LF that translates to expression S' in PFL of type τ. Then we can define the Heimian notion of update as follows:

Definition 1: Acceptance. *F accepts S* iff for every pair $\langle w, f \rangle \in F$, there is a g such that $f [\![S']\!]^w g \neq \#_t$

[3]Note that a stronger presupposition could easily be given for *the*, whereby it is presupposed not only that there is a familiar referent, but also that the nominal property was familiar. This would be achieved with the following alternative translation: *the* $\mathrm{X}_i \rightsquigarrow \lambda\mathcal{P}.\ \mathbf{familiar}(i)\ \mathbf{And}\ \partial_d(\mathbf{Ex}(X_i)(X_i))\ \mathbf{And}\ \mathbf{Ex}(X_i)(\mathcal{P})$. For example, *the glass*$_i$ would presuppose that i was familiar and that something was a glass identical with i. Heim (1983) has only the weaker familiarity condition.

Definition 2: Update. $F + S$ is defined iff F *accepts* S, in which case
$$F + S = \{\langle w, g\rangle \mid \exists f\ \langle w, f\rangle \in F \text{ and } f[\![S']\!]^w g = \mathrm{T}\}$$

The translation of *The glass*$_7$ *broke* into PFL will be accepted in any file whose sequences are defined on 7, and no others; this is what the familiarity presupposition amounts to. The update will remove world-sequence pairs in which 7 is not a glass or did not break.

This completes the core of a re-implementation of Heim (1982, 1983). Note that the system can straightforwardly be applied to cases of donkey anaphora using a dynamic translation of *if-then*, for example as the dynamic equivalent of a material conditional:

Translation 5. If X then Y $\rightsquigarrow$ $\mathbf{Not}(X' \ \mathbf{And}\ \mathbf{Not}\, Y')$, where X$\rightsquigarrow X'$ and Y$\rightsquigarrow Y'$

The system will then produce an appropriate update for e.g. "If a farmer$_1$ owns a donkey$_2$, then the farmer$_1$ beats the donkey$_2$". Specifically, a file updated with this sentence will contain no worlds in which a farmer owns a donkey and fails to beat it.

In the next section we reconsider the semantics of definites and indefinites, and show how a variant of Heim's novelty/familiarity condition can be derived pragmatically from a system in which definites encode uniqueness, and there is no stipulation regarding familiarity or novelty. Crucially, again, familiarity in case of semantic uniqueness will not be required, and the uniqueness requirement will effectively drop away in case of familiarity.

4 Deriving familiarity from uniqueness

We now switch to the analysis of definite and indefinite descriptions in Coppock & Beaver (2015), an analysis that differs from Heim's in two crucial respects. First, the difference between the meaning of *the* and *a* does not involve novelty and familiarity, but rather involves what Coppock & Beaver (2015) term 'weak uniqueness', i.e. a presupposition that there is at most one entity in the extension of the complement of *the*. Second, the basic denotation of both definite and indefinite descriptions is as properties, so that for example *a table* denotes the property of being a table, and *the best friend you could ever ask for* denotes the property that such friends have.

Taking definite and indefinite descriptions to be property-denoting has the immediate benefit of providing a straightforward analyis for predicative uses of DPs, e.g. in *Mary is the best friend you could ever ask for*, but creates a problem when DPs are used in argument positions. When a property-donoting DP occurs in an argument position, Coppock & Beaver (2015) take the resulting type mismatch to trigger a shift, specifically, one of two shifts of Partee (1986). We maintain the same intuitions here, but will adapt the shifts to a dynamic framework. One of these two dynamic shifts is the **Ex** shift introduced above. The other shift, **Iota**, has the same effect on types, but carries an additional presupposition that there exists exactly one object with the property given by the description. To achieve this, we first define a static operator **one** which holds of a property if there is exactly one object in its extension, use this to define a dynamic variant **One** which provides an update just in case it is applied to a dynamic property that holds of exactly one individual, and then build that dynamic notion into the definition of **Iota**:

Abbreviation 11. $\mathbf{one} \equiv \lambda P \,.\, \exists x \,.\, P(x) \wedge \neg\exists y \neq x \,.\, P(y)$

Abbreviation 12. $\mathbf{One} \equiv \lambda \mathcal{P} \lambda f \lambda g \,.\, f = g \wedge \exists h \,.\, \mathbf{one}(\lambda x \,.\, f[\mathcal{P}(x)]h)$

Abbreviation 13. $\mathbf{Iota} \equiv \lambda \mathcal{P}_1 \lambda \mathcal{P}_2 \,.\, \partial_d(\mathbf{One}(\mathcal{P}_1)) \ \mathbf{And}\ \mathbf{Ex}(P_1)(P_2)$

Following Coppock & Beaver (2015), we take the indefinite article to have only a trivial meaning, an identity operation on properties, except that these properties are now dynamic:

TRANSLATION 6. *a(n)* $\rightsquigarrow \lambda\mathcal{P} \,.\, \mathcal{P}$

The definite article must also denote a function from dynamic properties to dynamic properties. Let us assume that its meaning is captured by an abbreviation **The**:

TRANSLATION 7. *the* $\rightsquigarrow$ **The**

To specify how **The** is to be interpreted, we need to define weak uniqueness, which we again do in terms of a static predicate (**unique**) from which a dynamic variant (**Unique**) is defined.

ABBREVIATION 14. $\mathbf{unique} \equiv \lambda P \,.\, \neg\exists x \exists y \neq x \,.\, P(x) \wedge P(y)$

ABBREVIATION 15. $\mathbf{Unique} \equiv \lambda\mathcal{P}\lambda f \lambda g \,.\, f = g \wedge \exists h \,.\, \mathbf{unique}(\lambda x \,.\, f[\mathcal{P}(x)]h)$

We can now give the interpretation of the definite article, presupposing weak uniqueness:

ABBREVIATION 16. $\mathbf{The} \equiv \lambda\mathcal{P}\lambda x \,.\, \partial_d(\mathbf{Unique}(\mathcal{P}))\ \mathbf{And}\ \mathcal{P}(x)$

Thus, for example, *the glass* gets the meaning **The**(**Glass**), equivalent to the following dynamic property:

$$\lambda x \,.\, \partial_d(\mathbf{Unique}(\mathbf{Glass}))\ \mathbf{And}\ \mathbf{Glass}(x)$$

Similarly, for the labeled DP *the glass$_i$* we have the translation $\mathbf{The}(\mathbf{Glass}_i)$, which is equivalent to:

$$\lambda x \,.\, \partial_d(\mathbf{Unique}(\lambda y \,.\, \mathbf{Labeled}(i)(y)\ \mathbf{And}\ \mathbf{Glass}(y)))\ \mathbf{And}\ \mathbf{Labeled}(i)(x)\ \mathbf{And}\ \mathbf{Glass}(x)$$

Thus, *the glass$_i$* presupposes that there is at most one entity which has both the property of being identical to whatever is labeled i, and the property of being glass.

Used in argument position, *the glass$_i$* will be translated either as $\mathbf{Iota}(\mathbf{The}(\mathbf{Glass}_i))$ or $\mathbf{Ex}(\mathbf{The}(\mathbf{Glass}_i))$. Two principles determine which is used. The first is essentially that of e.g. Heim (1991); Schlenker (2011); Percus (2006), while the second is a variant of the Principle of Informativeness of Atlas & Levinson (1981) and the Strongest Meaning Hypothesis of Dalrymple et al. (1998):

Maximize presupposition (production principle) Relative to a file F, if two sentences are identical except for one item which could take values A or B differing only in that A has stronger presuppostions than B, and if F accepts both versions, then prefer A.

Maximize presupposition (comprehension principle) Suppose two LFs for a sentence are identical except for one item which could take values A or B differing only in that A has stronger presuppostions than B. Then, in the absence of evidence to the contrary, prefer the interpretation with A, if necessary removing world-sequence pairs from the input file F which would not be compatible with that interpretation.

The production variant can be illustrated using semantically unique descriptions. Consider (3) and (4), in which the descriptions *only way* and *tallest mountain* are semantically unique:

(3) {The/#an} only way is up.

(4) {The/#a} tallest mountain is Everest.

Given that the descriptions in these sentences are semantically unique, it follows that in any context of interpretation, the uniqueness presupposition of the definite article would be satisfied. Since *the* has strictly stronger presuppositions than *a*, and since those presuppositions are guaranteed to be satisfied, the production principle then predicts that the weaker variant, the indefinite, will be blocked by the stronger variant, and hence infelicitous. Quite generally, the principle predicts infelicity of indefinite articles with semantically unique descriptions.

Descriptions that are unique with respect to a background file are also prevented by the production variant of Maximize Presupposition from co-occuring with indefinite articles. This fact lets us derive novelty for indefinite descriptions, because familiarity implies uniqueness. More specifically, if i is familiar, then *glass*$_i$ will be unique. So the speaker should use a definite article in combination with *glass*$_i$ in that case. Indefinite, labeled descriptions will only be licenced when the label is novel, because only then can the description be non-unique.

Note that the production variant of Maximize Presupposition also predicts that indefinite descriptions should never be interpreted with **Iota**. If the speaker presupposes uniqueness, as he should if he or she intends an **Iota** interpretation, then the definite article should be used.

The comprehension variant of Maximize Presupposition implies that **Iota** is usually chosen over **Ex** in the case of definite descriptions, even if it requires accommodation, but not always – not if there is sufficent "evidence to the contrary", as discussed by Coppock & Beaver (2015). For a case like *Jane didn't score the only goal*, mentioned in the introduction, Coppock and Beaver assume that placement of focus on *only* is sufficient "evidence to the contrary" to rule out an **Iota** interpretation, because the salient focus-alternative to *only* is 'multiple', so the common ground must allow for multiple satisfiers of the predicate, which in turn means that there is *no* satisfier of the predicate 'only goal'. This goes against **Iota**'s existence presupposition, so **Ex** is the only option. In the present setting, the reasoning is somewhat more complicated, because *the only goal* may in principle carry an index. But the same results obtain; if the index is familiar, then there can only be one satisfier of the predicate, and this clashes with focus on *only.* If there is focus on *only*, then any index must be novel. With a novel index, this example behaves as it does in the absence of an index. (The failure to license anaphora observed in the introduction can be attributed in that case to the presence of negation, which caps the 'life-span' of any discourse referents in its scope, in Karttunen's (1973) terminology.)

Now let us consider what presuppositions arise under the **Iota** interpretation of a definite description like *the glass*$_i$. We have the following equivalences (where some steps in the derivation are left as an exercise for the reader):

$$\begin{aligned}
&\mathbf{Iota}(\mathbf{The}(\mathbf{Glass}_i))(\mathbf{Broke})\\
&\equiv \partial_d(\mathbf{One}(\mathbf{The}(\mathbf{Glass}_i)))\ \mathbf{And}\ \mathbf{Ex}(\mathbf{The}(\mathbf{Glass}_i))(\mathbf{Broke})\\
&\equiv \partial_d(\mathbf{One}(\mathbf{Glass}_i))\ \mathbf{And}\ \mathbf{Ex}(\mathbf{The}(\mathbf{Glass}_i))(\mathbf{Broke})\\
&\equiv \lambda f \lambda g \,.\, \partial_s(\mathbf{one}(\lambda x \,.\, \exists h \,.\, h \geq_i f \wedge x = h(i) \wedge \mathbf{glass}(x)))\ \wedge\ f = g \wedge\ \mathbf{glass}(f(i)) \wedge \mathbf{broke}(f(i))
\end{aligned}$$

To consider when the presuppositions are met, recall the definition of acceptance: F *accepts* S iff for every pair $\langle w, f\rangle \in F$, there is a g such that $f[\![S']\!]^w g \neq \#_t$. It turns out that F will accept *The glass*$_i$ *broke* on an **Iota** interpretation either if i is a familiar glass (regardless of how many other glasses there are in the worlds under consideration) or if every world has exactly one glass. To put it more simply, the presuppositions are met either if i is a familiar glass or if it is in the common ground that there is exactly one glass.

Let us see why this is so. First, suppose i is familiar in file F. This means that for all pairs $\langle w, f\rangle \in F$, i is in the domain of f. Any extension h of f will map i onto the same individual. So there is only one individual that can satisfy the property in the scope of **one**, regardless of how many glasses there are. Since the constraint inside the ∂_s operator in the last line of the derivation above is satisfied for all sequences f in the input file, it follows that for every pair $\langle w, f\rangle$ in F, there will be some g for which the update is defined; F *accepts* the sentence, in the technical sense.

Suppose on the other hand that i is not familiar. If there are worlds in the common ground where there are multiple glasses, then there are multiple individuals that an extension h of f could map i to. Therefore, the property in the scope of **one** will not be unique, and the presupposition will not be satisfied. Put more technically, there will be some pairs $\langle w, f\rangle \in F$ for which the constraint inside the ∂_s operator is not satisfied, and this will yield undefinedness. Therefore, F does not accept the sentence under such conditions. On the other hand, if there is exactly one glass in every world in F, then the update will be defined, even if the index is new. Thus only if the unlabeled property is presupposed to be unique can the presuppositions be satisfied when the discourse referent is new.

Note that we get similar presuppositions under the **Ex** interpretation. The only difference is that **one** is replaced by **unique**, so the presupposition may be satisfied even if there are no satisfiers of the predicate when the discourse referent is novel. But existence of a satisfier is part of the at-issue meaning, and may therefore be the target of negation.

5 Summary

From a uniqueness-based theory of definites, supplemented with a mechanism for interpreting indices on descriptions, we have derived novelty for labeled indefinite descriptions, and familiarity or semantic uniqueness for definite descriptions. The blocking principle Maximize Presupposition implies that indefinite descriptions must be novel, because if they are familiar, then they are unique, and a unique description should be accompanied be a definite article. The uniqueness requirement means that labeled definite descriptions must be familiar if they are not semantically unique, and effectively disappears in case the description is familiar, in the sense that the common ground may allow many satisfiers of the unlabeled predicate.

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