Chapter 11
Definite Descriptions

Only

Unitary Account of Nouns

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A. Definite Descriptions

1. Original Proposal

As originally proposed, ‘the’ is a functor that takes a common-noun-phrase (C) as input, and delivers a definite-noun-phrase (D) as output, being semantically rendered as follows.

\[
\begin{array}{c|c|c}
\text{the[s]} & C \rightarrow D & \lambda P_0 \, 1xP_0 \end{array}
\]

Here the upside-down iota is the definite-description operator.\(^1\) ‘S’ refers to Strawson (1950), whose ideas form the basis of this account.\(^2\) The following is an example derivation.

1. the woman next to Kay is tall

\[
\begin{array}{c|c|c|c}
\text{the[s]} & \text{woman-next-to-Kay} & +1 & \text{is tall} \\
\lambda P_0 \, 1xP_0 & \lambda x_0 Wx & \lambda x_1 & \lambda x_1 Tx \\
1xWx & [1xWx] & \lambda x_1 Tx \\
T[1xWx] & 
\end{array}
\]

In any given situation, a definite description is proper or improper. \(\nu \Phi\) is proper if exactly-one entity satisfies \(\Phi\); otherwise, it is improper.\(^3\) If \(\nu \Phi\) is proper, then it denotes the unique entity that satisfies \(\Phi\). On the other hand, if \(\nu \Phi\) is improper, then it denotes nothing, and is accordingly treated as a non-starter, which vitiates every expression in which it appears. In particular, an improper description is null [i.e., denotes nothing], and every expression in which it appears is similarly null. So, in the example above, if no man is next to Kay, or two or more men are next to Kay, then ‘the man next to Kay’ is null, and so is every expression containing it.

The underlying idea is that expressions that contain a description presuppose that the description is proper. When we have presupposition-failure, we also have semantic-failure – not in the sense that the expression is meaning-less, but in the sense that the expression is denotation-less.

2. Free-Logic

All we have said so far is that descriptions have type \(D\), and are null when they are improper. We have not explained how one reasons with descriptions. We now supply the missing details, following the Free-Logic approach.

Free Logic sounds like a happening in the 60’s, and indeed it came into prominence in the 60’s,\(^4\) but ‘free’ here does not denote freedom to indulge, but rather freedom not to indulge – in this case, in presuppositions that plague classical logic, including the following two principles.\(^5\)

1. the domain is non-empty.
2. every singular-term\(^6\) denotes something (in the domain).

One cannot do descriptions à la Strawson, as we propose to do, unless one abandons (2), since the central thesis is that improper descriptions are singular-terms, but denote nothing.\(^7\)

There are various ways to formally implement Free Logic. In my elementary logic textbooks, I introduce a class of constants, which act like demonstrative pronouns, and always denote elements in the domain.\(^8\)

---

1. Although it is upside-down, we usually refer to it simply as “iota”.
2. This approach to definite descriptions is implicit in the work of Gottlob Frege (1892), who does not however allow any term to denote nothing. Rather, he chooses an arbitrary entity in the domain to serve as the denotation of all improper terms.
3. See below however, about problems with counting.
4. The term was coined by Karel Lambert (1960).
5. So ‘free’ is short for ‘presupposition-free’.
6. We pretend, as is common in elementary logic, that all terms are singular in number.
7. Russell agrees on this point, but for different reasons; he thinks no description is referential, since descriptions don't have type \(D\).
The inference-rules for descriptions are then based on the following underlying principle.

\[ \alpha = \text{the } F \]

iff

\[ \alpha \text{ is } F \]

and

\[ \text{nothing else is } F \]

i.e. nothing other than \( \alpha \) is \( F \)

Supposing ‘other than’ means ‘\( \neq \)’, the formalization of this principle goes as follows, which is a bi-directional rule of inference.

\[
\begin{align*}
\text{c} = 1\nu\Phi & \quad \text{//} \quad \Phi[c/\nu] \land \neg \exists \nu \{ \nu \neq c \land \Phi \} \\
\text{c} \text{ is any constant; } \nu \text{ is any variable; } \Phi \text{ is any formula}
\end{align*}
\]

Remember, constants automatically denote entities, so the left side entails that the description is proper.

In this connection, it is useful to define a uniqueness-operator \( [!] \) as follows.

\[
\begin{align*}
P[!]\alpha & = \alpha \land \neg \exists x (x \neq \alpha \land Px) \\
\text{\( \alpha \) is uniquely } P \text{ means } \alpha \text{ is } P, \text{ and nothing else is } P
\end{align*}
\]

Then the above inference rule can be rewritten as follows.

\[
\begin{align*}
\text{c} = 1\nu\Phi & \quad \text{//} \quad \lambda \nu \Phi ![c] \\
\text{The latter formula can be read thus.}^{11} \\
\text{c} \text{ is the-only } \nu \text{ such that } \Phi
\end{align*}
\]

3. Russell’s Theory of Descriptions

As is well known, Bertrand Russell (1905) rejected the key premise underlying our original approach, that descriptions have type \( D \), and accordingly purport to denote entities. He proposed instead to treat descriptions as quantifier-phrases.

By way of formalizing Russell’s account within our semantic framework, we offer the following categorial rendering of ‘the[R]’.

\[
\begin{align*}
\text{the[R]} & \quad C \rightarrow \forall D \quad \lambda P_0 \forall x P[!]x \\
\text{Here, } \forall \text{ is infinitary-disjunction, as before, and the exclamation point is our recently-minted uniqueness operator. The following is an example derivation employing this account of ‘the’.
}\end{align*}
\]

---

8 Other singular-terms, including proper-names, do not automatically denote. Also, when we consider modal logic, constants denote rigidly, which is why I call them "constants".
9 We often use ‘description’ in place of ‘definite description’. Indefinite descriptions are examined under the heading of indefinite noun phrases.
10 However, see later section for a counter-example to this supposition.
11 See Section B below for a general semantic account of ‘only’.
12 The term ‘singular-term’ is common in elementary logic, which is usually presented in a way that presupposes all definite-noun-phrases are singular; there are no plural-terms or mass-terms. Our core language First-Order Loglish allows plural-terms and mass-terms in addition to singular-terms.
2. the cat hates the dog

\[
\begin{array}{c|c|c|c|c|c|c|c}
\text{the[r]} & \text{cat} & +1 & \text{hates} & \text{the[s]} & \text{dog} & +2 \\
\hline
\lambda P_0 \lor x P!x & \lambda x_0 Cx & \lor x C!x & \lambda x_0 x_1 & \lambda P_0 \lor y P!y & \lambda x_0 Dx & \lor y D!y \\
\hline
\hline
\lambda P_0 \lor x P!x & \lambda x_0 Cx & \lor \{ x_1 \mid C!x \} & \lambda x_0 x_1 & \lambda P_0 \lor y P!y & \lambda x_0 Dx & \lor \{ y_1 \mid D!y \} \\
\hline
\lambda P_0 \lor x P!x & \lambda x_0 Cx & \lor \{ x_1 \mid C!x \} & \lambda x_0 x_1 & \lambda P_0 \lor y P!y & \lambda x_0 Dx & \lor \{ y_1 \mid D!y \} \\
\hline
\end{array}
\]

Here, we combine the two disjunctions using parallel-composition.¹³ The resulting formula says there is exactly one cat, and exactly one dog, and the former hates the latter. So, if either description is improper, the corresponding uniqueness claim is false, and the sentence as a whole evaluates as false.

The following is the corresponding Strawsonian analysis.

\[
\begin{array}{c|c|c|c|c|c|c|c}
\text{the[s]} & \text{cat} & +1 & \text{hates} & \text{the[s]} & \text{dog} & +2 \\
\hline
\lambda P_0 \lor x P!x & \lambda x_0 Cx & \lor x C!x & \lambda x_0 x_1 & \lambda P_0 \lor y P!y & \lambda x_0 Dx & \lor y D!y \\
\hline
\hline
\lambda P_0 \lor x P!x & \lambda x_0 Cx & \lor [\lambda x_1 Hxy] & \lambda x_0 x_1 & \lambda P_0 \lor y P!y & \lambda x_0 Dx & \lor \{ y_1 \mid D!y \} \\
\hline
\lambda P_0 \lor x P!x & \lambda x_0 Cx & \lor \{ x_1 \mid C!x \} & \lambda x_0 x_1 & \lambda P_0 \lor y P!y & \lambda x_0 Dx & \lor \{ y_1 \mid D!y \} \\
\hline
\end{array}
\]

According to this analysis, if either description is improper, it is a non-starter, and the sentence is a non-starter, due to presupposition-failure.

4. The Predicative Account of Definite Descriptions

Another account of descriptions must be mentioned – the predicative account.¹⁴ By way of formalizing this account within our semantic framework, we offer the following categorial rendering predicative-the.

\[
\text{the[p]} \quad C \rightarrow C \quad \lambda P_0 \quad \lambda x_0 \quad P!x
\]

In other words, according to the predicative account, even though ‘the’ behaves syntactically as a determiner, it behaves semantically as a modifier adjective.¹⁵

In order to illustrate the plausibility of this approach, we first recall that, in traditional grammar, a sentence like

3. Jay is the man next to Kay

is understood as involving:

<table>
<thead>
<tr>
<th>Subject</th>
<th>Verb</th>
<th>Predicate-Nominative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jay</td>
<td>is</td>
<td>the man next to Kay</td>
</tr>
</tbody>
</table>

According to the Russell account, and the Strawson account, the nominative part of predicate-nominative is emphasized – it is an NP, so ‘is’ is identity. The following are the derivations.

---

¹³ We could also use linear-composition, in two different ways (scopes), but since \( \lor \) is associative, the three readings are all equivalent.

¹⁴ Delia Graff Fara (2001) presents the boldest and most thorough version of this thesis.

¹⁵ Which moreover is non-conjunctive; to be the-dog is not to be “the” and dog!
By contrast, according to the predicative-account, the *predicate* part of predicate-nominative is emphasized; it is a bare adjective, and ‘is’ is copular.

This says that Jay is a man-next-to-Kay, and no one else is. Notice that treating ‘the F’ as a bare-adjective makes ‘is the F’ completely analogous to ‘is virtuous’.

The latter may seem merely to be logic-chopping. But treating descriptions as CNPs permits a completely straightforward analysis of examples like the following.

Obama wants to be the greatest president

If the description ‘the greatest president’ is a DP, then ‘to be’ is identity, so if Lincoln is in fact the greatest president, then this says Obama wants to be identical to Lincoln!\(^{16}\) On the other hand, according to the predicative approach, we do not face this difficulty,\(^{17}\) since we treat ‘the greatest president’ as a CNP, and treat ‘be’ as copular, as in the following semantic analysis.

Here ‘PRO’ is an unpronounced reflexive pronoun ‘himself’, which is analyzed as follows.

Note that the category of ‘wants’ is something we haven't examined in detail. As used here, “wants” is a relation between agents and kinds of states-of-affairs. The final formula says that Obama wants a state-of-affairs\(^ {18}\) in which he is a president who is greater than all the other presidents.

\(^{16}\) We can also avoid this conclusion if we employ the Russell-analysis of ‘the’. There are then two readings according to whether ‘the president’ has wide scope or narrow scope. This is left as an exercise.

\(^{17}\) The new account still permits the goofy reading, but it no longer seems logically apt.

\(^{18}\) We could also express this indefinite phrase ‘a state of affairs…’ via \(\Sigma \{s \mid G!s/o\} \).
5. On Deferring \(^{19}\) – A Unified Account of Definite Descriptions

We have now examined three different accounts of ‘the’.

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<th>Strawson Account</th>
<th>descriptions are DNPs</th>
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<tr>
<td>[ \text{the[s]} ]</td>
<td>C→D [ \lambda P_0 \ 1xPx ]</td>
</tr>
</tbody>
</table>

<table>
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<th>Russell Account</th>
<th>descriptions are QPs</th>
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</thead>
<tbody>
<tr>
<td>[ \text{the[R]} ]</td>
<td>C→∨D [ \lambda P_0 \ \lor xP!x ]</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Predicate Account</th>
<th>descriptions are CNPs</th>
</tr>
</thead>
<tbody>
<tr>
<td>[ \text{the[P]} ]</td>
<td>C→C [ \lambda P_0 \ \lambda x_0 P!x ]</td>
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</tbody>
</table>

We now present a single unified account that subsumes all three accounts. Fundamental to the unification is the inherent semantic versatility of common-noun-phrases, which is related to the fundamental correspondence between sets and their characteristic-functions, and between sets and their associated pluralities. For example, ‘dog’ can be thought of as referring to:

- the set of dogs,
- or: the function that assigns T to every dog, and F to every non-dog,
- or: all-the-dogs, which is to say: dog-1 and dog-2 and …

We have emphasized the connection between the latter two, which is encapsulated in the following semantic principle.

CNP-Duality

\[ \lambda \nu \Phi \dashv \vdash \Sigma \nu \Phi \]

With this in mind we propose the following.

<table>
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<th>Unified Account</th>
<th>descriptions are INPs</th>
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</thead>
<tbody>
<tr>
<td>[ \text{the[U]} ]</td>
<td>C→ΣD [ \lambda P_0 \ \Sigma xP!x ]</td>
</tr>
</tbody>
</table>

How does this unify the three earlier accounts? First, notice that, by CNP-duality,

\[ \lambda \nu \Phi \! x \approx \Sigma xP!x \]

so

\[ \text{the[P]} \approx \text{the[U]} \]

The following derivation illustrates.

\[ \text{Jay +1 is [Cop]} \quad \text{the[P]} \quad \text{man-next-to-Kay} \]

\[ \lambda P_0 \ \Sigma xP!x \quad \lambda x_0 M!x \]

\[ \lambda P_0 \ P_1 \quad \Sigma xM!x \quad \lambda x_0 M!x \quad \text{CNP-Duality} \]

\[ \lambda x_1M!x \]

\[ M!j \]

\(^{19}\) Equal to ‘On Denoting’ (Russell) + ‘On Referring’ (Strawson).
Next, we observe that ‘the[\text{u}]’ is parallel to ‘the[\text{r}]’.

\[
\begin{array}{l|l|l|l}
\text{the[\text{r}]} & C \to \forall D & \lambda P_0 \forall x P!x & \text{descriptions are QPs} \\
\hline
\text{the[\text{u}]} & C \to \Sigma D & \lambda P_0 \Sigma x P!x & \text{descriptions are INPs} \\
\end{array}
\]

The difference is $\lor$ [disjunction] versus $\Sigma$ [sum]. Recall that both of these junctions simplify to existentials. On the other hand, whereas a sum of entities is an entity, a disjunction of entities is not. Also, recall that the type-flexibility of $\Sigma$ allows us to distinguish between distributive and collective readings of INPs, as in the following examples.

<table>
<thead>
<tr>
<th></th>
<th>most plausibly reads</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Jay owns dogs</td>
<td>Jay owns \textit{some} dogs</td>
<td></td>
</tr>
<tr>
<td>Jay loves dogs</td>
<td>Jay loves \textit{dogs-as-a-whole}</td>
<td></td>
</tr>
</tbody>
</table>

This flexibility also allows us to navigate between the Russellian and Strawsonian accounts of descriptions, as seen in analyzing the following famous example.\(^{20}\)

\[\text{the present king of France is bald}\]

In the following, we interpret ‘the F’ not as a QP $[\forall x F!x]$, nor as a DP $[\lambda x F]$, but as an indefinite-noun-phrase, $\Sigma x F!x$. The flexibility of $\Sigma$ then yields two different semantic trees.

\[
\begin{array}{c|c|c|c|c}
\text{the[\text{u}]} & \text{present-king-of-France} & +1 & \text{is bald} \\
\hline
\lambda P_0 \Sigma x P!x & \lambda x_0 Fx & \lambda x_0, x_1 & \Sigma \{ \begin{array}{l} x_1 | F!x \end{array} \} & \lambda x_1 Bx \\
\hline
\Sigma \{ \begin{array}{l} Bx | F!x \end{array} \} & \lambda x_1 Bx \\
\end{array}
\]

On the left side, the case-marker (+1) distributes over the sum. $\Sigma$ eventually applies to a collection of sentences, which simplifies to an existential, which is exactly the same as the formula obtained using the Russellian analysis – there is exactly one French king, and he is bald.

On the right side, the case-marker applies to the sum-as-a-whole. Now, the sum of a collection of entities is itself an entity, unless the collection is empty, in which case the sum is null. In the above example, the sum is $\Sigma x F!x$. So the question is whether \textit{this} is proper, which amounts to the question whether the collection $\{ x | F!x \}$ is non-empty, which amounts to the question whether there is exactly one $F$.

So suppose there is in fact exactly one $F$, call it $F$. Then the set $\{ x | F!x \}$ is non-empty, and indeed $\{ x | F!x \} = \{ F \}$, so $\Sigma \{ x | F!x \} = \Sigma \{ F \} = F$. So, if there is in fact exactly one $F$, then ‘the present king of France’ denotes it! On the other hand, if the description is improper, then $\{ x | F!x \} = \emptyset$, so $\Sigma \{ x | F!x \}$ is null, and ‘the present king of France’ denotes nothing! In either case, we have $\Sigma \{ x | F!x \} = \lambda x F!x$.

Thus, if the description is proper, we can pursue either side of the semantic derivation, and we get the same truth-value. On the other hand, if the description is improper, the derivation fails\(^{22}\) on the right side, but succeeds on the left side. Supposing we want to complete the semantic derivation, if the description is improper, we must pursue the derivation down the left side, in which case

---

\(^{20}\) Many years ago, my wife and I attended a Halloween party that featured philosophically-themed costumes. I went as a bound variable [and later free variable]. My wife [an entomologist, \textit{entymologist}] went as follows – she wore a hat with a small wrapped present hanging from it, which was labeled:

\[\text{To: Bertrand Russell; From: the Present King of France.}\]

This is a great pun already, since ‘The Present King of France’ could be the name of a gift shop. But that was not the \textit{real} pun; the philosophical/psychological concept was ‘specious present’ [cf. William James and C.D. Broad].

\(^{21}\) Earlier used to account for generic-uses of nouns, in sentences like ‘children like dogs’.

\(^{22}\) Failure here is denotation-failure, not semantic-failure.
\[ \Sigma \{ x \mid F!x \} \] takes on its quantificational guise, resulting in the usual Russellian formula, which in this case is false.

6. A Problem for All Four Accounts; Plural Nouns and Mass Nouns

There is still a big problem for the above account of descriptions, whether we follow Russell, Strawson, the way of predication, or the unified way. Consider the following example.\(^{23}\)

5. the dogs are barking

According to all four accounts given above, if ‘the dogs’ is proper, then the following is true.

\[ \exists x \{ D!x \land Bx \} \]

Note carefully that the phrases are all plural, so this says:

\[ \exists x \text{ there is a plurality } x \text{ [there are } x]\text{ such that:} \]

\[ D!x \text{ only } x \text{ are dogs and} \]

\[ Bx \text{ } x \text{ are barking} \]

where

\[ D!x \text{ only } x \text{ are dogs} \]

\[ Dx \text{ } x \text{ are dogs} \]

and

\[ \sim \exists x \{ x \neq \alpha \land Dx \} \text{ no things distinct from } x \text{ are dogs} \]

Now, suppose there are in fact exactly three dogs in the relevant situation – Penny, Quasi, and Rex, – the plurality of which we refer to as \( \text{PQR} \).\(^{24}\) It is obvious then that

\[ \text{PQR are the dogs,} \]

and so

\[ \text{only PQR are dogs,} \]

which means that:

\[ \text{PQR are dogs} \]

and

\[ \text{no things distinct from PQR are dogs} \]

But the latter conjunct is false, since surely we have the following.

\[ \begin{array}{ccc}
\text{PQ are dogs} & \text{PR are dogs} & \text{QR are dogs} \\
\text{and} & \text{and} & \text{and} \\
\text{PQ \neq PQR} & \text{PR \neq PQR} & \text{QR \neq PQR} \\
\end{array} \]

In other words, there are pluralities other than \( \text{PQR} \) that are dogs; they include \( \text{PQ, PR, QR} \). But then there isn’t exactly-one dog-plurality that is/are barking; there are in fact four – \( \text{PQ, PR, QR, PQR} \)!

A parallel counter-example can be formulated using mass-nouns, such as:

6. the water is boiling

Supposing water is arbitrarily-divisible, and supposing that a mass of water is boiling if and only if all its watery sub-masses are boiling, we have not one, but arbitrarily-many, watery masses that are boiling.\(^{25}\)

\(^{23}\) This criticism traces to Sharvy (1980). See Section 9 below.

\(^{24}\) This notation is short for \( P^+Q^+R \), or \( \Sigma \{P,Q,R\} \), which can be understood as Penny-and-Quasi-and-Rex.

\(^{25}\) Boiling is a macroscopic [colligative] property, which does not apply to the ultimate constituents (“atoms”) of water. It is an empirical matter, not logical matter, what counts as a watery [macroscopic] sub-mass.
7. Back to the Drawing Board!

In light of these serious difficulties, we must adjust our account of descriptions. The trouble seems to revolve around distinctness and the related concepts of one and two. As we have already seen in Chapter 9 [Number Words], counting is not as easy as one might think. Recall the interchange between Carmen Miranda and Groucho Marx [in logical guise].

Carmen: I can’t be in two places at the same time!
Groucho[1]: But you are in two places at this time;
for you are in New York City at this time,
and you are in the U.S. at this time,
and those are surely two places!

Recall that we propose that distinctness is ambiguous between logical-distinctness (≠) and mereological-distinctness (⊥), which is conveyed by the phrase ‘wholly distinct’. So Carmen Miranda’s response to Groucho[1] should be:

I am in NYC, but I am not in any place that is wholly-distinct from NYC;
yes, I am also in the U.S., which is logically-distinct from NYC, but it is not wholly-distinct from NYC, since NYC is part of the U.S.

With this in mind, we rewrite our definition of uniqueness as follows.

\[ P!_\alpha \equiv P\alpha \land \neg \exists x(x \perp \alpha \land P\alpha) \]

Here ⊥ is mereological-disjointness. Notice that, if we concentrate on singular-entities, then disjointness coincides with non-identity, and this principle reduces to our original principle.

With this in hand, let us reconsider our dog-trio PQR. They are the dogs, because they are a dog-plurality and there is no dog-plurality wholly-distinct from them are dogs. Yes, PQ, PR, and QR are all logically-distinct (≠) from PQR, and dogs, but they are not wholly-distinct (⊥) from PQR.

8. Counter-Examples

The revised account of uniqueness looks promising, but the following example presents an immediate challenge.

This may be analyzed as follows.\(^{26}\)

<table>
<thead>
<tr>
<th>the [0]</th>
<th>three</th>
<th>dogs</th>
</tr>
</thead>
<tbody>
<tr>
<td>(\lambda x_0.3x)</td>
<td>(\lambda x_0.Dx)</td>
<td></td>
</tr>
<tr>
<td>(\lambda P_0\Sigma xP!\alpha)</td>
<td>(\lambda x_0[3Dx])</td>
<td></td>
</tr>
<tr>
<td>(\Sigma x[3D!\delta])</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

So, the question is whether the description is proper, which amounts to whether there is a plurality \(\delta\) such that:

\[ 3D!\delta \]
\[ \delta \text{ are three dogs} \]

The latter expands thus:

\[ 3D\delta \]
\[ \delta \text{ are three dogs} \]

and

\[ \neg \exists x\{x \perp \delta \& 3Dx\} \]
\[ \text{no plurality distinct from } \delta \text{ are three dogs} \]

Now suppose as before that PQR are a dog-trio, but further suppose there is an extra dog, Sonny.\(^{27}\) So we have a dog-quartet SPQR,\(^{28}\) so the description ‘the three dogs’ is improper. Nevertheless

---

\(^{26}\) Using the simplified account of number.

\(^{27}\) Perhaps spelled ‘Sunny’. My grandfather had a collie with this name, but no one knows how it was spelled. My colleague Hilary Kornblith also had a dog with this name. Whereas his wife and daughter vehemently disagree about the spelling, Hilary maintains “there is no fact of the matter!”

\(^{28}\)
3D[PQR]  
PQR are three dogs
and
\neg \exists x \{ x \perp PQR \& 3Dx \}  
no plurality distinct from PQR are three dogs

To see the latter, suppose otherwise. Then there are three dogs that are wholly-distinct from PQR. But that means there are in fact six dogs, which contradicts our premise that there are only four dogs total. It follows that PQR are the three dogs, even though they are not the dogs.

Numerical-adjjectives are odd, as this example further illustrates! The chief difficulty is that ‘three’ is not distributive, the latter being defined as follows, where \leq is the part-whole relation.

\[
\text{DIST}[P] \equiv_{a} \forall x \{ Px \rightarrow \forall y(y \leq x \rightarrow Py) \}
\]

Note that 3 is not distributive, since 3[PQR], and P\leq PQR, but not: 3[PQ].

Another example of a non-distributive predicate is ‘surround’. For example, five students can surround a building, yet no single student can do so.\(^{29}\) Accordingly, the description

the students who surrounded the administration building \(^{30}\)

[abbrev: the surrounding-students]

presents another counterexample to the account above. To see this, suppose that ABCDE is a quintet of surrounding-students, and no other student is involved in this event. Then ABCDE are the surrounding-students. Suppose that ABCD are also surrounding-students, but E is not a surrounding-student. Then ABCD is a plurality of surrounding-students, and there is no plurality of surrounding-students disjoint from ABCD. So, according to the proposed account, ABCD are the surrounding-students, contrary to the supposition that ABCDE are the surrounding-students.

9. Sharvy’s Account of Descriptions

Recall our earlier counter-examples to the traditional account of descriptions. These examples trace to Ben Sharvy (1980), who proposes an alternative to the traditional account of definite descriptions. Just like us, Sharvy pursues a mereological approach. However, whereas we take ‘the’ to involve uniqueness, conveyed by mereological-disjointness, Sharvy takes ‘the’ to involve maximality, conveyed by the part-whole relation, as follows.\(^{31}\)

\[
\text{P} \alpha \equiv_{a} \text{P} \alpha \& \forall x \{ Px \rightarrow x \leq \alpha \}
\]

\alpha is maximally P
\text{P} \alpha \text{ is P, and } \alpha \text{ contains every } P

For comparison, P!\alpha can be redefined as follows.

\[
\text{P} ! \alpha \equiv_{a} \text{P} \alpha \& \forall x \{ Px \rightarrow x \Omega \alpha \}
\]

\alpha is uniquely P
\text{P} \alpha \text{ is P, and } \alpha \text{ overlaps every } P

Alternatively, we can reconfigure maximality to look more like uniqueness, as follows.

\[
\text{P} \alpha \equiv_{a} \text{P} \alpha \& \sim \exists x \{ x \perp \alpha \& Px \}
\]

\alpha is maximally P
\text{P} \alpha \text{ is P, and nothing not contained in } \alpha \text{ is P}

\[
\text{P} ! \alpha \equiv_{a} \text{P} \alpha \& \exists x \{ x \perp \alpha \& Px \}
\]

\alpha is uniquely P
\text{P} \alpha \text{ is P, and nothing disjoint from } \alpha \text{ is P}

Note the following theorems.\(^{32}\)

---

28 The dogs are patriotic Romans.
29 Unless the student is very large and amorphous!
30 Another 60's happening in which the students shouted “Free Logic!”
32 See Formal Appendices.
\[ \alpha \leftrightarrow \alpha \beta \iff \alpha, \beta \text{ are atomic} \]
\[ \alpha \Omega \beta \leftrightarrow \alpha \beta \iff \alpha, \beta \text{ are atomic} \]
\[ P \uparrow = P \uparrow \iff P \text{ is distributive} \]

So the two accounts are co-extensive when restricted to distributive predicates. But, as seen in the previous section, there are pesky examples in which the predicates are not distributive, which subvert the uniqueness \([!]\) account. What about Sharvy’s maximality \([\uparrow]\) account?

First, we adjust the accounts of descriptions, replacing ‘!’ by ‘\(\uparrow\)’.

\[
\begin{array}{|c|c|}
\hline
\text{the}[s] & C \rightarrow D \quad \lambda P_0 1x[P\downarrow x] \\
\text{the}[R] & C \rightarrow \lor D \quad \lambda P_0 \lor x[P\downarrow x] \\
\text{the}[P] & C \rightarrow C \quad \lambda P_0 \lambda x_0[P\downarrow x] \\
\text{the}[U] & C \rightarrow \Sigma D \quad \lambda P_0 \Sigma x[P\downarrow x] \\
\hline
\end{array}
\]

The remaining question is whether the new account overcomes the counterexamples from Section 8.

1. Three-Dog Example
Suppose SPQR is a dog-quartet. Then PQ\(R\) is dog-trio, and every dog-trio overlaps PQ\(R\), so according to the \(!\)-account, PQ\(R\) are the-three-dogs. Not good! However, this scenario does not subvert the \(\uparrow\)-account. For SPQ is a dog-trio not contained in PQ\(R\), so according to the \(\uparrow\)-account, PQ\(R\) are not the-three-dogs.

2. Five-Student Example
Suppose ABCDE are the surrounding-students. Suppose further that ABCD are surrounding-students, but E is not. Then no plurality disjoint from ABCD are surrounding-students, so according to the \(!\)-account, ABCD are the surrounding students. Not good! However, this scenario does not subvert the \(\uparrow\)-account. For ABCDE is a plurality of students surrounding the building not contained in ABCD, so according to the \(\uparrow\)-account, ABCD are not the students who surrounded the building.

The number of permissible readings according to which these translate as follows.

1. a dog is happy if and only if the dog is well-fed.
\[ \forall x \{ D x \rightarrow H x \leftrightarrow F x \} \]
2. if a man owns a dog, then he feeds it
\[ \forall x \forall y \{ M x \& D y \rightarrow O x y \rightarrow F x y \} \]

It is commonplace in English to replace anaphoric pronouns with descriptive phrases, as in:

1. a dog is happy if and only if the dog is well-fed
2. if a man owns a dog, then the man feeds the dog

First note that there are permissible readings according to which these translate as follows.\(^{33}\)

1. ∀x \{ Dx \rightarrow H x \leftrightarrow F[y\downarrow Dy] \}
2. ∀x∀y \{ M x \& D y \rightarrow O[i\downarrow x M x, 1 y\downarrow Dy] \rightarrow F[i\downarrow x M x, 1 y\downarrow Dy] \}

\(^{33}\) Using the Strawson approach, since it is compact.
However, these readings are not very plausible. On the other hand, the following is fairly plausible.

8. a dog is happy if and only if the alpha-dog is well-fed

This is presumably stated in reference to a dog-pack that has exactly one alpha-dog. This presumably translates as follows via the standard account of ‘the’.

\( \forall x \{ D_x \rightarrow. H_x \leftrightarrow F[yAy] \} \)

Since we do not want to throw the baby out with the bathwater, we do not want to block the above readings. Rather, we propose that there is a primary (descriptive) reading of ‘the’, and also a secondary (anaphoric) reading of ‘the’, which is officially rendered as follows.

\( (\alpha) \text{the } C \rightarrow (D_\alpha \rightarrow D) \lambda P_0 \lambda x_\alpha [x / Px] \)

Note the parenthetical \( \alpha \), which recapitulates how it attaches to anaphoric pronouns. Also note the slash symbol ‘/’, which revisits the conditional-assertion operator, which is defined as follows.

\[
A / B = A, \text{ if } B \text{ is true}; \\
A / B = \varnothing, \text{ if } B \text{ is false}.
\]

As originally conceived, conditionalization is a sentence-operator, so it is restricted to sentences. But it can also be expanded to all types, as follows.

<table>
<thead>
<tr>
<th>( \alpha / \Phi )</th>
<th>reads</th>
<th>( \alpha ) given/provided ( \Phi )</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \alpha / \Phi = \alpha, \text{ if } \Phi )</td>
<td>( \alpha / \Phi = \varnothing, \text{ if not-} \Phi )</td>
<td></td>
</tr>
</tbody>
</table>

We propose the term proviso for any right-complement of ‘/’. We also expand the rules of composition so that they carry/merge any provisos. The following is a simple example.

\[
\lambda P_0 \lambda x_{-1} [x / P_0] D_0 \\
\lambda x_{-1} [x / D_0] \lambda x x_6 \\
\lambda x_{-1} [x_6 / D_0] \lambda x_2 M(x) \\
\lambda x_{-1} [M(x) / D_0]
\]

The resulting function takes an anaphoric-marked \([-1]\) entity, and yields its mother subject to the proviso that the entity is a dog. In other words, the function yields the entity’s mother so long as the entity is a dog.

This corresponds exactly to the mathematical notion of function-restriction, which takes a function and cuts down its domain, thereby making a new (but similar) function. For example, the square-function is usually defined over the set of all real numbers, but it can be restricted to the integers. The resulting function is just like the original function except that it is undefined for non-integers.

Function-restriction is formalized by rewriting lambda-conversion as follows.

\[
\text{Restricted Lambda-Conversion} \\
\[ \lambda x \{ \beta / \Phi \} \langle \alpha[c/v] \rangle = \beta[c/v] \text{ if } \Phi[c/v] \]
\]

---

34 Supposing (pretending) this notion is scientifically respectable. Recent research on wolves has thrown serious doubt on the early studies that created this meme. (+++ref+++). Perhaps compare with the Great Eskimo Vocabulary Hoax [Pullum (1991)].

35 Nor do we want to throw the eggs out of the frying pan into the fire before they are hatched.

36 First seen in Chapter 6 [Quantification Reimagined].

37 The rule, in effect, is: \( \alpha / \Phi \times [\beta / \Psi] = [\alpha \times \beta / \Phi \& \Psi] \).
For example, when we apply this idea to the mother function above, we have:

\[
\lambda x.1 \{ M(x) / D x \} \langle \alpha, 1 \rangle = \begin{cases} M(\alpha) & \text{if } D\alpha \\ \emptyset & \text{otherwise} \end{cases}
\]

The following derivation illustrates how function-restriction (conditionalization) works.

<table>
<thead>
<tr>
<th>a dog</th>
<th>+1-1 is happy</th>
<th>if and only if</th>
<th>(-1) the</th>
<th>dog</th>
<th>+1 is well-fed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Σ x Dx</td>
<td>λ x { x \times x }</td>
<td>λ x \times H x</td>
<td>λ P0 λ x { x / P x }</td>
<td>D0</td>
<td>λ x \times F x</td>
</tr>
<tr>
<td>Σ { x \times x }</td>
<td>\lambda p : Q { Q \leftrightarrow P }</td>
<td>\lambda x : { x / D x }</td>
<td>\lambda x : { x / D x }</td>
<td>\lambda x : { x / D x }</td>
<td></td>
</tr>
</tbody>
</table>

\[\begin{align*}
\beth & \Pi \{ H x \times \lambda Q \{ Q \leftrightarrow F x \} / D x \} \\
\Pi & \{ H x \leftrightarrow F x \} / D x \\
\bar{\Pi} & \{ H x \leftrightarrow F x \} / D x \\
\forall x & \{ D x \rightarrow H x \leftrightarrow F x \}
\end{align*}\]

\[\begin{align*}
\beth \text{ ‘if and only if’ promotes } \Sigma \text{ to } \Pi. \\
\bar{\Pi} \text{ recall how conditional-assertion interacts with junctions.}
\end{align*}\]

Compare this with the alpha-dog example, where instead of using the usual (and plausible) descriptive-the, we use anaphoric-the, in which case ‘the alpha dog’ alludes to ‘a dog’.

9. a dog is happy if and only if the alpha-dog is well-fed

So this says an alpha-dog is happy iff it is well-fed.38

The following is another example in which the nouns don't match exactly, but it is more plausible.

38 This is implausible as it stands, but the construction does not always produce implausible readings, so we do not want to rule it out in general. See later section on semantic gender.
10. a dog is happy if and only if the critter\(^\text{39}\) is well-fed

\[
\begin{array}{c|c|c|c}
\text{a dog} & +1 & -1 & \text{is happy} \\
\text{if and only if} & \text{the} & \text{critter} & +1 \text{ is well-fed} \\
\hline
\Sigma \{ Hx \times x_1 | Dx \} & \lambda x_1 \lambda Q \left[ \left( Q \leftrightarrow Fx \right) / Cx \right] & \\
\end{array}
\]

\[
\begin{align*}
\Pi \{ & Hx \times \lambda Q \left[ \left( Q \leftrightarrow Fx \right) / Cx \right] | Dx \} \\
\Pi \{ & Hx \leftrightarrow Fx | Cx \& Dx \} \\
\Pi \{ & \left[ Hx \leftrightarrow Fx \right] / \left[ Cx \& Dx \right] \} \\
\forall x \{ & Dx \rightarrow Hx \leftrightarrow Fx \} \\
\end{align*}
\]

\(\text{① since } \text{Dx entails } Cx [\text{according to the lexicon}].\)

11. Semantic (Natural) Gender

Many languages \([\text{including Latin, German, French, Spanish, \ldots} \text{]}\) decline nouns according to gender, and enforce gender-agreement. On the other hand, many gender-assignments in these languages do not carry semantic (natural) significance. Perhaps the most striking examples of unnatural gender-assignments are diminutive forms in German, such as ‘mädchen’ and ‘fräulein’, which are syntactically neuter, even though the beings these words denote are naturally feminine.\(^\text{40}\)

English also uses gender-marking, for pronouns and a few common nouns,\(^\text{41}\) and enforces gender agreement. But unlike the languages mentioned above, English gender-markers usually carry semantic (natural) significance.\(^\text{42}\) For anaphoric pronouns at least,\(^\text{43}\) gender-marking can be semantically rendered as follows. Notice that semantic-gender is a special case of anaphoric-the.\(^\text{44}\)

\[
\begin{align*}
\text{(a) he} & = \lambda x_\text{a}:x \\
\text{(a) she} & = \lambda x_\text{a}:x \\
\text{(a) it} & = \lambda x_\text{a}:x \\
\end{align*}
\]

\[
\begin{align*}
\lambda x [x / \text{MASC}[x]] & = \lambda x_\text{a} [x / \text{MASC}[x]] = (a) \text{ the MASC} \\
\lambda x [x / \text{FEM}[x]] & = \lambda x_\text{a} [x / \text{FEM}[x]] = (a) \text{ the FEM} \\
\lambda x [x / \text{NEUT}[x]] & = \lambda x_\text{a} [x / \text{NEUT}[x]] = (a) \text{ the NEUT} \\
\end{align*}
\]

The following derivation illustrates how gender-markers contribute semantically.

a professor walked into the room; \text{she sat down}

---

\(^{39}\) In North American English, ‘critter’ is a humorous/dialect-variant of ‘creature’.

\(^{40}\) Syntactic gender seems highly counter-intuitive to native English speakers. For example, Mark Twain wrote an essay (1880) in which he translates German pronouns into English with their gender-markers, which produces some rather hilarious sentences.

\(^{41}\) Including masculine/feminine forms such as:

father/mother, brother/sister, king/queen, duke/duchesse, actor/actress, host/hostess

Some of the feminine forms have been eschewed. For example, Elizabeth I signed “Elizabeth REX”, and many female actors prefer ‘actor’ to ‘actress’. I am pretty sure most female doctors also prefer ‘doctor’ to ‘doctress’.

\(^{42}\) Old English (Anglo-Saxon) has three syntactic genders, like German and Latin. J.R.R. Tolkien makes use of this in \textit{The Silmarillion} (1977), in which he adopts Anglo-Saxon genders for a few common-nouns – for example, a river is a "he". Note also that, even in modern English, ships are often referred to using ‘she’, although the exact origin of this is obscure. (For example, Anglo-Saxon ‘scip’ [\textit{ship}] is Neuter.)

\(^{43}\) See Unit C Section 32 [Semantic Gender Revisited] for an account of demonstrative pronouns.

\(^{44}\) Bear in mind that what counts as "masculine", "feminine", and "neuter" is often context-dependent.
Notice in particular how the feminine pronoun ‘she’ supplies additional semantic information. Also, notice that we can replace ‘professor’ by other common-nouns with varying semantic success. For example, ‘dog’ works fine, whereas ‘robot’ works less well, and ‘man’ works rather badly. Also, if we change ‘she’ to ‘it’, we have a non-starter\(^{45}\) unless the context somehow supports an appropriate interpretation of NEUTER.\(^{46}\)

The following example illustrates how gender-markers might engender semantic dissonance.\(^{47}\)

If a professor is writing, then she is happy

<table>
<thead>
<tr>
<th>Expression</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>(\Sigma{x_1 \times x_1 \mid Px})</td>
<td>Full conjunctive context of professor who is writing</td>
</tr>
<tr>
<td>(\lambda x_1 Wx)</td>
<td>A professor who is writing</td>
</tr>
<tr>
<td>(\Sigma{Wx \times x_1 \mid Px})</td>
<td>is-writing</td>
</tr>
<tr>
<td>(\Pi{\lambda Y[Y/Wx] \times x_1 \mid Px})</td>
<td>(-1) she +1 is-happy</td>
</tr>
<tr>
<td>(\Pi{\lambda Y[Y/Wx] \times [Hx/\text{FEM}[x]] \mid Px})</td>
<td></td>
</tr>
<tr>
<td>(\Pi{Hx/\text{FEM}[x] \mid Wx \mid Px})</td>
<td></td>
</tr>
<tr>
<td>(\Pi{Hx\mid Px &amp; Wx &amp; \text{FEM}[x]})</td>
<td></td>
</tr>
<tr>
<td>(\forall x{Px &amp; Rx &amp; \text{FEM}[x] \rightarrow Hx})</td>
<td></td>
</tr>
</tbody>
</table>

For any \(x\) : if \(x\) is a female professor who is writing, then \(x\) is happy

12. The Former and The Latter

The expressions ‘the former’ and ‘the latter’ are special cases of anaphoric-the, but with the additional twist that the intended antecedents are selected according to the order in which the candidate antecedent phrases. This requires semantic processing sometimes to take into account the left-right structure of a semantic-tree.

We postpone analyzing these phrases until we have more semantic machinery.\(^{48}\)

---

\(^{45}\) In the sense that \(\Sigma\{Wx \& Sx \mid Px \& \text{FEM}[x]\}\) is empty.

\(^{46}\) For example, AI devices are not naturally endowed with gender, but they have voices that have gender. For example, my family all refer to our car’s GPS as ‘she’, since it has a female voice.

\(^{47}\) Note, however, that some writers these days often use ‘she’ as a gender-neutral pronoun, although others prefer ‘he/she’ or singular-they for this purpose.

\(^{48}\) See Chapter 14 [Pronoun-Binding Revisited 2].
B. Only

1. Introduction

Recall that the only-operator \([!]\) is defined so that:

\[
P!\alpha \equiv_a P\alpha \& \neg\exists x\{x \perp\alpha \& Px\}
\]

Here, \(P\) is a one-place predicate, \(\alpha\) and \(x\) are entities, and \(\perp\) is disjointness. We can read this as saying:

only \(\alpha\) is/are \(P\)

Given this reading of ‘!’, one naturally suspects that (something like) ‘!’ figures in the semantic account of the word ‘only’. In this unit, we investigate this idea.

13. The Versatility of Only

First we note that ‘only’ is very versatile, as illustrated in the following examples.

- only Jay is virtuous.
- only Jay and Kay are virtuous.
- only saints are virtuous.
- the only virtuous people are Jay and Kay.
- Jay and Kay are the only virtuous people.
- the only virtuous people are saints.
- saints are the only virtuous people.
- only poisonous snakes are dangerous.
- the only dangerous snakes are (the) ones that are poisonous.
- only the good die young.
- you will succeed only if you practice.

We note that ‘only’ is also flexible. Indeed, what makes ‘only’ so interesting, and perplexing, is that the very same surface form can receive wildly different readings. My favorite example comes from a popular song whose title and key lyric is:

I only have eyes for you.

I think everyone understands the sentiment expressed in this lyric. But imagine a considerably more gruesome scenario in which the village butcher saves body parts for the notorious mad-scientist Victor Frankenstein; further imagine that one day the village butcher declares:

**sorry, Dr. Frankenstein, but today I only have** eyes for you.

It is also not too hard to imagine a considerably less flattering song, according to which the crooner tells his girlfriend that only he has eyes for her. This is surely an example of croon-fail!

Another popular love song lyric is the following.

God only knows what I’d be without you.

The intended meaning focuses on ‘God’, but a more heretical reading focuses on ‘what I’d be without you’, and accordingly says that God knows precious little! Yet another heretical reading focuses on ‘knows’, and accordingly suggests that God may not care very much about us.

Back to “Eyes”. The difference in these three readings arises from a difference in focus, which can be annotated as follows, using boxes to indicate the focus-phrase.

---

49 The word ‘only’ is an example of an exclusive-adverb, other examples of which include:

- alone, uniquely, solely, just, exactly, precisely, merely, simply, exclusively, barely, scarcely

50 Written by Harry Warren and lyricist Al Dubin in 1934 for the film Dames. Many artists have sung it since then.

51 This is how the song was originally configured in 1934.

52 Written by Brian Wilson and Tony Asher (1966).

53 We can also concoct readings according to which any one of the following is focused:

- have, for, have eyes, have eyes for, have eyes for you

But these are far-fetched. For example, the last one says in effect “I do nothing but have-eyes-for you”. Talk about focus! See later for the calculation of this reading.
I only have eyes for you.

The following is our basic informal semantic hypothesis.

‘only’ focuses attention on a particular phrase, and excludes alternatives (to that phrase).

This principle is illustrated and clarified in the following paraphrases of the above three examples.

(1) I have eyes for you but I have eyes for no one else
(2) I have eyes for you but I have nothing else for you
(3) I have eyes for you but no one else has eyes for you

As mentioned elsewhere, the word ‘else’ is anaphoric, and means ‘other than α’, where α is the antecedent phrase. In the examples under consideration, the antecedent phrase is in fact the focus-phrase. So the above can be paraphrased respectively as follows.

(1) I have eyes for you but I have eyes for no one other than you
(2) I have eyes for you but I have nothing other than eyes for you
(3) I have eyes for you but no one other than I has eyes for you

As we have seen earlier, the inter-related concepts of “other than” and “two” are more complicated than initially construed. Initially we construed them both to reduce to non-identity (≠), but we were later forced to replace non-identity by the more general concept of disjointness (⊥).

With this in mind, we offer the following initial categorial rendering of ‘only’.

\[
\text{only}(x) = \lambda \ x \ \ (x \land \exists y (y \neq x))
\]

This is illustrated in the following derivation.

In this example, the focus-phrase is a singular-term. It can also be a plural-term, as in the following example.

54 Notice that the “antecedent” may also be given indexically, just as with pronouns; for example, ‘elsewhere’ means ‘place other than here’. Interestingly, the corresponding phrase ‘elsewhen’ is limited to whimsical and/or poetic usage. For example, Heinlein wrote a novella *Elsewhen* (1941), originally called *Elsewhere*.

55 Chapter 9 [Number Words].

56 Note that this involves conjoining an item of type D with an item of type O\(D\), which is consistent with binary-conjunction. See Chapter 10 [Finitary Junctions].
12. only Jay and Kay are virtuous

<table>
<thead>
<tr>
<th>only</th>
<th>Jay and Kay</th>
<th>+1</th>
<th>are virtuous</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\lambda x (x \land \diamond {y \mid y \perp x})$</td>
<td>J+K</td>
<td></td>
<td>$\lambda x V x$</td>
</tr>
<tr>
<td>$J+K \land \diamond {x \mid x \perp J+K}$</td>
<td>J,K</td>
<td></td>
<td>$\lambda x V x$</td>
</tr>
<tr>
<td>${J+K}_i \land \diamond {x_i \mid x_i \perp J+K}$</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

We treat ‘Jay and Kay’ as a plural-term obtained via mereological-addition. If we interpret ‘and’ as logical-conjunction ($\land$), we obtain the following derivation.

13. only Jay and Kay are virtuous

<table>
<thead>
<tr>
<th>only</th>
<th>Jay and Kay</th>
<th>+1</th>
<th>are virtuous</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\lambda x (x \land \diamond {y \mid y \perp x})$</td>
<td>J+K</td>
<td></td>
<td>$\lambda x V x$</td>
</tr>
<tr>
<td>$J \land \diamond {x \mid x \perp J} \land \diamond {x \mid x \perp K}$</td>
<td>J,K</td>
<td></td>
<td>$\lambda x V x$</td>
</tr>
<tr>
<td>$J_1 \land \diamond {x_1 \mid x_1 \perp J} \land \diamond {x_1 \mid x_1 \perp K}$</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The latter says that only Jay is virtuous and also only Kay is virtuous, which entails they are identical! Although this is a semantically-permissible reading, it is implausible; rather the pragmatically-plausible treatment of ‘and’ here is mereological, not logical.59

14. Expanded Account of Only

In the previous examples, the focus-phrase has type D, but ‘only’ is considerably more versatile than that, so we expand our account as follows.

<table>
<thead>
<tr>
<th>only</th>
<th>$\iota \rightarrow (\iota \land \diamond \iota)$</th>
<th>$\lambda \alpha (\alpha \land \diamond {\beta \mid \beta \perp \alpha})$</th>
</tr>
</thead>
</table>

Here, $\iota$ is any type, and $\alpha$ and $\beta$ are any expressions of that type. For example, the following involves type C.

14. only saints are virtuous

If ‘only’ operates the way we claim it does, then this means:

$saints$ are virtuous, but no other things are virtuous

Recall that ‘saints’ here is an example of an indefinite-noun-phrase, which can be treated either distributively or collectively,60 which means that ‘saints’ in effect means some-saints, or saints-as-a-whole. The following derivation takes the former tack. Note the use of CNP-duality.

57 $V[\alpha+\beta] \leftrightarrow V[\alpha]\&V[\beta]$. More generally, $V[\alpha] \leftrightarrow \forall \beta \{\beta \leq \alpha \rightarrow V[\beta]\}$.
58 $\alpha \perp \beta \& \gamma \leftrightarrow \alpha \perp \beta \& \alpha \perp \gamma$. Generally, $\alpha$ and $\beta$ are disjoint iff every part of $\alpha$ is disjoint from every part of $\beta$.
59 Recall from Chapter 10 [Finitary Junctions] that ‘and’ is interpreted as $\land$ precisely when the phrase admits ‘both’ insertion. Thus the reading is semantically implausible.
60 Recall Chapter 8 [Indefinite Noun Phrases].
Note that the existence-claim “some saints are virtuous” is critical to the meaning; without it, we could truthfully assert that only saints are virtuous merely because no one is virtuous.

The previous derivation takes ‘saints’ to mean some-saints. The following derivation takes ‘saints’ to mean saints-as-a-whole.

The latter says that saints-as-a-whole are virtuous and no group disjoint from saints are as-a-whole virtuous.

15. The Eyes Have It

We now return to the eyes-example. Here we can use typing to make sure ‘only’ finds the proper focus-phrase. In particular, we propose that ‘only’ is multi-typed, but we also propose that every application of ‘only’ chooses one of these types, which moreover is the only way that ‘only’ finds its focus-phrase.

For example, in the romantically-correct reading, the focus-phrase is ‘you’, which has type $\mathcal{D}_2$, in which case we have the following derivation.

15. I only have eyes for you

---

61 Officially, we should write $\lambda y [y_2 \land \{z_2 \mid z \land y\}]$, but we postulate that this is equivalent to $\lambda y [y_2 \land \{z_2 \mid z \land y\}]$.

62 See Appendix on mereology.

63 To see how it follows, suppose to the contrary that some $V$ is not $S$, call it $\alpha$. Let $Q = \lambda x [x = \alpha]$. Then no $Q$ is $S$, and some $Q$ is $V$, so there is a $Q$ such that no $Q$ is $S$ and some $Q$ is $V$, contrary to the hypothesis that there is no such $Q$.

64 This is formally analogous to claiming that ‘only’ is multiply-ambiguous. For each reading, we select one of its meanings.

65 Officially, we should write $\lambda x [x_2 \land y_2]$, but we postulate that this is equivalent to ‘$x \land y$’.
Here, i is the speaker, and Y is the addressee, in the given situation. Also note that ‘have eyes for’ is treated here as an idiomatic-unit.

Next, the croon-fail reading is accomplished by setting the focus-type to be $D_1$.

16. I only have eyes for you

<table>
<thead>
<tr>
<th>I +1</th>
<th>only</th>
<th>have-eyes-for you +2</th>
</tr>
</thead>
<tbody>
<tr>
<td>$i_1$</td>
<td>$\lambda x_1 { x_1 \land \bigcirc { z_1 \mid z_1 \perp i } }$</td>
<td>$\lambda y_2 \lambda x_1 E_{xy}$ $y_2$</td>
</tr>
<tr>
<td>$i_2 \land \bigcirc { x_1 \mid x_1 \perp i }$</td>
<td>$\lambda x_1 E_{xy}$</td>
<td></td>
</tr>
</tbody>
</table>

The previous reading involves croon-fail. The following reading, which focuses on the full VP, involves life-fail!

17. I only have eyes for you

<table>
<thead>
<tr>
<th>I +1</th>
<th>only</th>
<th>have-eyes-for you +2</th>
</tr>
</thead>
<tbody>
<tr>
<td>$i_1$</td>
<td>$\lambda x_1 \bigcirc { E_{xy} \mid x_1 \perp i }$</td>
<td>$\lambda y_2 \lambda x_1 E_{xy}$ $y_2$</td>
</tr>
<tr>
<td>$i_1 \land \bigcirc { x_1 \mid x_1 \perp i }$</td>
<td>$\lambda x_1 E_{xy}$</td>
<td></td>
</tr>
</tbody>
</table>

The latter says that the speaker has eyes for the addressee but s/he does nothing else! Get a life!

Next, in order to shift the focus to ‘eyes’, we must "deconstruct" the idiom ‘have eyes for’, which is to say decompose the phrase into its components, including ‘have’, which we render as a three-place predicate that subcategorizes for a nominative argument, an accusative argument, and a prolative argument. Since the focus ‘eyes’ is accusative, we set the focus-type to be $D_2$.

18. I only have eyes for you

<table>
<thead>
<tr>
<th>I +1</th>
<th>only</th>
<th>have eyes +2 for you +7</th>
</tr>
</thead>
<tbody>
<tr>
<td>$i_1$</td>
<td>$\lambda y_2 \lambda z_1 H_{xyz}$ $\Sigma y E_y\lambda y_2 \lambda x_7$ $x_7$ $y$</td>
<td></td>
</tr>
<tr>
<td>$i_1 \land \bigcirc { x_7 \mid x_7 \perp \Sigma y E_y } \land \bigcirc { \Sigma y E_y, x_7 }</td>
<td>w \perp \Sigma y E_y$</td>
<td></td>
</tr>
</tbody>
</table>

The key remaining question is what does it mean to have $\Sigma x E_x$ for someone. Does “have” distribute over the plural, and in what way. It seems that it's existential-distribution. For consider the following example.66

I have eyes for you… these two eyes

---

66 It might also be understood as a claim about habits, in which case ‘eyes’ is understood generically.
16. Adjective Focus

We have seen examples in which the focus is a common-noun-phrase, which has type C. We next consider examples in which the focus is a bare-adjective, which also has type C. We temporarily depart from lyrical examples in order to consider a more colorful example.67

19. only poisonous snakes are dangerous

The most natural reading locates the focus on ‘poisonous’, but there are three readings.

a. only poisonous snakes are dangerous
b. only poisonous snakes are dangerous
c. only poisonous snakes are dangerous

These may be paraphrased respectively as follows.

a. poisonous snakes are dangerous, but other snakes are not dangerous.

b. poisonous snakes are dangerous, but other poisonous things are not dangerous.

c. poisonous snakes are dangerous, but other things are not dangerous.

Before continuing, note carefully that the first two make sense because ‘poisonous’ has type C. If the adjective is not conjunctive, we get nonsense, as in the following examples.

only alleged snakes are dangerous.
only alleged snakes are dangerous.
only former snakes are dangerous.
only former snakes are dangerous.

On the other hand, the following make grammatical sense, although they assert wacko propositions.

only alleged snakes are dangerous.
only former snakes are dangerous.

Returning to the poisonous snakes, we consider the three readings in turn.68

20. only poisonous snakes are dangerous

<table>
<thead>
<tr>
<th>only poisonous snakes are dangerous</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \lambda P x [P_0 \land \Box { Q_0 \mid Q \land P }] )</td>
</tr>
<tr>
<td>( \lambda x_0 P x )</td>
</tr>
<tr>
<td>( P_0 \land \Box { Q_0 \mid Q \land P } )</td>
</tr>
<tr>
<td>( \lambda x_0 S x )</td>
</tr>
<tr>
<td>( \lambda x_0 { P x \land S x } \land \Box {{\lambda x_0 { Q x \land S x } \mid Q \land P }} )</td>
</tr>
<tr>
<td>( \lambda x_1 \Sigma x \mid P x \land S x } \land \Box {{\Sigma x \mid Q x \land S x } \mid Q \land P } )</td>
</tr>
<tr>
<td>( \Sigma x \mid P x \land S x } \land \Box {{\Sigma x \mid Q x \land S x } \mid Q \land P } )</td>
</tr>
<tr>
<td>( \Sigma { D x \mid P x \land S x } \land \Box {{\Sigma x \mid D x \mid Q x \land S x } \mid Q \land P } )</td>
</tr>
<tr>
<td>( \exists x { P x \land S x \land D x } \land \neg \exists { \exists x { Q x \land P x } \land \exists x { Q x \land S x \land D x } } )</td>
</tr>
<tr>
<td>( \exists x { P x \land S x \land D x } \land \neg \exists { \neg P x \land S x \land D x } )</td>
</tr>
</tbody>
</table>

This says that some poisonous snakes are dangerous, and no non-poisonous snakes are dangerous.

67 We are told by biologists that poisonous organisms are often very colorful; indeed, what is the point of being a poisonous frog or butterfly or mushroom if your predators don’t know! Note also that the term ‘poisonous’ is ambiguous according to who is biting whom. If I am told that a kind of frog is poisonous, do I worry about biting such a frog, or do I worry about being bitten by such a frog. Neither sounds very appealing!

68 Note that the ambiguity is not type-ambiguity, but rather structural-ambiguity. In every reading, ‘only’ focuses on type C.
21. only \textbf{poisonous snakes} are dangerous

<table>
<thead>
<tr>
<th>only</th>
<th>poisonous snakes</th>
<th>+1</th>
<th>are dangerous</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\lambda P_0[</td>
<td>P_0 \lor {Q_0 \mid Q \bot P}]$</td>
<td>$\lambda x_0 P x$</td>
<td>$\lambda x_0 S x$</td>
</tr>
<tr>
<td>$\lambda x_0 {P x \land S x} \land {Q_0 \mid Q \bot \lambda x_0 {P x \land S x}}$</td>
<td>$\lambda x_0 {P x \land S x}$</td>
<td>$\lambda x_0 {P x \land S x}$</td>
<td>$\lambda x_0 {P x \land S x}$</td>
</tr>
<tr>
<td>$\Sigma {P x \land S x} \land {\Sigma {Q x \mid Q \bot \lambda x {P x \land S x}}}$</td>
<td>$\Sigma {P x \land S x}$</td>
<td>$\Sigma {P x \land S x}$</td>
<td>$\Sigma {P x \land S x}$</td>
</tr>
</tbody>
</table>

This says that some poisonous snakes are dangerous, and every dangerous thing is a poisonous snake.

The last reading focuses on ‘snakes’, which is not adjacent to ‘only’, so non-adjacent (or ternary) composition is required to combine ‘only’ with ‘snakes’.

22. only \textbf{poisonous snakes} are dangerous

<table>
<thead>
<tr>
<th>only</th>
<th>snakes</th>
<th>+1</th>
<th>are dangerous</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\lambda P_0[</td>
<td>P_0 \lor {Q_0 \mid Q \bot P}]$</td>
<td>$\lambda x_0 P x$</td>
<td>$\lambda x_0 S x$</td>
</tr>
<tr>
<td>$\lambda x_0 {P x \land S x} \land {Q_0 \mid Q \bot \lambda x_0 {P x \land S x}}$</td>
<td>$\lambda x_0 {P x \land S x}$</td>
<td>$\lambda x_0 {P x \land S x}$</td>
<td>$\lambda x_0 {P x \land S x}$</td>
</tr>
<tr>
<td>$\Sigma {P x \land S x} \land {\Sigma {Q x \mid Q \bot \lambda x {P x \land S x}}}$</td>
<td>$\Sigma {P x \land S x}$</td>
<td>$\Sigma {P x \land S x}$</td>
<td>$\Sigma {P x \land S x}$</td>
</tr>
</tbody>
</table>

This says that some poisonous snakes are dangerous, and every dangerous poisonous thing is a snake.

17. Combining \textit{Only} with \textit{The}

How does ‘only’ combine with ‘the’? To start with, the following are not equivalent.

\textbf{only the} persons I respect are virtuous.

\textbf{the only} persons I respect are virtuous.

So ‘the only’ is not equivalent to ‘only the’, which suggests that ‘only’ and ‘the’ don’t compose in a straightforward way.

Let us concentrate on the first one, which is easier, although it admits numerous readings, including the following.

\textbf{the persons I respect} are virtuous, but \textbf{no other things} are virtuous.

\textbf{the persons I respect} are virtuous, but \textbf{no other persons} are virtuous.

\textbf{the persons I respect} are virtuous, but \textbf{the persons anyone else} respects are not virtuous.

\textbf{the persons I respect} are virtuous, but \textbf{the persons I don’t respect} are not virtuous.

\footnote{If we were examining Romance languages, then the word for snakes \textit{would} be adjacent.}
18. **Only the Lonely**

Rather than compute the above examples, let’s work on a more lyrical example.

23. *only the lonely* write country music

\[
\begin{array}{|c|c|c|c|}
\hline
\text{only} & \text{the} & \text{lonely} & +1 \text{ write-country-music} \\
\hline
\lambda x[x \land \circ (y \mid y \perp x)] & \lambda P_0P x l & \lambda x_0Lx & \Sigma xL!x \\
\Sigma xL!x & \circ (y \mid y \perp \Sigma xL!x) \\
\Sigma \{ x_1 \mid L!x \} & \circ (y_1 \mid y_\perp \Sigma xL!x) \\
\hline
\end{array}
\]

\[
\lambda x_1Wx \quad \Sigma \{ Wx \mid L!x \} & \circ (Wy \mid y_\perp \Sigma xL!x) \\
\exists x_1 \{ L!x & Wx \} & \& \not\exists y \{ y_\perp \Sigma xL!x & Wy \} \\
\exists x_1 \{ L!x & Wx \} & \& \not\exists x \{ \sim Lx & Wx \}
\]

Notice that the sentence has existential commitments. If there are no lonely people, then it is false. Notice also that the final formula seemingly has no uniqueness claim. This is a general feature of plural definite descriptions.

19. **The Only**

We next consider ‘the only’, as in our earlier example.

24. *the only persons* I respect are virtuous.

The most natural paraphrase of this is:

I respect virtuous persons, but no other persons.

The word ‘the’ has somehow disappeared. But it is not entirely empty, since removing ‘the’ produces an entirely different meaning.

*only persons* I respect are virtuous.

We propose to understand ‘the only’ as *partially-idiomatic*. In other words, although it is systematically related to ‘the’ and ‘only’, the construction does not follow the usual compositional rules. Rather, we propose that ‘the-only’ is a *species* of ‘only’ that focuses on type \(D_0\),

\[
\begin{array}{c}
\text{the-only} \quad \Delta_0 \to (\Delta_0 \land \Delta_0) \\
\lambda x_0 \{ x_0 \land \circ \{ y_0 \mid y_\perp x \} \}
\end{array}
\]

The following is a simple example.

25. *Jay is the only virtuoso*

\[
\begin{array}{c|c|c|c|}
\text{Jay} & +1 & \text{the-only} & \text{virtuoso} \\
\hline
\lambda P_0P_1 & \{ x_0 \land \circ \{ y_0 \mid y_\perp x \} \} & \lambda x_0Vx \\
\lambda x_0[Vx \land \circ \{Vy \mid y_\perp x \}] & \lambda x_0[Vx \land \& \exists y \{ y_\perp x & Vy \}] \\
\lambda x_0[Vx \land \& \exists y \{ y_\perp x & Vy \}] & \lambda x_0[Vx \land \& \exists y \{ y_\perp x & Vy \}] \\
J_1 & \{ Vx \land \& \exists y \{ y_\perp x & Vy \} \} & \{ Vy \land \& \exists y \{ y_\perp x & Vy \} \}
\end{array}
\]

Note that the noun-phrases can be permuted, the result being equivalent to the original.

---

70 The lyric ‘only the lonely’ appears in numerous pop songs, the most prominent being sung by Roy Orbison (1960), whose biography is called *Only the Lonely*.

71 This explains the disappearance of ‘the’ in the paraphrase. Also note that, since no expression has type \(D_0\) *in situ*, the focus of ‘the-only’ is covert.
26. the only virtuoso is Jay

\[
\lambda x_0 [x_0 \land \circ (y_0 \mid y \perp x)] \quad \lambda x_0 Vx
\]
\[
\lambda x_0 [Vx \land \circ (Vy \mid y \perp x)]
\]
\[
\lambda x_0 [Vx \land \circ \neg \exists y (y \perp x \land Vy)]
\]
\[
\Sigma \{ x_1 \mid Vx \land \neg \exists y (y \perp x \land Vy) \}
\]
\[
\lambda x_1 V1x
\]
\[
\Sigma \{ x = j \mid Vx \land \neg \exists y (y \perp x \land Vy) \}
\]
\[
\exists x \{ Vx \land \neg \exists y (y \perp x \land Vy) \land x = j \}
\]
\[
V1 \land \neg \exists y (y \neq j \land Vy)
\]

\[
\lambda x_1 [x = j]
\]

20. The Only P versus The P

The alert reader may recognize a familiar logical pattern in the above derivations, which we reveal by rewriting the first one using the !-operator.

\[
\lambda P_0 [x_0 \land \circ (y_0 \mid y \perp x)] \quad \lambda P_0 Vx
\]
\[
\lambda x_0 [Vx \land \circ (Vy \mid y \perp x)]
\]
\[
\lambda x_0 [Vx \land \circ \neg \exists y (y \perp x \land Vy)]
\]
\[
\lambda x_0 V1x
\]
\[
\lambda x_0 [x_1 \land \circ (y_0 \mid y \perp x)]
\]
\[
\lambda x_1 V1x
\]
\[
\lambda x_1 [x = j]
\]
\[
\lambda x_1 V1x
\]
\[
\exists x \{ Vx \land \neg \exists y (y \perp x \land Vy) \land x = j \}
\]
\[
V1 \land \neg \exists x (x \perp \land Vx)
\]

So an alternative analysis of ‘the only’ is given as follows.

\[
\text{the-only} \quad \text{C} \rightarrow \text{C} \quad \lambda P_0 \lambda x_0 P!x \quad \approx \lambda P_0 \Sigma x P!x
\]

which provides the following more succinct derivation.

\[
\text{the-only} \quad \text{C} \rightarrow \text{C} \quad \lambda x_0 V1x
\]

Notice that this rendering of ‘the only’ coincides with our initial attempt at a unified account of ‘the’. Recall that this analysis founders on predicates that are not distributive. So we naturally wonder how ‘the only’ interacts with non-distributive predicates. The following involve examples discussed earlier.

the only three dogs
the only students who surrounded the building

These seem bizarre, which suggests that ‘the only’ operates properly only when applied to a distributive predicate. When dealing with distributive predicates, ‘only’ and ‘the’ work well. For example, the following are all equivalent.

Jay is the-only virtuoso
Jay is the virtuoso
only Jay is a virtuoso

This equivalence works for plural subjects as well.
Jay and Kay are the-only virtuosos
Jay and Kay are the virtuosos
only Jay and Kay are virtuosos

Next, we observe that ‘be’ is predicative (copular) in the above examples. Nevertheless, the sentences involving ‘the’ can be paraphrased by permuting the phrases flanking ‘be’.

27. the only virtuoso is Jay
28. the only virtuosos are Jay and Kay

These could be understood as Y-transpositions\(^\text{72}\) of the originals, but they are more naturally understood as identities, as in the following derivation.

<table>
<thead>
<tr>
<th></th>
<th>virtuosos</th>
<th>+1 are</th>
<th>Jay and Kay +2</th>
</tr>
</thead>
<tbody>
<tr>
<td>(\lambda x_0 \lambda x_1 [x = y])</td>
<td>(\lambda x_0 \lambda x_1 Vx)</td>
<td>(\lambda y_0 \lambda x_1 [x = y])</td>
<td></td>
</tr>
<tr>
<td>(\lambda x_0 V!x)</td>
<td>(\Sigma { x \mid V!x })</td>
<td>(\lambda x_1 [x = j + k])</td>
<td></td>
</tr>
<tr>
<td>(\Sigma { x_1 \mid V!x })</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

21. Combining Only with Number Words

Consider the following example.

29. only two dogs are barking

Technically, this is ambiguous between the following two readings.

a. only \(\text{two dogs}\) are barking
b. only \(\text{two dogs}\) are barking

which paraphrase roughly as follows.

a. two dogs are barking, and no other number of dogs are barking
b. two dogs are barking, and no other things are barking

The latter is an example involving CNP-focus, which we have already examined. The first one involves a number-word, which is a special category, which we need to examine now.

The following is a decent start.

<table>
<thead>
<tr>
<th>only</th>
<th>two dogs</th>
</tr>
</thead>
<tbody>
<tr>
<td>(\lambda x_0 \lambda x_0 [N \land \circ {M \mid M \perp N]})</td>
<td>(\lambda x_0 \lambda x_0 <a href="x">N(P)</a>)</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Recall that number-functors expand as follows.

\(N =_x \lambda x_0 \lambda x_0 [N(P)](x)\)

So the derivation expands as follows.

\(^{72}\) In other words, they involve Y-fronting, so called because it is common in Yiddish, although perhaps more people are familiar with this phenomenon in Yodish [the language spoken by the Starwars character Yoda].
The first conjunct is clear – there are at least two dogs who are barking. The second conjunct is less clear, since we don't yet have an account of \( \perp \) as applied to numbers. First, \( \perp \) cannot be non-identity, since \( 1 \neq 2 \), in which case the final formula above is self-contradictory. The most natural substitution for \( \perp \) above is \( > \), in which case the second conjunct becomes:

\[
\neg \exists M \{ M > 2 \text{ & } \exists x (Mx \text{ & } Bx) \}
\]

which says that no more than 2 dogs are barking. Bingo!

It may seem bizarre to treat \( > \) as a species of disjointness, since it is not even symmetrical. On the other hand, recall the expanded account of \( \text{‘the’} \), which involves mereological containment \( \preceq \), and "reinterprets" distinctness as non-containment \( \perp \). According to von Neumann, each natural number contains all its predecessors, in which case \( \perp \) is \( > \) for natural numbers. It might be worthwhile to consider an alternative account of \( \text{‘only’} \) that uses \( \perp \) instead of \( \perp \).

### 22. Only Children are Lonely

Earlier we encountered a phrase – \( \text{‘the only’} \) – which is systematically \( \text{related} \) to \( \text{‘only’} \) and \( \text{‘the’} \), but is not constructed from \( \text{‘the’} \) and \( \text{‘only’} \) using the usual semantic rules. Rather, \( \text{‘the only’} \) is partially-idiomatic. Another example of a partially-idiomatic construction is \( \text{‘only child’} \), which means a person who is \( \text{the-only} \) child of a family, which is to say a person with no sibling.

Let's first consider how \( \text{‘only child’} \) is semantically constructed, as in the following.

30. Jay is Kay's only child

<table>
<thead>
<tr>
<th>Jay (+1) is</th>
<th>Kay's only</th>
<th>child</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \lambda x_0 [x_0 \wedge \bigcirc {z_0 \mid z \perp x_0}] )</td>
<td>( \lambda y, \lambda x_0 [Cxy] )</td>
<td>( K_0 )</td>
</tr>
<tr>
<td>( \lambda y_0, \lambda x_0 [Cxy \wedge \bigcirc {Czy \mid z \perp x_0}] )</td>
<td>( \lambda y_0, \lambda x_0 [Cxy \wedge \neg \exists z {z \perp x_0 &amp; Czy}] )</td>
<td></td>
</tr>
<tr>
<td>( \lambda x_0 [\bigcirc Cxk &amp; \neg \exists z {z \perp x_0 &amp; Czk}] )</td>
<td>( \lambda x_1 [\bigcirc Cxk &amp; \neg \exists z {z \perp x_0 &amp; Czk}] )</td>
<td></td>
</tr>
<tr>
<td>( Cxk &amp; \neg \exists z {z \perp x_0 &amp; Czk} )</td>
<td>( Cxk &amp; \neg \exists z {z \perp x_0 &amp; Czk} )</td>
<td></td>
</tr>
</tbody>
</table>

Notice that the above derivation treats \( \text{‘child’} \), and hence \( \text{‘only child’} \), as relational nouns. We know that to be a mother is to be \text{someone's} mother. Similarly, to be an only-child is to be \text{someone's} (or some family's) only child.

Interestingly, this use of \( \text{‘only’} \) gives rise to further ambiguities, as in the following examples, including the title of this section.

31. only children are lonely
32. the only children are sleeping
33. first-born children are only children until a sibling arrives

The respective readings are given as follows.

31a. only-children are lonely.
31b. only \text{children} are lonely.

---

73 For future research!
32a. the only-children are sleeping.
32b. the-only children are sleeping.
33a. first-born children are only-children until a sibling arrives.
33b. first-born children are only children until a sibling arrives.
33c. first-born children are only children until a sibling arrives.

23. Only-If and the Weak Sense of Only

Finally, we consider how ‘only’ interacts with ‘if’, as in phrases such as:74

I will get into MIT only if I ace all my courses
a number is even if and only if it is divisible by two

James McCawley (1981)75 claims that, contrary to what logicians say about ‘only if’, which he deems bizarre, an example such as76

I will get into MIT only if I ace all my courses
does not mean:
if I will get into MIT, then I ace all my courses

Rather, it means:
I will not get into MIT, if I do not ace all my courses

which of course is equivalent to:
if I do not ace all my courses, then I will not get into MIT

Another example:
my plant will grow only if it receives light
doesn't mean:
if my plant will grow, then it receives light

Rather, it means:
my plant will not grow if it does not receive light

which of course is equivalent to:
if it does not receive light, then my plant will not grow

Now, McCawley was not aware of how I have taught ‘only if’ in intro logic, since 1977, for I had already adopted his proposed paraphrase. So when I later read his work, I felt vindicated. Still later, I was in a conversation with Ed Gettier and Robert Stalnaker, and Gettier asked Stalnaker what ‘only if’ means, and Stalnaker pondered a moment then said that ‘A only if B’ means ‘not A if not B’, but he paused after ‘not’, suggesting he parsed it as ‘not (A if not B)’. This seemed to conflict with McCawley's account, but I realized only recently77 that, according to Stalnaker's theory of conditionals, these two sentences are equivalent!78 Indeed, as it turns out, this equivalence is key to our account of how ‘only if’ gets semantically constructed out of ‘only’ and ‘if’.

Thus, we have a starting point, since semantic-fluency is a pre-requisite for semantic-analysis. As usual, what we want is not only the translation of ‘A only if B’, but also the translation of all its parts, plus an account of how these parts semantically combine to produce the whole.79

74 There is also ‘if only’ as in ‘if only I could finish this section, then I would be done with this chapter’. We postpone discussing this for the moment.
75 James D. McCawley, Everything that Linguists Always Wanted to Know about Logic* [*but were too ashamed to ask] (1981). I wish he had written a similar book in the other direction, although the passage under consideration was obviously already a step in that direction.
76 The examples are mine, not McCawley's.
77 In other words, I did not realize it until recently.
78 This is based on the principle of conditional-excluded-middle – (P→Q)∨(P→¬Q) – which is not valid for the truth-functional conditional. This principle turns out to be critical to our analysis of ‘only if’.
79 This is much harder; in fact, it is so hard that I have been trying to figure this out since 1977!
Supposing we have the correct analysis of ‘only’ and ‘if’, the only remaining question seems to be: what phrase, overt or covert, does ‘only’ focus on? Among the overt phrases, the natural candidates are ‘if’, ‘if A’, A, where A is the antecedent (complement of ‘if’). 80

The connective ‘if’ is difficult, since orthogonality among two-place connectives is mathematically obscure. The same holds for ‘if A’, although orthogonality among one-place connectives is less obscure. That leaves A, where orthogonality is obscure, but not nearly so difficult. If the focus is A, then since the denotations of sentences are truth-values, we need orthogonality among truth-values. Many logicians and linguists identify the truth-values T and F with the numbers 1 and 0, which seems metaphorically implausible. Let's pursue this anyway, since 0 and 1 might provide useful mathematical models. And indeed, they do! Using von Neumann's 81 we have 82

\[ \exists \lambda \in \{ \emptyset \} \]

0 is identical to the empty-set \( \emptyset \), and 1 is identical to the singleton of the empty-set \( \{ \emptyset \} \). But now we have sets, and hence mereology, and hence orthogonality. In particular, \( \perp \) corresponds to "nand" ["not both"], i.e., \( \perp = \neg (P \land Q) \).

Using this account of orthogonality for sentences, let's do a generic derivation.

<table>
<thead>
<tr>
<th>A only</th>
<th>if B</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \lambda P : P \land \circ { X \mid X \perp P } )</td>
<td>( \lambda P \land Q (P \rightarrow Q) )</td>
</tr>
<tr>
<td>( \lambda P : \lambda Q (P \rightarrow Q) \land \circ { \lambda Q (X \rightarrow Q) \mid X \perp P } )</td>
<td>B</td>
</tr>
<tr>
<td>( \lambda Q (B \rightarrow Q) \land \circ { \lambda Q (X \rightarrow Q) \mid X \perp B } )</td>
<td></td>
</tr>
<tr>
<td>(( B \rightarrow A ) &amp; ( X \rightarrow A \mid X \perp B ))</td>
<td>(( B \rightarrow A ) &amp; ( X \rightarrow A \mid X \perp B ))</td>
</tr>
<tr>
<td>(( B \rightarrow A ) &amp; ( \neg X { (X &amp; B) ) &amp; (X \rightarrow A) } )</td>
<td>(( B \rightarrow A ) &amp; ( \neg X { (X &amp; B) ) &amp; (X \rightarrow A) } )</td>
</tr>
<tr>
<td>(( B \rightarrow A ) &amp; ( \neg B \rightarrow \neg A ) )</td>
<td>(( B \rightarrow A ) &amp; ( \neg B \rightarrow \neg A ) )</td>
</tr>
</tbody>
</table>

Notes:
1. ‘P’ ‘Q’ and ‘X’ are sentence-variables.
2. \( P \perp Q = \neg (P \land Q) \)
3. the move from \( \neg \exists X \{ (X \& B) \) \& (X \rightarrow A) \} \) to \( \neg (B \rightarrow A) \)
appeals to second-order logic. 82
4. the move from \( \neg (B \rightarrow A) \) to \( (\neg B \rightarrow \neg A) \) appeals to Stalnaker's account of conditionals. 83

The resulting formula is:

if B then A, and if not-B then not-A

which seems like the translation of:

A if and only if B

I am pretty sure no logician accepts this translation. What to do? To cure this semantic inaccuracy, we must revise our account of ‘only’ – but only slightly. In particular, we now claim that ‘only’ has both a strong sense, which it usually takes, and a weak sense, which it takes when combined with ‘if’. The following is our official formulation.

<table>
<thead>
<tr>
<th>only [WEAK]</th>
<th>only</th>
</tr>
</thead>
<tbody>
<tr>
<td>( J \rightarrow \circ J )</td>
<td>( \lambda \alpha \circ { \beta \mid \beta \perp \alpha } )</td>
</tr>
<tr>
<td>( J \rightarrow (J &amp; \circ J) )</td>
<td>( \lambda \alpha \circ { \alpha &amp; \circ { \beta \mid \beta \perp \alpha } } )</td>
</tr>
</tbody>
</table>

\( \alpha \) and \( \beta \) are open expressions of type J.

Applying this new account of ‘only’ to our earlier example, we have the following derivation.

80 Of course the same surface form admits readings according to which ‘only’ focuses on ‘MIT’, ‘get into MIT’, ‘I will get into MIT’, and even ‘I’. These are a bit bizarre.
81 John von Neumann (1923).
82 Arguing by contraposition, suppose \( \neg (B \rightarrow A) \), then since \( \neg (B \& B) \), we have \( \neg (B & B) \& (B \rightarrow A) \), so by 3-Introduction, we have \( \exists X \{ (X \& B) \) \& (X \rightarrow A) \}.
83 Stalnaker (1968). The key principle is conditional-excluded-middle – \( (P \rightarrow Q) \lor (P \rightarrow \neg Q) \) – which entails that \( \neg (P \rightarrow Q) = (P \rightarrow \neg Q) \). Note also that the Stalnaker conditional does not satisfy contraposition. So the logician-account of ‘only if’ is not even truth-conditionally correct, if ‘if’ satisfies Stalnaker's logical principles.
Finally, we note that we have proposed that a viable interpretation of ‘if’ is conditional assertion. If we read ‘only if’ as built from conditional-assertion, rather than an ordinary conditional-operator, then we have a very similar construction.

The final step is based on the fundamental idea of conditional-assertion.

\[
A / B = A, \text{ if } B \text{ is true;}
\]

\[
A / B = \emptyset, \text{ if } B \text{ is false.}
\]

First, \(~[A/\sim B]\) is understood to assert that \([A/\sim B]\) is false. So suppose \(~[A/\sim B]\); then \([A/\sim B]\) is false, in which case \([A/\sim B] \neq \emptyset\), which means \(\sim B\) is true, in which case \([A/\sim B] = A\), and \([\sim A/\sim B] = \sim A\), and also \(~[A/\sim B] = A\), so \(~[A/\sim B] = [\sim A/\sim B]\).

### 24. Other Uses of Weak-Only

Having identified the weak sense of ‘only’, we can understand the usual treatment of ‘only’ in logic texts (including mine!), according to which

\[
\text{only } A \text{ are } B
\]

is equivalent to:

\[
\text{no non-}A \text{ is } B
\]

We can understand this reading as an appeal to the weak sense of ‘only’, as in the following derivation.

---

84 Belnap (1970).
The problem with the weak-reading is that the above formula can be true merely because there are no virtuous people. That there are virtuous people must then be recovered from the sentence (utterance) by appealing to pragmatic considerations. The strong-reading obviates this particular appeal to pragmatics.

25. Except

How does one analyze the following sentences.

34. every dog is barking except Penny
35. no dog is barking except Penny

This is surprisingly subtle. The challenge is to convey the information that Penny is not barking in the first example, and she is barking in the second one. How does the word ‘except’ convey this?

The answer makes use of the concept of an exception (also called a falsity-maker). Some sentences have truth-makers but not falsity-makers; others have falsity-makers but not truth-makers.

<table>
<thead>
<tr>
<th>some dog is barking</th>
<th>truth-maker</th>
<th>any dog that is barking</th>
</tr>
</thead>
<tbody>
<tr>
<td>only dogs are barking</td>
<td>falsity-maker</td>
<td>any non-dog that is barking</td>
</tr>
<tr>
<td>every dog is barking</td>
<td>falsity-maker</td>
<td>any dog that is not barking</td>
</tr>
<tr>
<td>no dog is barking</td>
<td>falsity-maker</td>
<td>any dog that is barking</td>
</tr>
</tbody>
</table>

So, we propose the following paraphrases of the test sentences.

Penny is the only exception to [the claim that] every dog is barking
Penny is the only exception to [the claim that] no dog is barking

In other words,

Penny is the only dog that is not barking
Penny is the only dog that is barking

We understand the above chart as saying that ‘except’ acts on two kinds of phrases. For each particular application, we choose the appropriate clause. The following derivations illustrate.

36. every dog is barking except Penny

\[ \land \{ Gx | Fx \} \rightarrow (Fx & \sim Gx)!p \]

37. no dog is barking except Penny

\[ \lor \{ Gx | Fx \} \rightarrow (Fx & Gx)!p \]

Also notice that this account of ‘except’ means that sentences like the following do not compute.

85 So much so that, except for a precious few, my intermediate logic students cannot write down the correct translations, even though I spend a lot of time on it!

86 The exact case-marker is not obvious. We have chosen accusative, but other object-cases would also work.
38. some dog is barking except Penny

<table>
<thead>
<tr>
<th>some dog is barking</th>
<th>except</th>
<th>Penny +2</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \bigcirc { Gx[Fx] } \to \lambda x_2[(Fx &amp; Gx)Ix] )</td>
<td>( \lor { Gx[Fx] } \to \lambda x_2[(Fx &amp; \neg Gx)Ix] )</td>
<td>( p_2 )</td>
</tr>
<tr>
<td>( \lor { Gx[Fx] } \to (Fx &amp; Gx)!p )</td>
<td>( \lor { Gx[Fx] } \to (Fx &amp; \neg Gx)!p )</td>
<td>( \times )</td>
</tr>
</tbody>
</table>

26. Double Definates

Consider the following example.

39. the mother of every virtuous person is virtuous

This is structurally-ambiguous, between a reading according to which ‘every…’ has wide-scope, and a reading according to which ‘the’ has wide-scope. The following are the respective derivations.

‘every’ wide; ‘the’ narrow

\[
\begin{array}{|c|c|c|c|}
\hline
\text{the} & \text{mother} & \text{of every} & \text{virtuous person} +1 \text{ is virtuous} \\
\hline
P \to P! & \lambda y_0 \lambda x_0 Mxy & \lambda x_1 \Sigma \to \land & \Sigma V x \\
\hline
\land \{ y_0 \mid V y \} & \land \{ \lambda x_0 M!xy \mid V y \} & \lambda x_1 V x \\
\hline
\land \{ \Sigma \{ x_1 \mid M!xy \} \mid V y \} & \land \{ \Sigma \{ V x \mid M!xy \} \mid V y \} & \lambda x_1 V x \\
\hline
\forall y : \text{if } y \text{ is virtuous, then some } x \text{ who is virtuous is the only mother of } y
\end{array}
\]

‘the’ wide; ‘every’ narrow

\[
\begin{array}{|c|c|c|c|}
\hline
\text{the} & \text{mother} & \text{of every} & \text{virtuous person} +1 \text{ is virtuous} \\
\hline
P \to P! & \lambda y_0 \lambda x_0 Mxy & \land \{ y_0 \mid V y \} \\
\hline
\land \{ \lambda x_0 Mxy \mid V y \} & \lambda x_0 \forall y \{ V y \to Mxy \} \\
\hline
\Sigma \{ x_1 \mid \forall y \{ V y \to Mxy \} \} & \lambda x_1 V x \\
\hline
\Sigma \{ V x \mid \forall y \{ V y \to Mxy \} \} & \exists x \{ \forall y \{ V y \to Mxy \} \} \\
\hline
\exists x : x \text{ is the only person who mothers every } V, \text{ and } x \text{ is } V
\end{array}
\]

There is a third reading, according to which a second DEF is attached to ‘mother’. It cannot be pronounced, since the expression would then be the syntactically absurd ‘the the mother…’. The latter is not semantically prohibited, since ‘the’ is semantically an adjective. One might think that a double-definite is nevertheless semantically redundant, but in this example it is not, as seen in the following derivation.
### C. Unitary Account of Nouns

#### 1. Introduction

Our current semantic theory was originally based on the orthodox account of nouns, according to which definite-noun-phrases have type $D$, which denote entities, whereas common-noun-phrases have type $C$, which denote (in effect) classes of entities. This demarcation is based mainly on the syntax of Western European [WE] languages, which all have both definite and indefinite articles, and the syntax of mathematics and modern symbolic logic.

In what follows, we propose an account of nouns that:

1. is not so WE-centric, and
2. offers a leaner and cleaner semantic theory.

In particular, we propose a unitary account of nouns, according to which common-nouns and definite-nouns, including definite descriptions, have type $C$.

We have already begun the transformation, since we already have an account of definite-descriptions that treats them as having type $C$, which is equivalent for us to $\Sigma D$. In this connection, recall the following rendering of ‘the’ [and hence $\text{DEF}$].

<table>
<thead>
<tr>
<th>the mother</th>
<th>$[\text{DEF}]$ of every virtuous person</th>
<th>+1</th>
<th>is virtuous</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\lambda y_0 \lambda x_0 M_{xy} \stackrel{P \rightarrow P!}{\rightarrow}$</td>
<td>$\lambda y_0 \lambda x_0 M!_{xy}$</td>
<td>$\wedge { y_0 \mid V y }$</td>
<td>$\lambda x_0 \forall y { V y \rightarrow M!_{xy} }$</td>
</tr>
<tr>
<td>$\lambda x_0 \forall y { V y \rightarrow M!_{xy} }$</td>
<td>$\lambda x_0 [\forall y { V y \rightarrow M!_{xy} }] x$</td>
<td>$\Sigma { x \mid [\forall y { V y \rightarrow M!_{xy} }] x }$</td>
<td>$\lambda x x_1$</td>
</tr>
<tr>
<td>$\Sigma { x_1 \mid [\forall y { V y \rightarrow M!_{xy} }] !x }$</td>
<td>$\Sigma { V x \mid [\forall y { V y \rightarrow M!_{xy} }] !x }$</td>
<td>$\exists x { [\forall y { V y \rightarrow M!_{xy} }] !x &amp; V x }$</td>
<td>$\lambda x_1 V x$</td>
</tr>
</tbody>
</table>

As before, the uniqueness operator $!$ is defined as follows.

$P!\alpha =_{s} P \alpha \& \sim \exists x \{ x \perp \alpha \& P x \}$

#### 27. Predicate Nominatives

We review earlier discussion. In traditional grammar, a sentence like

40. Jay is the man next to Kay

is understood as involving:

1. a subject: Jay
2. a verb: is
3. a predicate-nominative: the man next to Kay

According to both the Russell account, and the Strawson account, the nominative part of ‘predicate-nominative’ is emphasized; it is an NP, and ‘is’ is identity.

By contrast, according to the predicative-account, the predicate part of ‘predicate-nominative’ is emphasized; it is an adjective, and ‘is’ is copular, as in the following derivation.
Jay +1 is \([\text{COP}]\) the\([\text{P}]\) man-next-to-Kay

\[\lambda x_1: x_0 \lambda x_0 P!x \quad \lambda x_0 M!x \quad \lambda x_1 M!x\]

Although the predicative-analysis does not gain much semantic traction in this example, it provides a completely straightforward and simple analysis of examples like the following.

Obama wants to be the greatest president

If the description ‘the greatest president’ is an NP, then ‘be’ is identity, so if Lincoln is in fact the greatest (U.S) president, then this says that Obama wants to be identical to Lincoln\(^\text{87}\) On the other hand, according to the predicative approach, we do not face this difficulty, since we treat ‘the greatest president’ as a CNP, and treat ‘be’ as copular, as in the following semantic analysis.

<table>
<thead>
<tr>
<th>Obama +1</th>
<th>wants</th>
<th>PRO</th>
<th>to-be [\text{COP}]</th>
<th>the [\text{P}]</th>
<th>greatest-president</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(\lambda x_1{x_1 \times x_1})</td>
<td>(\lambda Y \lambda x_1 {W[x,Y]})</td>
<td>(\lambda P_0; P_1)</td>
<td>(\lambda x_0 P!x)</td>
<td>(\lambda x_0 G!x)</td>
</tr>
<tr>
<td></td>
<td>(\lambda x_1{x_1 \times x_1})</td>
<td>(\lambda Y \lambda x_1 {W[x,Y]})</td>
<td>(\lambda x_1; G!x)</td>
<td>(\lambda x_0{x_1 \times G!x})</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(\lambda x_1{x_1 \times G!x})</td>
<td>(\lambda x_1 {W[x,G!x]})</td>
<td>(\lambda x_0{x_1 \times G!x})</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(W[o, G!o])</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The final formula says that Obama wants to be a president who is greater than all the other presidents.

Along completely analogous lines, consider the phrase:

if I were you

It seems daft to suppose that the following are true.@\(^{88}\)

if I were you, then you would be me
if I were you, and you were her, then I would be her

Similarly, it is fairly obvious that the following are not (plausibly) equivalent.

if I were you
if you were me

The above few examples suggests that, although the subjects are thorough-going NPs, the predicate-nominatives are not. Otherwise, ‘were’ [the subjunctive form of ‘be’] is identity, and the daft sentences are true. On the other hand, if the predicate-nominatives are common-nouns, then ‘were’ is copular, and symmetry and transitivity are not forced on us.

Indeed, treating predicate-nominatives as adjectives [common-nouns] makes sense, since it seems that

\(^{87}\) There are ways to avoid this conclusion, even while treating ‘the greatest U.S. president’ as an NP. The point is that the issue does not even arise if ‘the greatest U.S. president’ is a CNP.

\(^{88}\) Two jokes of mine:

if I were you, I would be giving myself advice!
if I were you, there would be fewer people in the room!

A funnier joke, due to Oscar Wilde:

be yourself; everyone else is taken!

That we understand these as funny shows how ‘be’ is ambiguous between **copular-be** [predication] and **transitive-be** [identity]. What we learn here is that **copular-be** is more common than we originally thought.
if I were you doesn't mean: if I were identical to you; rather, it means more like: if I were in your shoes, or more literally: if I were in your circumstances.

By way of dis-entangling this conundrum, we propose to treat predicate-nominatives as predicates. Then we have the following derivation.

<table>
<thead>
<tr>
<th>if</th>
<th>I +1 were you</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>λP₀P₁ x₀Ux</td>
</tr>
<tr>
<td>I₁</td>
<td>λx₁Ux</td>
</tr>
<tr>
<td>λXλY[X→Y]</td>
<td>U₁</td>
</tr>
<tr>
<td></td>
<td>λY{U₁→Y}</td>
</tr>
</tbody>
</table>

28. Unified Treatment of Relative Clauses

The treatment of non-restrictive relative clauses is quite complicated – that is, if one adopts the conventional account of descriptions. Our account of descriptions leads to a much more straightforward and intuitive analysis of relative clauses. For example, consider the following phrase.

41. the woman who is tall

This is ambiguous according to whether we read the relative-clause ‘who is tall’ as restrictive or non-restrictive. Punctuation (and prosody) can help clear up the ambiguity, as in:

the woman, who is tall non-restrictive
the woman-who-is-tall restrictive

On the conventional (NP) account of ‘the’, the restrictive reading is easy to construct,

the woman-who-is-tall

<table>
<thead>
<tr>
<th>[R] woman who is tall</th>
</tr>
</thead>
<tbody>
<tr>
<td>λx₀Wx</td>
</tr>
<tr>
<td>λx₀Tx</td>
</tr>
<tr>
<td>∨x[λx(Wx &amp; Tx)]!x</td>
</tr>
</tbody>
</table>

but the non-restrictive reading is not.

the woman, who is tall

<table>
<thead>
<tr>
<th>[R] woman who is tall</th>
</tr>
</thead>
<tbody>
<tr>
<td>λx₀Wx</td>
</tr>
<tr>
<td>λx₀Tx</td>
</tr>
<tr>
<td>∨xW!x</td>
</tr>
<tr>
<td>λx₀Tx</td>
</tr>
</tbody>
</table>

On the unified-noun account, they are equally easy.

---

89 In this connection, it is worthwhile perhaps to note that, in *The Silmarillion*, Tolkien describes the valar (major holy ones) as taking on various forms, which he calls *raiment* [literally, clothing, but also etymologically related to ‘arrangement’].

90 This is visually confusing this both variable-binding operators bind the same variable letter ‘x’
the woman, who is tall

<table>
<thead>
<tr>
<th>the [U]</th>
<th>woman</th>
<th>who is tall</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \lambda P \Sigma x P ! x )</td>
<td>( \lambda x_0 W x )</td>
<td></td>
</tr>
<tr>
<td>( \Sigma x W ! x )</td>
<td>( \lambda x_0 W x )</td>
<td></td>
</tr>
<tr>
<td>( \lambda x_0 { W ! x \land T x } )</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The first one is the property of being \( T \) and uniquely-\( W \), whereas the second one is being uniquely-\( T \)-and-\( W \). Notice also that ‘who’ is given the same reading in both sentences. This suggests that whether ‘who’ is restrictive or non-restrictive is not a matter of lexicon, but is rather a matter of scope. The scopal account is furthermore consistent with the prosody of these two readings, since the intended reading is conveyed by placing a pause after ‘woman’ [non-restrictive] or after ‘the’ [restrictive].

29. Proper Names

When we apply these ideas to proper-names, we reap further theoretical benefits. The underlying idea is that all nouns are common-nouns, so names like ‘Jay’ and ‘Kay’ are common-nouns. This is born out in ordinary language, where one is apt to combine proper-names with determiners like ‘my’ or ‘the’. The latter is usually, but not always, combined with plural forms, like ‘the Smiths’. Affixing determiners and plural-s makes syntactic sense only if proper-names can act as common-nouns.

The easiest way to accomplish the latter is to maintain that proper-names are fundamentally common-nouns. Of course, proper-names usually refer to just one entity, or at least purport to. We propose to understand such usage as involving an implicit occurrence of \( \text{DEF} \), exactly as employed earlier in connection with genitive-nouns.

What is new here is that \( \text{DEF} \) is now an adjective, not a determiner; in particular, ‘Jay’ is a common-noun, and so is ‘\( \text{DEF} \) Jay’, and so is ‘\( \text{DEF} \) my Jay’.

The following shows how these ideas are fleshed out in a simple example.

<table>
<thead>
<tr>
<th>Jay +1 respects Kay +2</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \Sigma x J x )</td>
</tr>
<tr>
<td>( \lambda x_0 x_1 )</td>
</tr>
<tr>
<td>( \lambda y_2 \lambda x_1 R x y )</td>
</tr>
<tr>
<td>( \Sigma { x_1</td>
</tr>
<tr>
<td>( \Sigma { R x y</td>
</tr>
<tr>
<td>( \exists x \exists y { J x \land K y \land R x y } )</td>
</tr>
</tbody>
</table>

Notice that ‘Jay’ and ‘Kay’ are common-nouns, but they are called upon to play roles in the respect-relation, so they are categorially transformed into sums, each of which can be case-marked. Notice that we apply parallel-composition to the two junctions, since it is simpler, and since the two linear-compositions produce equivalent results.

Notice the final formula above says that there is a Jay, and a Kay, such that the former respects the latter. Most often, however, we assume uniqueness in the given situation, in which case the sentence contains two occurrences of \( \text{DEF} \), as in the following computation.

---

91 For example, ‘my mother’ and ‘my brother’ can both be indefinite, or definite. In case of the latter, the phrase contains a tacit \( \text{DEF} \).

92 The phrase ‘the my Jay’ is syntactically inadmissible, just like ‘the my dog’, but they are both OK semantically. The use we have in mind occurs when distinguishing my Jay from your Jay in situations in which ‘Jay’ is multiply-instantiated.
The last transformation pursues a mathematical-logical custom to its logical extreme, and accordingly may require explaining. The idea is that every n-place function-sign is deep-down a special kind of n+1-place predicate. We have pursued this custom in connection with genitive-nouns, even using the same letter for both the predicate and the function-sign. This idea equally applies to a 0-place function-signs; a 0-place function-sign is a 1-place predicate, but not just any 1-place predicate; the latter must have a solitary instance. Now, notice in the penultimate line above that it says there is an x and a y such that x alone is J, and y alone is K, and x respects y. This means J has a solitary instance, which we call J, and K has a solitary instance, which we call K. This yields the final transformation above.

This seems like a very complicated way to reach such a simple formula! But this is the price we pay if we employ nouns that assert, rather than presuppose, existence.

### 30. Adjectives and Definite-Nouns

Next, we reconsider how adjectives can variously apply to definite-nouns, including descriptions and proper-names. The following are examples.

- the greedy Vogons
- the poet Homer
- Zeno of Elea
- Swarte Piet

Categorial analysis can be quite complicated using our original analysis. It is considerably easier using our new account of nouns. In particular, notice in the following examples that restrictive versus non-restrictive readings come down to structural ambiguity. We also get more readings, in general, although some of them don’t seem very plausible.

<table>
<thead>
<tr>
<th>the greedy Vogons</th>
<th>the greedy, who are Vogons</th>
<th>the Vogons, who are greedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \lambda x_0 { Gx } )</td>
<td>( \lambda x_0 { Gy &amp;Vy }} Jx )</td>
<td>( \lambda x_0 { Vl &amp;Gx }}</td>
</tr>
<tr>
<td>( \lambda P { \lambda x_0 { Gx } &amp; Vx } )</td>
<td>( \lambda x_0 { Gy &amp;Vx }} Jx )</td>
<td>( \lambda x_0 { Vl &amp;Gx }}</td>
</tr>
</tbody>
</table>

93 And is utilized in Kalish and Montague’s (1964) classic introduction to symbolic logic. In particular, they use zero-place function-signs to symbolize proper-names.

94 We have made the function-sign a small-caps version of the predicate.

95 Swarte Piet [Black Peter] is a mythological character who figures in Dutch Christmas traditions, being the sidekick of Sinterklass (from which American-English derives the word ‘Santa Claus’). Unlike the legendary outlaw Black Bart, but like Sherriff Bart in the movie Blazing Saddles, Swarte Piet is black. Many decry this tradition as racist, including many Dutch. I too decry it, but use the example because Swarte Piet is an example of a Relative Claus.

96 Note that syntax confounds the semantic-calculations in some cases. English mostly puts adjectives in front of nouns, but other languages place them after nouns. Syntactic-adjacency is linear, as demanded by the format of spoken language. Semantic-adjacency is more complicated.
31. Restricted Demonstratives

The demonstrative pronouns are usually officially listed as:

- this
- that
- these
- those

These pronouns can be restricted by appending a common-noun-phrase, as in this very sentence, where this phenomenon occurs three times!

What is the grammar of such constructions? The syntax is fairly straightforward. For example, in ‘this dog’, ‘this’ is a determiner that acts on the common-noun ‘dog’ to produce a noun-phrase. On the other hand, the semantics is less straightforward, since the meaning of ‘this’ is somewhat complicated, since it can be repeated in a sentence several times, each time denoting a different object. We propose that each occurrence of ‘this’ involves its own act of demonstration; there is a first act, a second act, etc. We propose to mark these with numerical indices, using superscripts, as follows.

\[ \delta^1, \delta^2, \ldots \]

We take these to be semantically rendered thus:

\[ \delta^1, \delta^2, \ldots \]

We also have these same items without superscripts when just one act of demonstration occurs.

So how do we add the information that the demonstrated entity is a dog? Since we propose that every noun is fundamentally a common-noun, we first convert \( \delta, \delta^1, \ldots \) into INPs, which we do as follows.

\[ \Sigma x[x=\delta], \Sigma x[x=\delta^1], \Sigma x[x=\delta^2], \ldots \]

Then we add the dog-predicate conjunctively, which is illustrated in the following derivation.

---

97 Since subscripts are used for case-marking.
this dog +1 is ours

\[ \Sigma x[x=\delta] \Sigma xDx \]

\[ (1) \Sigma x \{ x=\delta \land Dx \} \lambda x.x_1 \]

\[ \Sigma \{ x_1 \mid x=\delta \land Dx \} \lambda x.Ox \]

the demonstrated entity, which is a dog, is ours

\[ (1) \text{CNP-duality + Conjunction} \]

32. Semantic Gender Revisited

In Unit B, Section 14, we propose to render gender-marked anaphoric pronouns as a special case of anaphoric-the, as follows.

\[(\alpha) \text{ he} \quad \lambda x_a[x / \text{MASC}[x]] = (\alpha) \text{ the MASC} \]

\[(\alpha) \text{ she} \quad \lambda x_a[x / \text{FEM}[x]] = (\alpha) \text{ the FEM} \]

\[(\alpha) \text{ it} \quad \lambda x_a[x / \text{NEUT}[x]] = (\alpha) \text{ the NEUT} \]

Demonstrative pronouns are done in a parallel manner, but using restricted demonstratives.

\[ (\delta) \text{ he} \quad \Sigma x[x=\delta \land \text{MASC}[x]] = \text{this MASC} \]

\[ (\delta) \text{ she} \quad \Sigma x[x=\delta \land \text{FEM}[x]] = \text{this FEM} \]

\[ (\delta) \text{ it} \quad \Sigma x[x=\delta \land \text{NEUT}[x]] = \text{this NEUT} \]

The following derivation illustrates.

\[ (\delta) \text{ she} \quad +1 \quad \text{is tall} \]

\[ \Sigma x[x=\delta \land \text{FEM}[x]] \lambda x.x_1 \]

\[ \Sigma \{ x_1 \mid x=\delta \land \text{FEM}[x] \} \lambda x.Tx \]

\[ \Sigma \{ Tx \mid x=\delta \land \text{FEM}[x] \} \exists x\{ x=\delta \land \text{FEM}[x] \land Tx \} \]

\[ \text{the demonstrated entity, which is female, is tall} \]

D. Formal Summary

1. Various Accounts

<table>
<thead>
<tr>
<th>Strawson Account</th>
<th>descriptions are DNs</th>
</tr>
</thead>
<tbody>
<tr>
<td>the[S]</td>
<td>C→D</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Russell Account</th>
<th>descriptions are QPs</th>
</tr>
</thead>
<tbody>
<tr>
<td>the[R]</td>
<td>C→VD</td>
</tr>
</tbody>
</table>

| Predicate Account | descriptions are CNPs |
2. **Uniqueness (singular-entities)**

<table>
<thead>
<tr>
<th>P!α</th>
<th>=₀</th>
<th>Pα &amp; ∼∃(x ≠ α &amp; Px)</th>
</tr>
</thead>
<tbody>
<tr>
<td>only α is P means α is P, and nothing distinct from α is P</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

3. **Uniqueness (general entities)**

<table>
<thead>
<tr>
<th>P!α</th>
<th>=₀</th>
<th>Pα &amp; ∼∃(x ⊥ α &amp; Px)</th>
</tr>
</thead>
<tbody>
<tr>
<td>only α is P means α is P, and nothing disjoint from α is P</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

4. **Disjointness**

\[ α⊥β =_₀ \sim\exists x\{x≤α & x≤β\} \]

\( ≤ \) is part-whole relation

5. **Distributive Predicates**

\[ \text{DIST}[P] =_₀ \forall x(Px → ∀y(y≤x → Py)) \]

6. **Correction for Non-Distributive Predicates**

<table>
<thead>
<tr>
<th>the[s]</th>
<th>C→D</th>
<th>λP₀ λx[P!x]</th>
</tr>
</thead>
<tbody>
<tr>
<td>the[r]</td>
<td>C→V D</td>
<td>λP₀ ∨x[P!x]</td>
</tr>
<tr>
<td>the[p]</td>
<td>C→C</td>
<td>λP₀ λx₀[P!x]</td>
</tr>
<tr>
<td>the[u]</td>
<td>C→Σ D</td>
<td>λP₀ Σx[P!x]</td>
</tr>
</tbody>
</table>

7. **Maximality**

<table>
<thead>
<tr>
<th>P!α</th>
<th>=₀</th>
<th>Pα &amp; ∀x(Px → x≤α)</th>
</tr>
</thead>
<tbody>
<tr>
<td>α is maximally-P means α is P, and α contains every P</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Compare:

<table>
<thead>
<tr>
<th>P!α</th>
<th>=₀</th>
<th>Pα &amp; ∀x(Px → xΩα)</th>
</tr>
</thead>
<tbody>
<tr>
<td>α is exclusively-P means α is P, and α overlaps every P</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

8. **Theorems**

| α≤β ↔ α=β | if | α, β are atomic |
| αΩβ ↔ α=β | if | α, β are atomic |
| P! = P! | if | P is distributive |
9. **Anaphoric-The**

$\langle \alpha \rangle \text{the } C \rightarrow (D \alpha \rightarrow D) \quad \lambda P_0 \lambda x_\alpha [x / P x]

10. **Conditionalization [Function-Restriction]**

$\alpha \rightarrow \Phi$ reads $\alpha$ given/provided $\Phi$

$\alpha \rightarrow \Phi = \alpha$, if $\Phi$;

$\alpha \rightarrow \Phi = \emptyset$, if not-$\Phi$

<table>
<thead>
<tr>
<th>Restricted Lambda-Conversion</th>
</tr>
</thead>
<tbody>
<tr>
<td>$[\lambda \alpha { \beta / \Phi } \langle \alpha[c/v] \rangle] = \beta[c/v]$ if $\Phi[c/v]$</td>
</tr>
<tr>
<td>$= \emptyset$ otherwise</td>
</tr>
</tbody>
</table>

33. **Only**

1. **Underlying Principle**

‘only’ focuses attention on a particular phrase, and excludes alternatives (to that phrase).

2. **Basic Form**

\[
\text{only } \not\exists \rightarrow (\not\exists \land \exists) \quad \lambda \alpha[\alpha \land \exists \{ \beta | \beta \perp \alpha \}]
\]

3. **The Only**

\[
\text{the-only } D_0 \rightarrow (D_0 \land \exists D_0) \quad \lambda x_0 [x_0 \land \exists \{ y_0 | y_\perp \}]
\]

\[
\text{the-only } C \rightarrow C \quad \lambda P_0 \lambda x_0 P!x \approx \lambda P_0 \Sigma x P!x
\]

4. **Only If**

\[
\text{only [WEAK]} \quad \text{if } \lambda P : P \land \exists \{ X | X \perp P \} \quad \lambda P : \exists Q(P \rightarrow Q)
\]

\[
\lambda P : \exists Q(P \rightarrow Q) \land \exists \{ \lambda Q(X \rightarrow Q) | X \perp P \}
\]

5. **Except**

\[
\not\alpha \rightarrow (\not\exists \rightarrow S) \quad \not\{Gx[Fx] \rightarrow \lambda x_2[(Fx \land \neg Gx)!x]
\]

\[
\not\exists \rightarrow (\not\exists \rightarrow S) \quad \not\{Gx[Fx] \rightarrow \lambda x_2[(Fx \land Gx)!x]
\]

34. **Restricted Demonstratives**

\[
\langle \delta \rangle \text{this } C \rightarrow \Sigma D \quad \lambda P : \Sigma x \{ x = \delta \land P x \}
\]

**Derivation:**

\[
\lambda x_0 \{ x = \delta \land Dx \} \quad \Sigma x \{ x = \delta \land Dx \}
\]
## 35. Semantic Gender

### 1. Anaphoric Pronouns

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>(α) he</td>
<td>$\lambda x, \alpha \lambda x [x / \text{MASC}[x]]$</td>
<td>= (α) the MASC</td>
</tr>
<tr>
<td>(α) she</td>
<td>$\lambda x, \alpha \lambda x [x / \text{FEM}[x]]$</td>
<td>= (α) the FEM</td>
</tr>
<tr>
<td>(α) it</td>
<td>$\lambda x, \alpha \lambda x [x / \text{NEUT}[x]]$</td>
<td>= (α) the NEUT</td>
</tr>
</tbody>
</table>

### 2. Demonstrative Pronouns

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>(δ) he</td>
<td>$\Sigma x [x = \delta \land \text{MASC}[x]]$</td>
<td>= (δ) this MASC</td>
</tr>
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<td>$\Sigma x [x = \delta \land \text{FEM}[x]]$</td>
<td>= (δ) this FEM</td>
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<td>$\Sigma x [x = \delta \land \text{NEUT}[x]]$</td>
<td>= (δ) this NEUT</td>
</tr>
</tbody>
</table>