Chapter 9
Indefinite Noun Phrases

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1. **Indefinite Articles**

In English, and many other languages, a common-noun-phrase may be prefixed by an indefinite article, the resulting phrase being what may be called an *indefinite noun phrase*. The following are example sentences from English, in which ‘a’ serves as an indefinite article.

<table>
<thead>
<tr>
<th>that is a dog</th>
<th>that is milk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jay owns a dog</td>
<td>Jay has milk</td>
</tr>
<tr>
<td>a dog is in the yard</td>
<td>there is a dog in the yard</td>
</tr>
<tr>
<td>there is a dog in the yard</td>
<td>a dog is happy if it is well-fed</td>
</tr>
<tr>
<td>a dog is happy if it is well-fed</td>
<td>every man who owns a dog feeds it</td>
</tr>
<tr>
<td>if a man owns a dog, then he feeds it</td>
<td>a dog is a mammal</td>
</tr>
<tr>
<td>a dog can hear sounds a human can't</td>
<td>Jay is looking for a dog</td>
</tr>
</tbody>
</table>

Note in particular that, if we delete the word ‘a’, we obtain phrases that standard English rejects as syntactically ill-formed. On the other hand, languages that lack indefinite articles – the biggest of which are Latin, Russian, and Mandarin – have no problem saying sentences like ‘that is dog’. Furthermore, even English eschews indefinite articles when the common-nouns are plural-nouns or mass-nouns, as in the following examples.

<table>
<thead>
<tr>
<th>those are dogs</th>
<th>that is milk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jay owns dogs</td>
<td>Jay has milk</td>
</tr>
<tr>
<td>dogs are in the yard</td>
<td>milk is in the refrigerator</td>
</tr>
<tr>
<td>there are dogs in the yard</td>
<td>there is milk in the refrigerator</td>
</tr>
<tr>
<td>dogs are happy if they are well-fed</td>
<td>milk stays fresh if it is refrigerated</td>
</tr>
<tr>
<td>every man who owns dogs feeds them</td>
<td>every man who has milk drinks it</td>
</tr>
<tr>
<td>if men own dogs, they feed them</td>
<td>if men have milk, they drink it</td>
</tr>
<tr>
<td>dogs are mammals</td>
<td>milk is food</td>
</tr>
<tr>
<td>dogs can hear sounds humans can't</td>
<td>milk can be made into cheese</td>
</tr>
<tr>
<td>Jay is looking for dogs</td>
<td>Jay is looking for milk</td>
</tr>
</tbody>
</table>

Given the strong structural similarities among these examples, and given the existence of languages that lack indefinite articles, we propose to use the term *indefinite noun phrase* in reference to all such phrases, whether prefixed by an overt indefinite article or not. More generally, we propose to use this term in reference to any common-noun-phrase

---

1. Supposing we reject the reading according to which ‘dog’ is a proper-name, and the reading according to which ‘dog’ is a mass-noun [referring presumably to dog-matter].

2. Note carefully, however, that colloquial spoken English often employs unstressed ‘some’ [“som”] as an indefinite article, which can prefix all the nouns above. Also note that Spanish has plural indefinite articles – ‘unos’ (masculine), ‘unas’ (feminine), and French has a plural indefinite article ‘des’ and a mass indefinite article ‘de’.
that plays the role of an NP [subject, object, …], treating the presence of an indefinite article, overt or covert, as secondary.

2. **Initial Hypothesis – INPs are QPs**

First, we consider the following seemingly natural initial hypothesis.

(iH) INPs are QPs;
in particular:

‘a’ is a variant of ‘some’;
‘som’ is a variant of ‘a’, which attaches to plural-nouns and mass-nouns, and which may/must be deleted in the final form [spoken/written].

(iH) accounts for the following examples.³

1. **Jay owns a dog**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>J</td>
<td>λx.x₂</td>
<td>J₁, λy.λx₁Oxy</td>
</tr>
<tr>
<td></td>
<td></td>
<td>∨{ x₁</td>
</tr>
<tr>
<td></td>
<td></td>
<td>∃x{D₀ &amp; O₀x}</td>
</tr>
</tbody>
</table>

2. **Jay owns dogs**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>J</td>
<td>λx.x₁</td>
<td>J₁</td>
</tr>
<tr>
<td></td>
<td>λP₀λxPx</td>
<td>λx.x₂</td>
</tr>
<tr>
<td></td>
<td>∨xD₀x</td>
<td>∨{ x₁</td>
</tr>
<tr>
<td></td>
<td>λy.λx₁Oxy</td>
<td>∨{ x₂</td>
</tr>
<tr>
<td></td>
<td>∨{ O₀x</td>
<td>D₀ }</td>
</tr>
<tr>
<td></td>
<td>∃x{D₀ &amp; O₀x}</td>
<td></td>
</tr>
</tbody>
</table>

3. **Rex is a dog**

<table>
<thead>
<tr>
<th>Rex [+1]</th>
<th>is</th>
<th>a dog [+2]</th>
</tr>
</thead>
<tbody>
<tr>
<td>R</td>
<td>λx.x₁</td>
<td>R₁</td>
</tr>
<tr>
<td></td>
<td>λy.λx₁[x=y]</td>
<td>J₁</td>
</tr>
<tr>
<td></td>
<td>∨{ y₁[y=x]</td>
<td>D₀ }</td>
</tr>
<tr>
<td></td>
<td>∨{ r=x</td>
<td>D₀ }</td>
</tr>
<tr>
<td></td>
<td>∃x{ D₀ &amp; R=r }</td>
<td></td>
</tr>
</tbody>
</table>

Notice in particular that being a dog is equivalent to being identical to *some* dog.

³ A parallel example can be provided with a mass-noun; for example: Jay owns [som] land.
3. **Problems with the Initial Hypothesis**

Although (iH) accounts for some data, it has trouble accounting for other data, including the following examples.

- a dog is a mammal
- Jay is looking for a dog
- a dog is happy if it is well-fed

Let's see what happens when we apply (iH) to these examples.

4. **a dog is a mammal**

<table>
<thead>
<tr>
<th>a dog [+1]</th>
<th>is</th>
<th>a mammal [+2]</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\lambda y_2 \lambda x_1 [x=y] \lor { y_2</td>
<td>M_y }$</td>
<td></td>
</tr>
<tr>
<td></td>
<td>$\lor { \lor { x=y</td>
<td>M_y }</td>
</tr>
<tr>
<td></td>
<td>$\times \exists x{Dx &amp; Mx} \times$</td>
<td></td>
</tr>
</tbody>
</table>

Other sentences with similar form do seem to work this way – for example:

<table>
<thead>
<tr>
<th>a dog is in the yard</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\exists x{Dx &amp; Yx}$</td>
</tr>
</tbody>
</table>

But, unlike the latter, the former seems to be nomi c (law-like), and to be about *kinds*. The following is similar in the latter respect.

5. **Jay is looking for a dog**

<table>
<thead>
<tr>
<th>Jay [+1]</th>
<th>is-looking-for</th>
<th>a dog [+2]</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\lambda y_2 \lambda x_1 Lxy \lor { y_2</td>
<td>D_y }$</td>
<td></td>
</tr>
<tr>
<td>$\lor { \lor { Lxy</td>
<td>D_y } }$</td>
<td></td>
</tr>
</tbody>
</table>

According to this reading, there is a (particular) dog that Jay is looking for. Although this is an admissible reading, there is another reading according to which Jay is not looking for a particular dog. Rather, ‘a dog’ is better understood as indicating the kind of thing Jay is looking for. The following seems similarly *generic*.

6. **a dog is happy if it is well-fed**

<table>
<thead>
<tr>
<th>a dog</th>
<th>[+1, -1]</th>
<th>is happy</th>
<th>if</th>
<th>(-1) it [+1]</th>
<th>is well-fed</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\lor xDx \lambda x[x \times x_1]$</td>
<td>$\lambda x_1 Hx$</td>
<td>$\lambda P,Q{P \rightarrow Q}$</td>
<td>$\lambda x_1 Wx$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$\lor { x_1 \times x_1</td>
<td>D_x }$</td>
<td>$\lambda x_1 Hx$</td>
<td></td>
<td>$\lambda x_1 Wx$</td>
<td></td>
</tr>
<tr>
<td>$\lor { Hx \times x_1</td>
<td>D_x }$</td>
<td></td>
<td>$\lambda x_1 \lambda Q{Wx \rightarrow Q}$</td>
<td></td>
<td>$\lambda x_1 \lambda Q{Wx \rightarrow Q}$</td>
</tr>
<tr>
<td></td>
<td>$\lor { Hx \times \lambda Q{Wx \rightarrow Q}</td>
<td>D_x }$</td>
<td>$\lor { Wx \rightarrow Hx</td>
<td>D_x }$</td>
<td>$\exists x{Dx &amp; {Wx \rightarrow Hx}}$</td>
</tr>
</tbody>
</table>
This reading says there is at least one dog who is happy if well-fed, which is probably better said using the word ‘some’ rather than ‘a’.

It seems that ‘a dog’ seems more generic in this example.

In conclusion, treating ‘a’ as synonymous with ‘some’ fails to capture what may be described as the generic use of ‘a’.

4. New Proposal

In order to account for indefinite noun phrases, we pursue a three-part approach.

(1) we propose a dual-pair of junctions – product and sum.
(2) we propose a type-logical extension of our account of common-noun-phrases.
(3) we propose to treat the article ‘a’, not as a quantifier, but as an adjective.

1. Product and Sum

We expand the type-formation rules so that, if \( \mathcal{F} \) is a type, then so are \( \Pi \mathcal{F} \) and \( \Sigma \mathcal{F} \), and we expand the syntax of type-theory to include all expressions of the following forms.

\[
\begin{align*}
\Pi \{ \varepsilon \mid \Phi \} & \quad \text{the product of all } \varepsilon \text{ such that } \Phi \\
\Sigma \{ \varepsilon \mid \Phi \} & \quad \text{the sum of all } \varepsilon \text{ such that } \Phi
\end{align*}
\]

Here, \( \varepsilon \) is any expression [of type \( \mathcal{F} \)], \( \Phi \) is any formula, and the resulting expression has type \( \Pi \mathcal{F} \) [respectively, \( \Sigma \mathcal{F} \)]. The following are the associated type-identities.

\[
\begin{align*}
\Sigma \mathcal{D} & = \mathcal{D} \\
\Sigma \mathcal{S} & = \mathcal{S} \\
\Pi \mathcal{F} & \neq \mathcal{F}
\end{align*}
\]

And the following are the associated composition-rules.

\[
\begin{align*}
\alpha & \quad \alpha, \beta, \gamma \text{ are any expressions;} \\
\Pi \{ \beta \mid \Phi \} & \quad \Phi \text{ is any formula;}
\end{align*}
\]

\[
\begin{align*}
\alpha ; \beta \vdash \gamma & \quad \text{any sub-derivation of } \gamma \text{ from } \{ \alpha, \beta \} \\
\Pi \{ \gamma \mid \Phi \} & \quad \Pi \text{ admits all } \alpha
\end{align*}
\]

---

4 Indeed, there is a usage of ‘some’ according to which it means in effect “special”. For example: that is some dog you have there

This usage is often conveyed phonetically by emphasizing the word ‘some’. Another example, from a TV ad.

this sale is not for some people; it is for all people.

5 This was proposed earlier in our treatment of number-words, where we propose that number-words are fundamentally adjectives, and ‘a’ is synonymous with ‘one’.

6 As usual, we also have abbreviated forms: \( \Pi \nu \Phi, \Sigma \nu \Phi \).

7 In other words, we propose that a sum of entities is itself an entity. We are not committed either way, but \( \Sigma x Fx \) might be the set of all F’s, or it might be the mereological-sum of all F’s.

8 There are no admissibility restrictions. Even relative pronouns are admitted, unlike all other junctions.
| $\alpha$ | $\alpha, \beta, \gamma$ are any expressions; |
| $\Sigma\{ \beta \mid \Phi \}$ | $\Phi$ is any formula; |
| $\alpha ; \beta \vdash \gamma$ | any sub-derivation of $\gamma$ from $\{\alpha, \beta\}$ |
| $\Pi\{ \gamma \mid \Phi \}$ | if $\alpha$ is $\Sigma$-promoting; |
| $\Sigma\{ \gamma \mid \Phi \}$ | otherwise; $\Sigma$ admits all $\alpha$ |

$\Sigma$ is promoted by any phrase headed by:
1. not 
2. no 
3. if 
4. if and only if 
5. every

### $\Pi$-Simplification

| $\Pi\text{-Simplification}$ | $\Phi, \Psi$ are formulas |
| $\Pi\{ \Psi \mid \Phi \}$ | $\nu$ are the variables c-free in $\Phi$ |
| $\forall\nu\{\Phi \rightarrow \Psi\}$ | $\forall\nu_1 \ldots \forall\nu_k\Phi =_{sf} \forall\nu_1 \ldots \exists\nu_k\Phi$ |

provided expression contains no free variables\(^9\)

### $\Sigma$-Simplification

| $\Sigma$-Simplification | $\Phi, \Psi$ are formulas |
| $\Sigma\{ \Psi \mid \Phi \}$ | $\nu$ are the variables c-free in $\Phi$ |
| $\exists\nu\{\Phi \& \Psi\}$ | $\exists\nu_1 \ldots \exists\nu_k\Phi =_{sf} \exists\nu_1 \ldots \exists\nu_k\Phi$ |

### 2. Common-Noun-Phrases Transform into Junctions

A major problem with indefinite noun phrases is that they have type $C$, but they are called upon to play functional-roles [subject, object, etc.], which is indicated by the presence of case-markers. Under these circumstances, the following transformation rule is applied.

\[
\lambda v_0 \Phi \quad ; \quad \lambda v. v_0 \quad / \quad \Sigma\{v_0 \mid \Phi\}
\]

---

\(^9\) In which case, the node in question is assertional. The transformation is based on the plausible intuition that to assert a product of sentences is to assert all those sentences.
3. **The Indefinite Article**

We propose that ‘a’ is fundamentally a number-word,\(^{10}\) which is an adjective, semantically rendered as follows.

\[
[a] = \lambda x_0 1x
\]

where ‘1’ is understood as follows.\(^ {11}\)

\[
1x = a \text{ is a "unit"}
\]

which is regarded as a primitive notion.\(^ {12}\) If we do not admit compound-nouns, plural-nouns, measure-nouns, or mass-nouns, as is pretty much standard in elementary logic, then the domain consists only of "units", which are individuals, and ‘a’ is redundant.

5. **Examples**

In the following, we concentrate on singular-nouns, and accordingly treat ‘a’ as redundant.

7. **Jay owns a dog**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>( \lambda y \lambda x_1 Oxy )</td>
<td>( \Sigma { \lambda x_1 Oxy \mid D_y } )</td>
<td>( \Sigma { \lambda y \mid D_y } )</td>
<td>( \exists y { D_y \mid O_y } )</td>
</tr>
</tbody>
</table>

In this example, ‘a dog’ ultimately gets treated just like ‘some dog’, since ‘a dog’ begins as a common-noun-phrase, which transforms into an entity-sum, which eventually gets simplified to an existential.

The following follows a similar path, treating ‘a dog’ pretty much just like ‘some dog’.

---

\(^{10}\) See Chapter 9 [Number Words].

\(^{11}\) This seems plausible when one notices that many languages – e.g., German, French, Spanish, … – use the same word-form – eine, une, una, … [variously inflected!] – to mean both ‘a’ and ‘one’.

\(^{12}\) The term ‘unit’ is scare-quoted because its application is heavily context-dependent. First, in the case of measure-nouns, the units are ratio-measures such as gallons, acres, miles; in which case ‘a’ and ‘one’ are modifier-adjectives, not bare-adjectives. Second, sometimes compound entities count as "units" as in:

- a man and woman
- a family
8. every man who owns a dog is happy

<table>
<thead>
<tr>
<th>every man who owns a dog is happy</th>
</tr>
</thead>
<tbody>
<tr>
<td>every man who owns a dog is happy</td>
</tr>
<tr>
<td>every man who owns a dog is happy</td>
</tr>
</tbody>
</table>

The following is an alternative account of the above sentence, which does not treat ‘a dog’ as ‘some dog’, although it produces an equivalent reading.

Note that $\Sigma$ admits [who], and note that [every] is $\Sigma$-promoting and accordingly converts $\Sigma$ to $\Pi$, which grants wide scope to ‘a dog’.

In the previous example, ‘a dog’ can be narrow-existential or wide-universal, the resulting formulas being logically equivalent. In the following example, ‘a dog’ can only be a wide-universal.
9. every man who owns a dog feeds it

<table>
<thead>
<tr>
<th>every [+]</th>
<th>man</th>
<th>who</th>
<th>owns</th>
<th>a dog</th>
<th>[+2, −1]</th>
<th>feeds</th>
<th>(−1) it [+]</th>
</tr>
</thead>
<tbody>
<tr>
<td>λy_yDy</td>
<td>λy_yx[Fxy]</td>
<td>λy_xz₂</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Notice, in particular, that a narrow-scope reading of ‘a dog’ is impossible because Σ-simplification is not available at any node, because the sum is not a sum of sentences. In order to accomplish the latter, we must remove the anaphoric marker [−1], but then ‘a dog’ does not bind ‘it’.

The following is another example in which ‘a dog’ gains wide-scope in order to bind ‘it’.

10. a dog is happy if it is well-fed

Notice that [if...] is Σ-promoting, and accordingly converts Σ to Π.

The following is an example of semantic-binding that is not syntactically-admissible.

11. it is happy if a dog is well-fed [binding fail?]

---

13 Here, in order to save space, we "pre-inflect" the quantifier. Officially, this is syntactically inadmissible, since case-markers attach only to NPs. We propose to ease this restriction, and allow anticipatory case-marking.
By contrast, both the following are OK syntactically.

12. if a dog is well-fed, then it is happy
13. if it is well-fed, then a dog is happy

The following is a variation with two occurrences of ‘a’ with corresponding pronouns.

14. if a man owns a dog, then he feeds it

<table>
<thead>
<tr>
<th>if</th>
<th>a man [+1,−1]</th>
<th>owns</th>
<th>a dog [+2, −2]</th>
<th>then</th>
<th>(−1) he [+1]</th>
<th>feeds</th>
<th>(−2) it [+2]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Σ{ x₁ × x₂</td>
<td>Mx }</td>
<td>λy₂λx₁Oxy</td>
<td>Σ{ y₂ × y₂</td>
<td>Dy }</td>
<td>∅</td>
<td>λx₁,x₁</td>
<td>λy₂λx₁Fxy</td>
</tr>
<tr>
<td>λPλQ{P→Q}</td>
<td>Σ{ Oxy × x₁ × y₂</td>
<td>Mx &amp; Dy }</td>
<td>λy₂λx₁Fxy</td>
<td>λy₂λx₁Fxy</td>
<td>λy₂λx₁Fxy</td>
<td>λy₂λx₁Fxy</td>
<td></td>
</tr>
</tbody>
</table>

Π{ λQ{Oxy→Q} × x₁ × y₂ | Mx & Dy }
Π{ λQ{Oxy→Q} × Fxy | Mx & Dy }
Π{ Oxy→Fxy | Mx & Dy }
∀x∀y{ Mx & Dy ,→, Oxy→Fxy }

Notice that the two Σ-junctions combine into a big one, and [if] is Σ-promoting, and accordingly converts the latter to a big Π.

6. Sometimes some is Indefinite

When applied to special domains, quantifier phrases occasionally take on special forms, including ‘always’, ‘never’, ‘everywhere’, and ‘somewhere’. When the special domain is persons, we have the following replacements.¹⁴

- every person ⇒ everyone
- any person ⇒ anyone
- some person ⇒ someone
- no person ⇒ no one

The morphological rule is clear. However, when we apply it to ‘a person’, we obtain ‘a one’, which is inadmissible.¹⁵ What we have instead is the following.

- a person ⇒ someone

which means that ‘someone’ is ambiguous between the QP ‘some person’ and the INP ‘a person’, which can be a source of confusion for semantic-theorists.

A potential exception to this rule is the following.

15. a person is a moral agent

This philosophical claim is presumably nomic (law-like), and accordingly licenses counterfactual reasoning. But if we replace ‘a person’ by ‘someone’, we obtain

- someone is a moral agent

which does not seem to be nomic.

¹⁴ Note that these phrases should be distinguished from similar forms that have a slight pause before ‘one’. For example, ‘every…one’ is analogous to ‘this one’, as in the following example:

I have many dogs; every one is smart; this one is very smart

¹⁵ Also, the rule does not apply to plural quantifiers; for example, ‘several persons’ does not abbreviate as ‘several ones’. Also, the rule does not apply to numerical quantifiers; for example, ‘exactly one person’ does not abbreviate as ‘exactly one one’.
The following illustrates using ‘someone’ as an indefinite noun phrase.

16. if someone owns a dog, then he/she is happy

<table>
<thead>
<tr>
<th>if</th>
<th>someone [+1][-1]</th>
<th>owns a dog</th>
<th>then</th>
<th>(-1) he/she [+1]</th>
<th>is happy</th>
</tr>
</thead>
<tbody>
<tr>
<td>ΛP.ΛQ[P→Q]</td>
<td>Σ { x₁ × x₁</td>
<td>Px }</td>
<td>Λx₁∃y(Dy &amp; Oxy)</td>
<td>∅</td>
<td>Λx₁.x₁</td>
</tr>
</tbody>
</table>

The following is a similar example, but with two bound pronouns

17. if someone owns a dog, then he/she feeds it

which can be done similarly, and is left as an exercise.

7. A Surprise Re-Rendering

The phrase

every man's mother

is customarily parsed as follows.

```
  mother
 /     \
\  s  /
|     |
\ every -- man
```

which is odd, since ‘man’s’ is presumably a word, and *apostrophe-s* is presumably not a phrase.\(^\text{16}\) Presumably, the reason this parsing is required that ‘every man’ is an NP, but ‘man’ is not. On the other hand, this chapter has presented many examples of common-nouns being case-marked. So what happens when we try that ploy on this example? Consider the following example.

18. every man's mother is kind

<table>
<thead>
<tr>
<th>every</th>
<th>man</th>
<th>'s</th>
<th>mother</th>
<th>[+1]</th>
<th>is kind</th>
</tr>
</thead>
<tbody>
<tr>
<td>Λx₀Mx</td>
<td>Λx₁</td>
<td>Λx₂</td>
<td>Λx₃</td>
<td>Λx₄</td>
<td>Λx₅</td>
</tr>
<tr>
<td>Σ { x₆</td>
<td>Mx }</td>
<td>Λy₀Λx₀Oxy</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ΛP₀/ΛxPx</td>
<td>Σ { λx₀Oxy</td>
<td>Mx }</td>
<td>λx₀Σ { Oxy</td>
<td>Mx }</td>
<td>λx₀∃y{Mx &amp; Oxy}</td>
</tr>
<tr>
<td>Λ { x₁</td>
<td>Λy{Mx &amp; Oxy} }</td>
<td>λx₁x₁</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>∀x { Λy{Mx &amp; Oxy} → Kx }</td>
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</table>

\(^\text{16}\) This phenomenon is often described by saying that *apostrophe-s* is a clitic. Another well-known example is the Latin ‘que’ as in the widely inscribed ‘SPQR’ [Senatus Populusque Romanus; the Senate and the people of Rome].
This analysis maintains the integrity of ‘man’s’, and also does not depend upon a covert occurrence of [def]. It reads the sentence thus.

\[
\text{everyone who mothers at least one man is kind.}
\]

Alas, the critical behavior of \textit{apostrophe-s} can’t be entirely eliminated, since this trick can’t be used on the following example.

19. \text{the Queen of England’s mother is kind.}

8. \textbf{Entity-Sums as Entities}

We still don’t have an account of the reading of

\[
\text{Jay is looking for a dog}
\]

generating which ‘a dog’ does not indicate a particular individual Jay is looking for, but rather indicates the \textit{kind} of thing Jay is looking for.

To account for this \textit{generic} reading of ‘a dog’, we take advantage of the following type-identity.

\[
\Sigma D = D
\]

In other words, any sum of entities is itself an entity. Various types of compound-entities appear in the philosophical literature, including \textit{mereological-sums} and \textit{pluralities}.$^{17}$ We have already utilized pluralities in our treatment of number-words, which are treated as adjectives that apply to count-nouns including plural-nouns.

The current example provides another opportunity to invoke compound-entities. In particular, it permits us to treat \textit{looking-for} as a relation between cognitive-agents and entities, the latter of which may be simple or compound.$^{18}$

Since ‘a dog’ can be QP or a DNP, ‘looking for a dog’ is correspondingly ambiguous, as seen in the following two constructions.$^{19}$

\begin{align*}
\text{Jay [+1]} & \text{ is-looking-for a dog [+2]} \\
\lambda y \lambda x Lxy & \Sigma \{ y \mid Dy \} \\
\Sigma \{ \lambda x Lxy \mid Dy \} \\
\exists y \{ Dy \} \\
\Sigma \{ L y \mid Dy \} \\
\end{align*}

\begin{align*}
\text{Jay [+1]} & \text{ is-looking-for a dog [+2]} \\
\lambda y \lambda x Lxy & \Sigma \{ y \mid Dy \} \\
\lambda x L[x, \Sigma Dy] \\
L[j, \Sigma Dy] \\
\end{align*}

According to the first reading, Jay stands in relation \textit{L} to a particular dog. According to the second reading, Jay stands in relation \textit{L} to a compound-entity – namely, the sum of all dogs.

To see that this is not as exotic as it might sound at first, consider what it means to be looking for a spatially-complex entity such as India; one stands in relation \textit{L}, not to any particular part of India, but to the whole. We propose that looking for a dog, or dogs, can be similarly "holistic".

In the above example, ‘looking for’ is given a purely extensional interpretation; the relation \textit{L} stands between \textit{actual} entities. Sometimes, however, ‘looking for’ is \textit{intensional} in nature. For example, looking for a unicorn is different from looking for a dragon, although the extensions of ‘unicorn’ and ‘dragon’ are identical, both being empty.

$^{17}$ See Chapter \textit{[Mereology]}.

$^{18}$ Treating ‘looking for’ as an \textit{extensional} predicate may seem implausible on the face of it. See later examples.

$^{19}$ In \textit{The Empire Strikes Back}, Luke says he is looking for someone, to which Yoda replies “found someone, you have…” Recall that ‘someone’ often replaces the indefinite ‘a person’.
In such cases, what we seek is not so much an entity, simple or complex, but a more abstract item – a state of affairs. For example, seeking a unicorn might be understood as seeking *to-behold-a-unicorn*.\(^\text{20}\) Then looking for a unicorn is seeking a state of affairs in which one beholds a unicorn.\(^\text{21}\)

Entity-sums are also useful in explaining generic readings of common nouns, as in the following examples

20. children like dogs
21. fruit-flies like a banana\(^\text{22}\)

If one thinks there are covert quantifiers lurking in the deep-structure representations, one must say which ones; unfortunately, no particular quantifiers seem to work. On the other hand, if one takes the pertinent phrases to be indefinite noun phrases, and one takes the latter to transform into entity-sums, then one can interpret (1) as asserting a relation between children-as-a-whole and dogs-as-a-whole, and (2) as asserting a relation between fruit-flies-as-a-whole and bananas-as-a-whole.

\[
\begin{array}{c|c|c|c|c|c|c|c|c|c|c}
\text{children} & \text{like} & \text{dogs} & \lambda y, \lambda x_1 L x y & [\Sigma x D x]_2 \\
\Sigma x C x_1 & & & & \\
\hline
\text{fruit-flies} & \text{like} & \text{a banana} & \lambda y, \lambda x_1 L x y & [\Sigma x B x]_2 \\
\Sigma x F x_1 & & & & \\
\hline
\end{array}
\]

With this in mind, consider the following generic (perhaps nomic) assertions.

22. a dog is a mammal
23. dogs are mammals

\[
\begin{array}{c|c|c|c|c|c|c|c|c|c|c}
a \text{dog} & \text{is} & \text{a mammal} & \lambda x_1 L [x, \Sigma x D x] & [\Sigma x D x]_2 \\
\Sigma x D x_1 & ? & & & \\
\hline
dogs & \text{are} & \text{mammals} & \lambda x_1 L [x, \Sigma y B y] & [\Sigma x M x]_2 \\
\Sigma x M x_1 & ? & & & \\
\hline
\end{array}
\]

Suppose all the indefinite noun phrases above are understood to be generic, so they denote compound entities. Then how do we interpret ‘is’? The usual suspects are *existence*, *predication*, and *identity*,\(^\text{23}\) but none of these work. Since the arguments are entities, the connector must be a transitive verb, which means it must be identity. But the relation expressed in these two sentences is not symmetric, so it is not identity.

Rather, it seems we have yet another variety of *being*. For these particular examples, the most natural semantic account is that ‘be’ denotes the *species-genus* relation, whose extensional-form is set-inclusion.\(^\text{24}\)

\[
\text{is} [\mathcal{G}] = \lambda y, \lambda x_1 [x \subseteq y]
\]

The above semantic derivations can then be completed as follows.

---

\(^{20}\) More generally, one seeks to stand in some tacitly understood relation to a unicorn – for example, *owning*. Also, if I am seeking a spouse, I may be seeking to be related to someone who is a spouse (of mine, or of someone else), or I may be seeking to be spousally-related to someone.

\(^{21}\) But notice that one is thereby seeking a, but no particular, state of affairs, which means one stands in the seek relation to a mereological-sum, not of unicorns, but of states of affairs.

\(^{22}\) This comes from Groucho Marx, which is a follow-up to ‘time flies like an arrow’. A variant joke might be for Groucho to pull out a very crooked arrow, and say, ‘... but not this one’.

\(^{23}\) For logicians at least!

\(^{24}\) Set A is included in set B if and only if every member of A to also be a member of B. Note, however, that the species-genus relation is modal in character, standing between possible pluralities.
9. **The Difference between *a* and *any***

There is a striking similarity between ‘*a*’ and ‘*any*’. In particular, both can be promoted to a junction that ultimately gets simplified to ∀. Because of this, the following sentences convey the same information.

if *a* wild animal comes into the house, we put it back outside
if *any* wild animal comes into the house, we put it back outside

On the other hand, ‘*a*’ and ‘*any*’ are not equivalent, as immediately seen in the following pair.

Rex is a dog
≠
Rex is any dog

There are also more complicated examples.

if Jay doesn’t own *a* dog, he doesn’t feed it
≠
if Jay doesn’t own *any* dog, he doesn’t feed it

Note, in particular, that the former, but not the latter, succeeds in binding ‘*it*’ to the NP. The following further emphasizes the difference between ‘*a*’ and ‘*any*’.

if *a* man doesn’t own *a* dog, he doesn’t feed it
≠
if *any* man doesn’t respect *any* dog, he doesn’t feed it

The former is sensible (grammatically); the latter is downright bizarre.

10. **More on Scope**

We adjudicate quantifier-scope by appealing to admissibility-restrictions on the relevant junctions. For example, ∧ and ∨ admit each other, so ‘*every*’ and ‘*some*’ can each out-scope the other. On the other hand, ∅ admits ∧, so ‘*no*’ out-scopes ‘*every*’, but not vice versa.

Let us see how this idea operates with indefinite noun phrases and Σ. For example, the following sentence

24. Jay doesn’t own *a* dog

does not have a reading according to which ‘*a* dog’ is a wide-scope existential. Rather, the admissible calculations are the following, which produce equivalent formulas.

25 For example, a moth!
The following takes advantage of \( \exists \) becoming a universal-quantifier. This maneuver is critical in the following example, in which \( \forall \) gains wide enough scope to bind \( \exists \), and in so doing becomes a universal-quantifier.

The following takes advantage of \( \Sigma \)-promotion to bind a pronoun.

25. if Jay doesn’t own a dog, then he [i.e., Jay] doesn’t feed it

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<tbody>
<tr>
<td>( \lambda y_1 \lambda x_1 \lambda y_2 \lambda x_2 \lambda z_1 \lambda z_2 )</td>
<td>( \lambda y_2 x_1 \lambda x_2 \lambda y_2 \lambda x_2 \lambda y_2 \lambda x_2 \lambda z_1 \lambda z_2 )</td>
<td>( \lambda y_2 x_1 \lambda x_2 \lambda y_2 \lambda x_2 \lambda z_1 \lambda z_2 )</td>
<td>( \lambda y_2 x_1 \lambda x_2 \lambda y_2 \lambda x_2 \lambda z_1 \lambda z_2 )</td>
<td>( \lambda y_2 x_1 \lambda x_2 \lambda y_2 \lambda x_2 \lambda z_1 \lambda z_2 )</td>
</tr>
</tbody>
</table>

\( \lambda y_1 \lambda x_1 \lambda y_2 \lambda x_2 \lambda z_1 \lambda z_2 \)

Next, consider the following.

26. every man owns a dog

27. no man owns a dog

Can we reverse the scopes; are the following readings admissible?

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</thead>
<tbody>
<tr>
<td>( \lambda y_1 \lambda x_1 \lambda y_2 \lambda x_2 \lambda z_1 \lambda z_2 )</td>
<td>( \lambda y_2 x_1 \lambda x_2 \lambda y_2 \lambda x_2 \lambda z_1 \lambda z_2 )</td>
<td>( \lambda y_2 x_1 \lambda x_2 \lambda y_2 \lambda x_2 \lambda z_1 \lambda z_2 )</td>
<td>( \lambda y_2 x_1 \lambda x_2 \lambda y_2 \lambda x_2 \lambda z_1 \lambda z_2 )</td>
</tr>
</tbody>
</table>

\( \lambda x_1 \lambda y_1 \lambda x_1 \lambda y_2 \lambda x_2 \lambda z_1 \lambda z_2 \)

Note that \([\text{doesn’t}]\) promotes \( \Sigma \) to \( \Pi \). So ‘a dog’ can gain scope over ‘not’, but in so doing it becomes a universal-quantifier. This maneuver is critical in the following example, in which ‘a dog’ gains wide enough scope to bind ‘it’, and in so doing becomes a universal-quantifier.
As implausible as these readings seem, we cannot block the formation of the \( \Sigma \)-phrases, because we need them as antecedents in the following examples.

28. if every man owns a dog, then it is bound
29. if no man owns a dog, then it is free

\[
\begin{array}{|c|c|c|c|c|c|}
\hline
\text{if} & \text{every man} & \text{owns} & \text{a dog} & \text{then} & \text{is bound} \\
\hline
\land \{ \ x_1 \ | \ Mx \} & \lambda y_2 \lambda x_1 Oxy & \Sigma \{ y_2 \times y_1 \ | \ Dy \} & \emptyset & \lambda y_1, y_1 & \lambda x_1 Bx \\
\land \{ \ x_1 \ | \ Mx \} & \Sigma \{ \lambda x_1 Oxy \times y_1 \ | \ Dy \} & & & & \\
\hline
\end{array}
\]

\[
\lambda P \lambda Q \{ P \rightarrow Q \} \\
\Sigma \{ \lambda \{ \forall x \{ Mx \rightarrow Oxy \} \times y_1 \ | \ Dy \} \} \\
\Pi \{ \lambda Q \{ \forall x \{ Mx \rightarrow Oxy \} \rightarrow Q \} \times y_1 \ | \ Dy \} \\
\Pi \{ \lambda Q \{ \forall x \{ Mx \rightarrow Oxy \} \rightarrow Q \} \rightarrow By \ | \ Dy \} \\
\forall y \{ Dy \rightarrow \{ \forall x \{ Mx \rightarrow Oxy \} \rightarrow By \} \} \\
\lambda y_1 By
\]

Notice that \([if] \) promotes \( \Sigma \) to \( \Pi \).

11. **Still more on Scope**

The previous examples suggest that ‘a’ can out-scope ‘every’ and ‘no’, which is accomplished by one junction absorbing the other. This is not the only way ‘a’ can out-scope ‘every’. The following is a clear (if surprising) example, due to Rodney Dangerfield.

I have a suit for every occasion… unfortunately, this is it!

The following is a variation.

I have a friend in every city… he is very big!

Even if \( \Sigma \) does not admit \( \land \), we can still account for these sentences. Central to our account is the idea that an indefinite noun phrase starts life as a common-noun phrase, which sometimes metamorphoses into an entity-sum. Moreover, between inception and metamorphosis, it can be modified adjectively, as illustrated in the two examples above.

Let’s concentrate on the initial clause.

30. I have a suit for every occasion

First, the following derivation accords wide scope to ‘a suit’.

\[
\begin{array}{|c|c|c|c|c|}
\hline
\text{I} & \{+1\} & \text{have} & \text{a-suit} & \text{for} \\
\hline
1 & \lambda x, x_1 & \lambda y_2 \lambda x_1 Fxy & \land \{ y_2 \ | \ Oy \} \\
26 & & \lambda x_0, \lambda x_0 \{ \ Fxy \ | \ Oy \} & & \\
& & \lambda x_0 \{ \forall y \{ Oy \rightarrow Fxy \} \} & & \\
& \lambda x_0, \{ Sx \ & \forall z \{ Oy \rightarrow Fxy \} \} & \lambda x, x_2 & \\
& \lambda x_2 \lambda y, Hyx & \Sigma \{ x_2 \ | \ Sx \ & \forall z \{ Oy \rightarrow Fxy \} \} & & \\
\hline
\end{array}
\]

\[
\Sigma \{ \lambda y_1, Hyx \ | \ Sx \ & \forall z \{ Oy \rightarrow Fxy \} \} \\
\exists x \{ Sx \ & \forall z \{ Oy \rightarrow Fxy \} \ & \lambda x \}
\]

---

26 Every utterance-context contains a speaker, which is what small-caps ‘I’ signifies.
By comparison, the following derivation accords wide scope to ‘every occasion’.

\[
\begin{array}{|c|c|c|c|c|}
\hline
1 & \text{[+1]} & \text{have} & \text{a suit} & \text{for every occasion [+2]} & \text{[+2]} \\
\hline
\lambda x_1.x_1 & \lambda y_1 \lambda x_1 \lambda y_2 \lambda x_2 \lambda y_3 \lambda x_3 \lambda y_4 \lambda x_4 \lambda y_5 \lambda x_5 \lambda y_6 \lambda x_6 \lambda y_7 \lambda x_7 \lambda y_8 \lambda x_8 \lambda y_9 \lambda x_9 & \lambda y_1 \lambda x_1 \lambda y_2 \lambda x_2 & \lambda y_3 \lambda x_3 \lambda y_4 \lambda x_4 \lambda y_5 \lambda x_5 \lambda y_6 \lambda x_6 \lambda y_7 \lambda x_7 \lambda y_8 \lambda x_8 \lambda y_9 \lambda x_9 & \lambda y_1 \lambda x_1 \lambda y_2 \lambda x_2 & \lambda y_3 \lambda x_3 \lambda y_4 \lambda x_4 \lambda y_5 \lambda x_5 \lambda y_6 \lambda x_6 \lambda y_7 \lambda x_7 \lambda y_8 \lambda x_8 \lambda y_9 \lambda x_9 \\
\hline
\end{array}
\]

Next, we add the punch-line, this time working on the second example.

31. I have a friend in every city; he is very big.

First note that having-a-friend is different from having-a-suit, the difference being precisely the same as the difference between genitive and possessive. In the case of having-a-friend, the relationship is friendship, but in the case of having-a-suit, the relationship is possession. We thus distinguish between genitive-have and possessive-have. In the previous example, we have an example of possessive-have, which is a transitive verb. In the following, we have an example of genitive-have, which we propose to treat as a copula+accusative-existence, categorically-rendered as follows.\(^{28}\)

\[
[[\text{have}[G]]] = \lambda x_1.x_6 \times \lambda x_2[x=x] \quad \text{[type: } \text{D}_1 \rightarrow \text{D}_6 \times \text{D}_2 \rightarrow \text{S}]
\]

\[
\begin{array}{|c|c|c|c|c|c|}
\hline
I & \text{[+1]} & \text{have} & \text{a-friend} & \text{in} & \text{every city [+2]} & \text{[+2]} & \text{[+1]} & \text{[+1]} & \text{[+1]} & \text{[+1]} & \text{[+1]} & \text{[+1]} & \text{[+1]} \\
\hline
1 & \lambda x_1.x_6 \times \lambda x_2[x=x] & \lambda y_1 \lambda x_1 \lambda y_2 \lambda x_2 & \lambda y_3 \lambda x_3 \lambda y_4 \lambda x_4 & \lambda y_5 \lambda x_5 \lambda y_6 \lambda x_6 & \lambda y_7 \lambda x_7 \lambda y_8 \lambda x_8 & \lambda y_9 \lambda x_9 & \lambda x_1 x_1 & \lambda x_1 Bx \\
\hline
\end{array}
\]

\(^{27}\) Possession/ownership is broadly understood. If I ask whether you have a horse in the next race, I am probably not asking whether you legally own such a horse, but whether you are invested – emotionally or financially – in such a horse. Similarly, the Red Sox are "my" baseball team, but I do not legally own them. See Chapter on Possessive versus Genitive.

\(^{28}\) A copula is a connecting-verb that is largely semantically-empty. For example, in elementary logic ‘is happy’ and ‘happy’ have the same formalization.