❖ *Names and Predicates: Translation and Semantics* ❖

5.2. Names and Predicates: English Language, Formal Language

1. Names and Predicates. As formal counterparts to proper names we add lower-case letters ‘a’ through ‘o’ to the formal language. These are **name letters**. (As always, we permit adding numerical subscripts if a translation requires a large number of distinct letters.)

> **Name letters**: lower-case letters **a** through **o** (with or without numerical subscripts)

Translation keys are likewise expanded, assigning a name letter to each proper name in the argument – as in the following example.

> **P**: Exercise is bad for the soul. **a**: Neko
> **Q**: The unexamined life is worth living. **b**: Jack

Of course names on their own are useless in providing new sentences, since trying to combine them with atomic sentences yields gibberish in both English and the formal language.

☠ Some Gibberish ☠

> **Either exercise is bad for the soul, or Neko (P ∨ a)**

To yield sentences we need to combine names with **predicates**. An English sentence uses the name “Neko” by way of attributing some **feature** to Neko.

> Neko **is a cat**.
> Neko i**s hungry**.

To achieve this end in the formal language, capital letters **G** through **O** act as formal counterparts to English language predicates.[1] These are **predicate letters**.

> **Predicate letters**: capital letters **G** through **O** (with or without numerical subscripts)

Just as proper name "Neko" and predicate "is a cat" combine to form a complete sentence in English, name letter and predicate letter do so in the formal language. (A minor notational difference: while in English the proper name typically comes before the predicate, as a matter of logical tradition the **name letter follows** the **predicate letter**.)

Using the following translation key, we translate both our earlier English examples.

a: Neko	**G**: ____ is a cat
	H: ____ is hungry

Neko is a cat	**Ga**
Neko is hungry	**Ha**

Predicate-letter-plus-name-letter thus forms a new type of **atomic sentence** in the formal language – call it a "**predicate atom**".

This expanded formal language marks an important change in sentence construction: while in previous chapters the smallest building block was itself a sentence (a sentence letter), with predicate and name letters we now cut finer than a whole sentence. Nonetheless it's still whole sentences which are candidates for truth or falsehood, and in that sense even a predicate-letter-plus-name-letter counts as atomic. (Neither a predicate nor a name can be true or false on its own.)

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[1] By "predicate" we generally mean a verb or verb phrase, such as "sleeps" and "likes sushi". But we'll also use the general phrasing "is __" or "is a __" to turn a wide array of words and phrases into predicates: adjectives like "bored" and "illegal" ("is bored," "is illegal") and nouns such as "surfer" and "gambler" ("is a surfer," "is a gambler").

Revised construction rules for the formal language reflect this new type of atomic sentence.

Revised Construction Rules (*First Draft*)

Atomic Sentences:

A1. Sentence letters are atomic sentence
A2. A predicate letter followed by a name letter is an atomic sentence.

Formal Sentences:

1. Atomic sentences are formal sentences.
2. If ● is a formal sentence, then ~● is a formal sentence.
3. If ● and ▲ are formal sentences, then (● ∧ ▲) is a formal sentence.
4. If ● and ▲ are formal sentences, then (● ∨ ▲) is a formal sentence.
5. If ● and ▲ are formal sentences, then (● → ▲) is a formal sentence.
6. If ● and ▲ are formal sentences, then (● ↔ ▲) is a formal sentence.

Note that adding another sort of atomic sentence is the only change we've made to the formal language so far.[2]

2. Translation. A predicate atom, just like a sentence letter, can appear in larger combinations within negations, conjunctions, disjunctions, conditionals, and biconditionals.

[2] So in a construction tree we won't break "Ga" into its two parts. A predicate atom will be just as much the end of the line, construction-wise, as a sentence letter.

a: Neko	**G**: ____ is a cat	**I**: _____ is ordering sushi
b: Jack	**H**: ____ is hungry	**J**: _____ is athletic
c: Suki		

Neko is hungry **and** Suki is hungry **(Ha ∧ Hc)**
("**Both** Neko **and** Suki are hungry")

Either Neko is unathletic **or** Suki is unathletic **(~Jc ∨ ~Jc)**
("**Either** Neko **or** Suki is unathletic";
"**Either** Neko is unathletic **or** Suki is")

If Suki is ordering sushi, **then** Neko is ordering sushi **(Ic → Ia)**
("**If** Suki's ordering sushi **then** so is Neko")

Some of these English variants are familiar from previous chapters – e.g., deleted repetition ("Either Neko ~~is unathletic~~ or Suki is unathletic"), negation morphemes ("**un**athletic"), and "(do) so".

But others are new. For instance: when applying more than one predicate to the same name, English lets us conjoin these predicates by listing them in a row, one after the other.

So the claim "Jack is an athletic cat" means the same as "Jack is athletic and Jack is a cat"; and both are translated into the same formal sentence.

Jack is athletic and Jack is a cat **(Jb ∧ Gb)**
Jack is an athletic cat **(Jb ∧ Gb)**

Likewise with larger conjunctions: "Jack is a hungry, athletic cat" translates the same as "Jack is hungry and Jack is athletic and Jack is a cat".

These 'stacked up' predicates can appear as parts of larger molecular sentences.

If Jack is an athletic cat, then Jack is hungry

((Jb ∧ Gb) → Hb)

If Jack is athletic, then Jack is a hungry cat

(Jb → (Hb ∧ Gb))

As we'll see, translating stacks of predicates as conjunctions yields the correct results in terms of truth and validity. [3]

Already in Chapter Two we remarked that the **order of parts of a conjunction** makes no difference to the **truth** of the sentence.[4] So our treatment of 'stacked up' predicates suggests that switching the order of predicates in the stack shouldn't affect the claim being made (or the truth value of the sentence). Examples bear this out: the following two sentences are true in the same situations, and seem to say the same thing.

Neko is a feline American. **(Ka ∧ La)**
Neko is an American feline. **(La ∧ Ka)**

It's a peculiarity of English (and other natural languages) that predicates sometimes can't naturally switch places in a sentence – as in the next examples.

Neko is a hungry cat.
☠ Neko is a cat hungry. ☠

One grammatical variation here is instead to embed the second predicate, "is hungry," inside a relative clause.

Neko is a cat [who is hungry].

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[3] But as we'll also see, in 5.4, while the easy equivalence between conjunctions and 'stacked up' predicates holds when the subject of the sentence is a proper name, it breaks down in the case of quantifiers.

We're also simplifying here by focusing on **intersective** predicates – where, for example, a **hungry cat** is **hungry** and is **cat**. 'Stacked-up' predicates don't translate so cleanly into a conjunction in the case of **subsective** predicates. For example, a **small galaxy** isn't both small and a galaxy, since galaxies aren't small. (A small galaxy is small-for-a-galaxy, but not flat-out small.) The analysis also breaks down for **non-subsective** predicates – for example, a **fake diamond** isn't both fake and a diamond (if it's a fake it's not a diamond), and a **former girlfriend** isn't both former and a girlfriend. (For that matter, a 'negated disjunction' isn't a disjunction – it's a negation.) See (Partee 1995: 323-325) for further discussion.

[4] This is the **commutativity** of conjunction, discussed in 2.5.

In so doing we again treat the original stack of predicates as a conjunction – recalling from Chapter Two that a sentence with a relative clause is treated as a conjunction in disguise.[5]

Relative clauses also illustrate how English allows the second predicate to be moved forward in the sentence, by rephrasing that predicate.

a: Elvis
b: Jack

G: ____ is a surfer
H: ____ drinks coffee (‘coffee-drinking’)
I: ____ is a cowboy
J: ____ counts cards (‘card-counting’)

Jack is a surfer **who drinks coffee**. **(Gb ∧ Hb)**
Jack is a **coffee-drinking** surfer. **(Hb ∧ Gb)**

Elvis is a cowboy **who counts cards**. **(Ia ∧ Ja)**
Elvis is a **card-counting** cowboy. **(Ja ∧ Ia)**

Likewise a predicate like “card-counting,” when standing alone, is more naturally phrased as “is a card-counter”.

a: Elvis

J: ____ counts cards (‘is a card-counter’)

Elvis **is a card-counter**. **Ja**

[5] See 2.4 §3.

With such English variations in hand we can easily explain the intuitive validity of the following argument.

a: Elvis

G: ____ is a cowboy
H: ____ counts cards
('is card-counting,' 'is a card-counter')
I: ____ reads minds
('is mind-reading,' 'is a mind-reader')

1. Elvis is a cowboy who either counts cards or reads minds.
2. Elvis isn't a mind-reader.

∴ Elvis is a card-counting cowboy.

((Ga ∧ (Ha ∨ Ia))
~Ia

∴ (Ha ∧ Ga)

That argument is valid in the same way as its Chapter Two counterpart.

1. We're having grog, and either truffles or grappa.
2. We aren't having grappa.

∴ We're having truffles and grog.

((P ∧ (Q ∨ R))
~R

∴ (Q ∧ P)

As always, noting English translation variations allows us to capture as much English form as possible – thereby allowing us to recognize the validity or invalidity of more English language arguments.[6]

[6] It will, furthermore, be a recurring theme of this chapter that we can understand features of our new sentences as paralleling features of sentences from Chapters Two and Three – but with new sorts of atoms. For example, we expect the sentence "Either Jack's a surfer or he's not" to be a logical truth, just as "Either it's raining or it's not" was in Chapter Two.