

❖ *Relations: Translation and Semantics* ❖

6.2. Relations: Formal Translation

As we've noted at earlier points, the additional expressive power of an expanded formal language brings additional need for attention to subtleties not found in simpler versions of the formal language. For instance, while we didn't need to worry about which part was which in a conjunction or disjunction (thanks to the lovely commutativity of those sentences), it was critically important once we graduated to conditionals (where switching antecedent and consequent is far from innocent).

Something similar holds when moving from simple one-placed predicates to multi-placed relation phrases. For it may be true that "Neko kicked Jack", but false that "Jack kicked Neko". Hence we need to specify in the translation key who (or what) is the 'doer' (or "agent") and who the 'do-ee' (or "patient").¹

A: Neko **B:** Jack
G²ab: a kicked b

Neko kicked Jack: G²AB
Jack kicked Neko: G²BA

Concerning who's the 'kicker' and who's the kick-ee', English word order can vary. For in **passive sentences** that order is reversed. In both of the following sentences, for instance, Neko is the 'kicker', and Jack the 'kick-ee'.

Active: Neko kicked Jack
Passive: Jack was kicked by Neko } G²AB

Following the above translation key, we can translate both these sentences as "G²AB" – treating those sentences as meaning the same thing. (But as we'll note later, the easy synonymy between active and passive sentences hits a bump when quantifiers are added to the mix.)

¹¹ In formal linguistics these different roles (e.g. 'kicker' vs. 'kick-ee') are called the **theta roles** of the verb- or predicate-phrase. An **intransitive** verb like "sleep" or "wake" has one theta role; a **transitive** verb like "kick" or "like" has two; and a **ditransitive** verb such as "give" or "put" has three.

Likewise with a three-place relation phrase: if Kitty transfers possession of Old Reliable, her .380 handgun, to Trixie, both the following sentences report the same fact.²

C: Kitty **D:** Old Reliable **E:** Trixie

H³abc: a gave b to c

Kitty gave Old Reliable to Trixie	}	H³CDE
Kitty gave Trixie Old Reliable		

And there's no requirement that different terms must fill the various 'blanks' of a relation phrase. For example, we can obviously translate the sentence "Neko likes Jack" into the formal language.

A: Neko **B:** Jack

I²ab: a likes b

Neko likes Jack I²AB

But we can use the same translation key to translate "Neko likes herself" – though here we replace the **reflexive** "herself" with "Neko" (just as in earlier chapters we replaced pronouns).

Neko likes herself I²AA

And note that the next sentence – a conjunction of such reflexive claims – means something quite different from the sentence that follows.

Neko likes herself and Jack likes himself (I²AA ∧ I²BB)
Neko and Jack like each other

² The second sentence, "Kitty gave Trixie Old Reliable," is a **dative** construction.

“Each other” is a **reciprocal** phrase, yielding a sentence equivalent to a **conjunction** of two (non-reflexive) relational claims. Like pronouns and reflexives, reciprocals are replaced by the names (or other terms) they stand in for.

So both of the following sentences are translated the same way.

A: Neko **B:** Jack
I²ab: a likes b

Neko and Jack like each other
Neko likes Jack and Jack likes Neko } $(I^2AB \wedge I^2BA)$

Likewise the phrase “one another” is a reciprocal – though one capable of referring to more than two people. Translating a “one another” sentence into the formal language can quickly become cumbersome – as in the following example.

A: Neko **B:** Jack **F:** Lucretia
I²ab: a likes b

Neko, Jack, and Lucretia like one other

$((I^2AB \wedge I^2BA) \wedge (I^2AF \wedge I^2FA)) \wedge (I^2BF \wedge I^2FB)$

[“Kitty and Lucretia don’t like one another” makes a stronger claim than just denying that the liking goes both ways. This claims the disliking goes both ways.]

And finally we should note that there are relation phrases that look similar to, and are indeed meaning-wise related to, other phrases, but which aren’t translated into the formal language the same way. The next sentence, for instance, seems unobjectionable.

Lucretia is **older than** Neko, but she’s not **old**.

The left part of this “but” sentence translates into the formal language using a two-place relation letter.

A: Neko **F:** Lucretia
J²ab: a is older than b

Lucretia is **older than** Neko, but she’s not **old**.

(J²FA ∧)

Yet the sentence “[Lucretia]’s not old” can’t appeal to this two-place relation letter. The best our formal language can do here is translate “is old” by a (one-place) predicate letter.³

A: Neko **F:** Lucretia
J²ab: a is older than b
K¹a: a is old

Lucretia is **older than** Neko, but she’s not **old**.

(J²FA ∧ ~K¹a)

[For Chapter Five:

Kitty is a bad singer, so Kitty is bad and Kitty is a singer.]

It may be true that Suki is taller than Neko, but still be false that Suki is tall.
 It may be true that Jake likes broccoli more than kale, but still false that Jake likes broccoli. (Here “likes” means...?)

³ We can bring out the semantic relation between “is old” and “is older than” by noting that “is old” seems to rely on an unspoken comparison with a group of people or things. So

This explains why we can say “Lucretia’s not old, but Neko is – though Lucretia is older than Neko.” For we measure Lucretia’s oldness against her fellow humans, but measure Neko’s oldness against her fellow cats.

For non-count nouns such as “water” or “time” or “patience”, we may need to mention an (unstated) sample or amount in order to translate into the formal language.

Neko drank (a serving or amount of) milk.
All milk contains calcium

Kitty sold Trixie Old Reliable
Kitty sent Trixie Old Reliable

[introduce phrase “arguments”]

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2. Relations and Quantifiers. [put this off until after 6.3 Relation Semantics; then can have 6.4 Relations and Quantifiers, and 6.5 Features of Relations]

The Cathedral of Learning is taller than the Kinkakuji

∴ Something’s taller than the Kinkakuji

There’s a skyscraper that Jack climbed.

$\exists x (Gx \wedge H^2Ax)$

Jack climbed a skyscraper
Something that Jack climbed is a skyscraper.

(Likewise: Neko built a robot.)

Suki made a California roll and ate it.

If A is a wife/husband/father/mother, then A is a wife/husband/father/mother of B (or of some x).

Kitty is Trixie's sister.
 Kitty and Trixie are sisters.
 (Q: Are they twin sisters?)

Suki likes Neko.
 Suki likes herself.
 Both Suki and Neko like themselves.
 Suki and Neko like each other.

If Neko and Jack both live with Rex, then they live with each other.

Everybody digs Bill Evans \therefore Bill Evans digs himself.

Neko likes anything that Suki cooks.
 $\forall x (GBx \rightarrow HAx)$

Nobody likes anything more than Neko likes food. ("food"?)

Everyone looks like themselves.
 \therefore Everyone looks like someone.

There's someone who looks like everyone.
 Seneca: "Every person... has someone to whom he confides everything that is confided to himself." (Letter 105, p. 196)

$\forall w \exists x \forall y \exists z (G^3zyw \rightarrow G^3wyx)$

Suki gave Neko a fish

$\exists x (Gx \wedge H^3Ax B)$

Someone gave Neko a fish

$\exists y \exists x (Gx \wedge H^3yx B)$

In discussion of multiple quantifiers can discuss passives:

Every arrow hit some target

Some target was hit by every arrow (ambiguous)

(From 1.5.17 note:)

Other than chick flicks and musicals, whatever does not kill Rex makes him stronger.